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MORBIDITY AND MORTALITY WEEKLY REPORT

Epidemiologic Notes and Reports

Nitrosamine Exposure in a Tire Manufacturing Plant — Maryland

Volatile N-nitrosomorpholine (NMOR), N-nitrosodimethylamine (NDMA), and N-nitrosopyrrolidine (NPYR)—3 powerful carcinogens for animals whose effects on humans are unknown—were found last year in air samples in a tire manufacturing plant in Cumberland, Maryland. Airborne NMOR was present at a maximum concentration of 250 micrograms per cubic meter ($\mu g/m^3$), a level 10 times higher than any nitrosamine concentration previously reported in the rubber industry. Over the following 8 months, ventilation improvements and changes in chemical formulation resulted in a 100-fold reduction in NMOR levels and in elimination from air of other nitrosamines.

In June 1979, the United Rubber Workers Union, Local 26, had requested an evaluation of worker exposure to N-nitrosodiphenylamine (NDPhA) (a rubber retarding agent) at the tire production plant, located in Cumberland. As a result, 12 air samples were obtained in August 1979 in plant areas above heated rubber stock (200-230 F) to measure airborne concentrations of volatilized nitrosamines. NMOR, NDMA, and NPYR were found in the majority of the air samples. The highest concentrations (64-250 $\mu g/m^3$) were found in those areas of the plant where rubber is fed into machines, pressed, and combined with nylon fabric for bias-ply tires (the so-called feed-mill and calendering areas). High NMOR levels were also found at the tire-tread extruding machine (32.0 $\mu g/m^3$) and in the press room (6.8 $\mu g/m^3$), where tires are cured. Personal (breathing-zone) air samples, obtained on workers in October 1979, showed feed-mill and calendering operators to be the most heavily exposed to nitrosamines; 1 worker had a time-weighted average NMOR exposure of 25 $\mu g/m^3$. Approximately 200 workers in the plant could have potentially been exposed to nitrosamines.

Recommendations were made for immediate reduction of exposure through improved ventilation. It was established that the source of the high levels of airborne NMOR was the thermal decomposition of NDPhA and the subsequent reaction of its nitroso group with other rubber additives (preformed morpholine compounds).

Follow-up environmental surveys were conducted at the plant in December 1979 and in February 1980. In December, the highest breathing-zone NMOR concentration was 18 $\mu g/m^3$; by February, the maximum concentration had decreased to 1.3 $\mu g/m^3$. NDMA levels at the latter time were 5.5 $\mu g/m^3$, and for the first time NPYR could not be detected. Before the December survey, plant management had installed local exhaust ventilation at all feed mills and tire-tread extrusion machines. By February, the company had substituted a different retarding agent for NDPhA.

In December 1979, blood, urine, and stool samples were collected from 15 workers for nitrosamine analysis. Results of all analyses were negative. In February 1980, urine samples were obtained from 9 workers for mutagenicity testing by the Ames *Salmonella* test. Methylene chloride extracts of urine showed no evidence of mutagenicity (*1*).

Nitrosamine – Continued

Reported by the New England Institute for Life Sciences, Boston, Massachusetts; Maryland Occupational Safety and Health, Baltimore; Washington University, St. Louis, Missouri; and the Div of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, CDC.

Editorial Note: All nitrosamine compounds have nitroso and alkyl groups and are usually prepared from alkylamino compounds by the action of nitrous acid. There are over 130 nitrosamine compounds.

Nitrosamines as a class are considered to be among the most potent and widespread of animal carcinogens. Over 70% of tested nitrosamines, including all the nitrosamines mentioned in this report, are carcinogenic (*2,3*). Various nitrosamines have been found in food, cosmetics, alcoholic beverages, cigarette smoke, and many industrial processes (*4*). Very recently, these compounds have been reported to be present in rubber and tire factories (*5,6*), possibly as a result of transformation (transnitrosation) of secondary amines by NDPhA. In addition, certain chemical materials (especially amines) supplied to machines may be contaminated with preformed nitrosamines.

Nitrosamines may enter the body by inhalation, ingestion, or percutaneous absorption. *In vivo* formation of nitrosamines may also occur. As yet, there is no direct evidence that nitrosamines cause cancer in humans. However, a number of epidemiologic studies of the tire industry have reported a high incidence of cancer among workers in the areas where the National Institute for Occupational Safety and Health has found the highest nitrosamine levels (*7,8*).

The reduction in airborne nitrosamine levels achieved in this plant by company management, with the active support of the union, serves as an excellent example of effective risk reduction in a workplace.

References

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Follow-up on Mount St. Helens

From June 3-13, industrial hygienists from the National Institute for Occupational Safety and Health (NIOSH) collected personal and area samples in northern Idaho and in 5 Washington communities (Longview, Chehalis, Moses Lake, Yakima, and Spokane) that were subjected to ash from either the May 18 or 25 eruptions of Mount St. Helens. The objective of this survey was to assess occupational exposures and community breathing-

Mount St. Helens -- Continued

zone concentrations of respirable dust.*

Samples of ash taken from these areas were analyzed by the NIOSH laboratories. The particles of these samples that were of respirable size (≤10 microns) have consistently been found to contain approximately 6% free crystalline silica (SiO_2), of which 2% is quartz and 4% is cristobalite. The sampling method consisted of using a personal sampling pump at a flow rate of 1.7 liters per minute with respirable-dust particles collected on a 37-mm polyvinyl chloride filter after passing through a 10-mm cyclone.

The NIOSH-recommended criterion for occupational exposure is 50 μg of free SiO_2 in the respirable dust per cubic meter of air (50 $\mu g/m^3$). Respirable-dust concentrations of 0.8 to 1.0 mg/m^3 of air and a 5% to 6% free SiO_2 content will yield approximately 50 μg free SiO_2/m^3. Based upon available epidemiologic data, nearly all occupationally exposed workers could be exposed up to this concentration 8 hours a day, 5 days a week, for many years without being expected to develop silicosis.

Table 1 shows the workers sampled and the average respirable-dust concentrations from all locations.

TABLE 1. Types of workers, the average respirable-dose concentrations of ash to which they are exposed, and results of area samples, northern Idaho and Longview, Chehalis, Moses Lake, Yakima, and Spokane, Washington

Types of workers/ Area samples	Average concentration of respirable dust mg/m^3
Clean-up crews	
hand-shovelers and sweepers	0.46
sweeper-truck or broom-truck drivers	0.64
front-end loader operators	0.50
grader operators	0.56
water-truck drivers	0.21
truck drivers	0.19
manual hosers	0.05
Rubbish workers	0.67
Idaho forest workers	0.48
Agricultural workers	0.55
Law enforcement personnel	0.10
Area samples	
homes	0.03
schools	0.06
commercial establishments	0.09
autos	0.10

Eighty-five percent of samples that had respirable-dust concentrations of ≥0.8 mg/m^3 (800 μg) were collected in the Moses Lake and Yakima areas. Those occupations that had an average respirable-dust concentration of ≥0.45 mg/m^3 exceeded 0.8 mg/m^3 15% to 31% of the time.

During the sampling period the clean-up crews (with the exception of the water-truck drivers and truck drivers), rubbish workers, and forest workers were exposed to concentrations of respirable dust that exceeded 0.8 mg/m^3 15% to 31% of the time. The use of respirators or dust masks by these individuals would reduce the amount of dust being

*These samples cannot be equated with Environmental Protection Agency samples, which are collected with different instruments and at different locations.

Mount St. Helens – Continued

inhaled. Area samples suggest the general population is exposed to low concentrations of respirable-dust particles in homes, school buildings, commercial establishments, and cars (with the windows rolled up). Persons could, however, be subjected to high concentrations of both total and respirable dust while doing clean-up work outside the house or when high winds are creating visible amounts of ash in the air.

Reported by NIOSH and the Chronic Diseases Div, Bur of Epidemiology, CDC.

Editorial Note: During this period of sampling, some clean-up workers, rubbish workers, and forest workers were exposed to excessive respirable-dust levels, based on a free silica content of 5%-6%. Should there be further ashfall or sustained work in heavy ashfall which results in similar and prolonged exposures over a period of several years, these workers would be expected to be at increased risk from silicosis. Occupationally exposed workers involved in operations which have or create a visible dust cloud should wear NIOSH-approved, half-face respirators with changeable filters or single-use dust masks.

The very low levels of respirable dust measured in community settings, if representative of any future ashfalls, suggest that the general population is not likely to be at increased risk of silicosis. Individuals with asthma and chronic lung disease may have their conditions aggravated by high levels of respirable dust.

During future ashfalls, the general public should stay indoors (or, if in a car, keep the windows closed) or, when outdoors, wear NIOSH-approved, single-use dust respirators. If

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

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

DISEASE	28th WEEK ENDING		MEDIAN 1975-1979	CUMULATIVE, FIRST 28 WEEKS		
	July 12, 1980	July 14, 1979		July 12, 1980	July 14, 1979	MEDIAN 1975-1979
Aseptic meningitis	121	144	118	1,914	1,818	1,396
Brucellosis	8	7	7	95	69	106
Chickenpox	1,527	1,219	1,219	151,000	167,472	146,885
Diphtheria	–	1	1	2	6	5
Encephalitis: Primary (arthropod-borne & unspec.)	13	24	19	319	296	350
Post-infectious	12	9	5	111	143	143
Hepatitis, Viral: Type B	310	301	301	8,970	7,549	7,937
Type A	477	594	594	14,081	15,635	16,771
Type unspecified	184	192	176	6,230	5,351	4,615
Malaria	33	18	16	949	322	253
Measles (rubeola)	201	171	477	12,092	10,978	22,160
Meningococcal infections: Total	43	42	38	1,627	1,680	1,099
Civilian	42	42	36	1,620	1,663	1,092
Military	1	–	1	7	17	17
Mumps	76	142	169	6,623	10,255	14,911
Pertussis	22	23	24	609	682	682
Rubella (German measles)	32	141	142	2,994	10,124	14,193
Tetanus	3	4	3	34	33	33
Tuberculosis	519	519	572	14,558	14,807	16,176
Tularemia	5	9	4	71	97	71
Typhoid fever	17	13	8	204	245	194
Typhus fever, tick-borne (Rky. Mt. spotted)	54	51	47	459	434	434
Venereal diseases:						
Gonorrhea: Civilian	19,355	20,850	20,554	508,962	513,741	508,137
Military	315	375	441	14,238	14,562	14,594
Syphilis, primary & secondary: Civilian	393	453	453	13,740	12,762	12,762
Military	2	8	6	166	159	166
Rabies in animals	129	97	60	3,568	2,574	1,612

TABLE II. Notifiable diseases of low frequency, United States

	CUM. 1980		CUM. 1980
Anthrax	–	Poliomyelitis: Total	7
Botulism	25	Paralytic	5
Cholera (Calif. 1)	9	Psittacosis (La. 1, Tex. 1, Utah 1, Calif. 2)	45
Congenital rubella syndrome	37	Rabies in man	–
Leprosy (Tex. 1, Calif. 5)	103	Trichinosis (Conn. 1, La. 4)	70
Leptospirosis (Mass. 1, La. 1)	32	Typhus fever, flea-borne (endemic, murine) (Tex. 3)	35
Plague	6		

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

TABLE III. Cases of specified notifiable diseases, United States, weeks ending July 12, 1980, and July 14, 1979 (28th week)

REPORTING AREA	ASEPTIC MENINGITIS	BRUCELLOSIS	CHICKEN-POX	DIPHTHERIA		ENCEPHALITIS			HEPATITIS (VIRAL), BY TYPE			MALARIA	
						Primary		Post-infectious	B	A	Unspecified		
	1980	1980	1980	1980	CUM. 1980	1980	1979	1980	1980	1980	1980	1980	CUM. 1980
UNITED STATES	121	8	1,527	–	2	13	24	12	310	477	184	33	949
NEW ENGLAND	9	1	190	–	–	1	1	–	11	11	8	2	63
Maine	–	–	10	–	–	–	–	–	–	–	2	–	12
N.H.	–	–	7	–	–	–	–	–	1	2	–	–	6
Vt.	–	–	11	–	–	–	–	–	–	1	–	–	–
Mass.	2	1	65	–	–	–	1	–	4	2	4	2	30
R.I.	4	–	28	–	–	–	–	–	–	–	–	–	6
Conn.	3	–	69	–	–	1	–	–	6	6	2	–	9
MID. ATLANTIC	20	–	219	–	1	2	5	–	47	22	25	8	132
Upstate N.Y.	–	–	33	–	–	–	–	–	4	3	3	–	20
N.Y. City	4	–	178	–	1	–	–	–	1	1	1	4	35
N.J.	13	–	NN	–	–	–	1	–	31	11	19	1	34
Pa.	3	–	8	–	–	2	4	–	11	7	2	3	43
E.N. CENTRAL	3	1	713	–	1	5	2	2	25	59	13	4	44
Ohio	–	–	27	–	–	1	2	2	9	8	8	–	8
Ind.	–	–	51	–	–	–	–	–	2	10	2	–	3
Ill.	2	1	74	–	–	3	–	–	5	19	–	4	13
Mich.	1	–	326	–	1	–	–	–	8	17	3	–	14
Wis.	–	–	235	–	–	1	–	–	1	5	–	–	6
W.N. CENTRAL	3	2	17	–	–	–	–	1	9	26	7	2	35
Minn.	–	–	–	–	–	–	–	–	–	6	–	–	13
Iowa	–	1	9	–	–	–	–	–	1	5	–	–	4
Mo.	1	–	2	–	–	–	–	–	1	1	3	1	9
N. Dak.	–	–	2	–	–	–	–	–	–	–	–	–	–
S. Dak.	–	–	–	–	–	–	–	–	–	1	–	–	2
Nebr.	1	–	3	–	–	–	–	–	1	1	–	–	4
Kans.	1	1	1	–	–	–	–	1	6	12	4	1	3
S. ATLANTIC	36	2	141	–	–	4	2	5	80	70	40	–	97
Del.	–	–	16	–	–	–	–	–	–	4	–	–	–
Md.	2	–	53	–	–	–	–	–	16	8	10	–	20
D.C.	–	–	–	–	–	–	–	–	1	1	–	–	1
Va.	3	1	11	–	–	2	–	–	18	3	3	–	33
W. Va.	–	–	29	–	–	–	2	–	–	–	1	–	3
N.C.	17	–	NN	–	–	2	–	–	2	8	2	–	5
S.C.	2	–	–	–	–	–	–	–	5	1	1	–	5
Ga.	–	–	–	–	–	–	–	–	14	6	–	–	13
Fla.	12	1	32	–	–	–	–	5	24	39	23	–	17
E.S. CENTRAL	6	–	68	–	–	–	1	1	13	47	3	–	9
Ky.	–	–	65	–	–	–	–	–	1	18	2	–	2
Tenn.	1	–	NN	–	–	–	–	–	3	16	–	–	–
Ala.	5	–	1	–	–	–	–	–	8	1	1	–	6
Miss.	–	–	2	–	–	–	1	1	1	12	–	–	1
W.S. CENTRAL	13	2	100	–	–	1	6	1	32	79	41	7	99
Ark.	–	1	3	–	–	–	–	1	4	9	4	–	6
La.	–	1	NN	–	–	–	3	–	5	7	5	–	37
Okla.	3	–	–	–	–	1	1	–	8	8	4	–	9
Tex.	10	–	97	–	–	–	2	–	15	55	28	7	47
MOUNTAIN	5	–	40	–	–	–	2	–	5	25	9	1	37
Mont.	–	–	10	–	–	–	–	–	–	3	–	–	–
Idaho	–	–	–	–	–	–	–	–	–	1	–	1	1
Wyo.	–	–	–	–	–	–	–	–	–	–	–	–	2
Colo.	2	–	25	–	–	–	2	–	2	14	1	–	19
N. Mex.	1	–	–	–	–	–	–	–	2	–	–	–	2
Ariz.	–	–	NN	–	–	–	–	–	–	4	4	–	10
Utah	–	–	–	–	–	–	–	–	–	–	1	–	–
Nev.	2	–	5	–	–	–	–	–	1	3	3	–	3
PACIFIC	26	–	39	–	–	–	5	2	88	138	38	9	433
Wash.	4	–	17	–	–	–	–	–	1	9	1	–	32
Oreg.	4	–	2	–	–	–	2	–	5	13	3	2	27
Calif.	15	–	–	–	–	–	2	2	78	116	34	5	357
Alaska	–	–	6	–	–	–	1	–	1	–	–	–	4
Hawaii	3	–	14	–	–	–	–	–	3	–	–	2	13
Guam	NA	NA	NA	NA	–	NA	–	–	NA	NA	NA	NA	2
P.R.	NA	NA	NA	NA	–	NA	–	–	NA	NA	NA	NA	1
V.I.	NA	NA	NA	NA	–	NA	–	–	NA	NA	NA	NA	–
Pac. Trust Terr.	NA	NA	NA	NA	–	NA	–	–	NA	NA	NA	NA	–

NN: Not notifiable. NA: Not available.
All delayed reports and corrections will be included in the following week's cumulative totals.

TABLE III (Cont.'d). Cases of specified notifiable diseases, United States, weeks ending July 12, 1980, and July 14, 1979 (28th week)

REPORTING AREA	MEASLES (RUBEOLA)			MENINGOCOCCAL INFECTIONS TOTAL			MUMPS		PERTUSSIS	RUBELLA		TETANUS
	1980	CUM. 1980	CUM. 1979	1980	CUM. 1980	CUM. 1979	1980	CUM. 1980	1980	1980	CUM. 1980	CUM. 1980
UNITED STATES	201	12,092	10,978	43	1,627	1,680	76	6,623	22	32	2,994	34
NEW ENGLAND	1	654	280	3	95	83	4	539	–	2	198	1
Maine	–	33	17	1	4	4	1	283	–	–	68	1
N.H.	1	319	29	–	6	8	–	19	–	1	31	–
Vt.	–	226	116	–	13	5	–	7	–	–	3	–
Mass.	–	50	13	–	31	28	1	118	–	1	74	–
R.I.	–	2	102	–	7	5	–	20	–	–	9	–
Conn.	–	24	3	2	34	33	2	92	–	–	13	–
MID. ATLANTIC	46	3,588	1,295	12	298	246	3	736	–	–	457	3
Upstate N.Y.	2	643	557	3	97	90	–	88	–	–	164	1
N.Y. City	30	1,113	646	3	78	62	3	72	–	–	83	1
N.J.	14	791	53	2	60	61	–	91	–	–	65	–
Pa.	–	1,041	39	4	63	33	–	485	–	–	145	1
E.N. CENTRAL	112	2,188	2,899	4	180	169	49	2,598	4	11	738	2
Ohio	67	346	241	–	64	67	10	1,101	–	2	6	1
Ind.	1	87	171	–	31	35	2	101	3	4	313	–
Ill.	3	304	1,306	2	29	4	8	334	–	–	155	–
Mich.	–	228	756	2	44	46	22	785	1	1	121	1
Wis.	41	1,223	425	–	12	17	7	277	–	4	143	–
W.N. CENTRAL	2	1,270	1,471	1	63	55	–	239	1	2	211	3
Minn.	–	1,050	975	–	20	10	–	21	1	–	51	2
Iowa	–	–	15	–	8	7	–	37	–	–	5	–
Mo.	–	63	406	1	23	29	–	69	–	–	41	–
N. Dak.	–	–	14	–	1	1	–	4	–	–	5	–
S. Dak.	–	–	1	–	4	3	–	1	–	–	–	–
Nebr.	2	83	–	–	–	–	–	9	–	1	1	–
Kans.	–	74	60	–	7	5	–	98	–	1	108	1
S. ATLANTIC	8	1,820	1,630	13	388	418	2	837	5	1	292	6
Del.	–	3	1	–	2	5	–	37	–	–	1	–
Md.	–	70	7	6	42	35	1	283	–	–	70	–
D.C.	–	–	–	–	1	–	–	3	–	–	–	–
Va.	1	299	246	–	34	61	–	47	–	1	49	2
W. Va.	–	16	50	–	13	8	–	68	–	–	20	1
N.C.	1	123	108	1	75	57	–	81	1	–	42	–
S.C.	2	156	145	1	50	50	–	198	–	–	49	2
Ga.	–	798	349	–	68	63	–	1	4	–	–	–
Fla.	4	355	724	5	103	139	1	119	–	–	61	1
E.S. CENTRAL	–	333	169	2	152	122	6	819	2	1	76	3
Ky.	–	51	24	–	49	23	4	724	–	–	35	1
Tenn.	–	176	48	–	42	37	–	24	1	1	36	1
Ala.	–	22	77	–	38	28	–	14	–	–	4	1
Miss.	–	84	20	2	23	34	2	57	1	–	1	–
W.S. CENTRAL	9	899	869	3	181	271	–	227	4	6	108	8
Ark.	–	12	7	–	15	24	–	20	–	–	3	1
La.	–	13	243	–	66	102	–	64	3	–	9	2
Okla.	4	740	22	–	16	24	–	–	–	–	4	–
Tex.	5	134	597	3	84	121	–	143	1	6	92	5
MOUNTAIN	17	381	287	1	50	68	3	167	1	2	115	–
Mont.	–	1	51	–	2	6	–	48	–	–	31	–
Idaho	–	–	18	–	4	5	–	15	–	–	17	–
Wyo.	–	–	36	–	2	1	–	–	–	1	1	–
Colo.	3	22	49	–	12	4	3	44	1	–	7	–
N. Mex.	–	9	38	–	7	4	–	–	–	–	5	–
Ariz.	14	296	69	–	8	31	–	25	–	1	27	–
Utah	–	46	15	–	2	8	–	26	–	–	23	–
Nev.	–	7	11	1	13	9	–	9	–	–	4	–
PACIFIC	6	959	2,078	4	220	248	9	461	5	7	799	8
Wash.	1	169	1,117	2	42	40	3	119	1	–	67	–
Oreg.	–	1	54	–	37	17	3	54	–	2	50	–
Calif.	5	778	828	1	136	178	3	268	4	5	667	8
Alaska	–	5	17	1	4	5	–	11	–	–	10	–
Hawaii	–	6	62	–	1	8	–	9	–	–	5	–
Guam	NA	3	3	–	1	1	NA	7	NA	NA	–	–
P.R.	NA	84	306	–	7	3	NA	111	NA	NA	11	7
V.I.	NA	6	4	–	1	3	NA	2	NA	NA	–	–
Pac. Trust Terr.	NA	6	6	–	–	1	NA	13	NA	NA	1	–

NA: Not available.
All delayed reports and corrections will be included in the following week's cumulative totals.

TABLE III (Cont.'d). Cases of specified notifiable diseases, United States, weeks ending July 12, 1980, and July 14, 1979 (28th week)

REPORTING AREA	TUBERCULOSIS		TULAREMIA	TYPHOID FEVER		TYPHUS FEVER (Tick-borne) (RMSF)		VENEREAL DISEASES (Civilian)						RABIES (in Animals)
								GONORRHEA			SYPHILIS (Pri. & Sec.)			
	1980	CUM. 1980	CUM. 1980	1980	CUM. 1980	1980	CUM. 1980	1980	CUM. 1980	CUM. 1979	1980	CUM. 1980	CUM. 1979	CUM. 1980
UNITED STATES	519	14,558	71	17	204	54	459	19,355	508,962	513,741	393	13,740	12,762	3,568
NEW ENGLAND	11	402	1	–	4	–	9	515	12,877	13,032	11	350	244	30
Maine	1	30	–	–	–	–	–	34	752	903	–	4	7	17
N.H.	–	9	–	–	–	–	–	13	417	469	–	1	13	4
Vt.	–	11	–	–	–	–	–	7	297	309	1	4	1	–
Mass.	7	219	–	–	2	–	5	216	5,323	5,250	9	224	141	3
R.I.	1	43	–	–	1	–	2	29	782	1,065	1	17	9	–
Conn.	2	90	1	–	1	–	2	216	5,306	5,036	–	100	73	6
MID. ATLANTIC	63	2,374	1	1	48	1	22	2,926	55,679	54,753	66	1,993	1,958	24
Upstate N.Y.	25	448	–	–	7	–	3	382	10,298	8,702	3	162	136	13
N.Y. City	18	853	1	1	20	–	2	1,137	21,516	21,537	46	1,319	1,345	–
N.J.	7	506	–	–	9	1	8	824	10,285	10,493	9	247	261	5
Pa.	13	567	–	–	12	–	9	583	13,580	14,021	8	265	216	6
E.N. CENTRAL	73	2,078	1	–	15	2	11	2,443	78,002	79,584	15	1,278	1,724	545
Ohio	15	347	–	–	4	–	7	579	20,955	22,047	8	212	318	28
Ind.	5	215	–	–	–	–	–	203	7,551	7,472	–	98	122	55
Ill.	32	760	–	–	6	2	4	816	24,532	24,222	1	699	1,007	325
Mich.	17	637	1	–	4	–	–	622	17,645	18,557	4	216	226	4
Wis.	4	119	–	–	1	–	–	223	7,319	7,286	2	53	51	133
W.N. CENTRAL	19	541	10	8	16	7	20	1,095	23,328	24,755	5	164	168	1,150
Minn.	6	102	1	–	1	–	–	150	3,859	4,128	2	58	47	103
Iowa	6	52	1	–	1	–	–	125	2,562	3,072	–	8	23	231
Mo.	4	242	7	8	12	7	12	608	10,218	10,664	3	79	70	275
N. Dak.	–	25	–	–	–	–	–	18	341	420	–	3	2	131
S. Dak.	–	29	–	–	1	–	–	19	714	829	–	2	1	246
Nebr.	–	24	1	–	–	–	–	86	1,916	1,695	–	7	2	53
Kans.	3	67	–	–	1	–	8	89	3,718	3,947	–	7	23	111
S. ATLANTIC	130	3,254	9	1	24	26	293	5,106	126,865	124,255	138	3,286	3,090	233
Del.	4	50	–	–	1	–	1	62	1,750	2,073	2	10	17	1
Md.	12	412	2	–	2	3	29	622	13,540	15,212	8	226	209	8
D.C.	4	186	–	–	3	–	–	287	8,771	7,982	7	233	239	–
Va.	4	361	–	–	4	9	32	571	10,966	11,838	4	290	278	7
W. Va.	–	117	–	–	1	–	2	53	1,563	1,722	–	12	40	10
N.C.	27	568	3	1	2	8	127	620	18,433	17,778	2	228	258	9
S.C.	9	295	–	–	3	5	80	570	12,143	11,566	8	183	144	37
Ga.	36	424	4	–	–	–	18	969	23,813	24,047	44	957	840	116
Fla.	34	841	–	–	8	1	4	1,352	35,886	32,037	63	1,147	1,065	45
E.S. CENTRAL	64	1,360	6	–	6	2	34	1,543	41,354	44,687	37	1,111	818	203
Ky.	6	296	–	–	2	–	2	219	6,155	5,740	1	76	87	89
Tenn.	28	467	6	–	–	1	23	609	14,874	16,028	23	460	348	89
Ala.	16	367	–	–	1	–	6	397	11,934	13,459	13	238	156	25
Miss.	14	230	–	–	3	1	3	318	8,391	9,460	–	337	227	–
W.S. CENTRAL	44	1,531	31	4	26	14	57	2,114	65,801	66,660	72	2,654	2,283	959
Ark.	8	149	21	–	–	3	9	240	5,012	5,155	2	85	76	123
La.	5	267	–	–	–	–	1	393	11,668	11,818	25	629	518	7
Okla.	4	168	7	–	1	9	32	273	6,510	6,180	–	52	47	161
Tex.	27	947	3	4	25	2	15	1,208	42,611	43,507	45	1,888	1,642	668
MOUNTAIN	20	389	10	1	13	–	9	685	19,309	20,094	5	326	249	96
Mont.	–	14	2	–	1	–	3	44	723	1,006	–	1	6	12
Idaho	2	18	1	–	1	–	1	27	896	837	1	18	19	1
Wyo.	–	15	3	–	–	–	2	3	553	508	–	8	5	5
Colo.	8	48	3	–	2	–	–	256	5,321	5,257	4	88	54	10
N. Mex.	5	84	–	–	2	–	2	64	2,426	2,578	–	55	47	24
Ariz.	5	161	1	–	4	–	–	161	5,025	5,562	–	107	76	44
Utah	–	30	–	1	3	–	1	37	915	1,051	–	9	3	–
Nev.	–	19	–	–	–	–	–	93	3,450	3,295	–	40	39	–
PACIFIC	95	2,629	2	2	52	2	4	2,928	85,747	85,921	44	2,578	2,228	328
Wash.	13	230	–	–	–	–	–	406	6,803	7,461	–	123	128	–
Oreg.	4	101	–	2	8	1	1	146	6,012	5,433	4	59	97	–
Calif.	77	2,220	2	–	44	1	3	2,253	69,089	68,712	37	2,289	1,933	284
Alaska	–	41	–	–	–	–	–	58	2,069	2,806	1	8	13	44
Hawaii	1	37	–	–	–	–	–	65	1,774	1,509	2	99	57	–
Guam	NA	24	–	NA	–	NA	–	NA	50	62	NA	–	–	–
P.R.	NA	100	–	NA	1	NA	–	NA	1,270	1,136	NA	259	257	25
V.I.	NA	–	–	NA	–	NA	–	NA	108	94	NA	10	6	–
Pac. Trust Terr.	NA	26	–	NA	–	NA	–	NA	214	264	NA	–	1	–

NA: Not available.
All delayed reports and corrections will be included in the following week's cumulative totals.

TABLE IV. Deaths in 121 U.S. cities,* week ending July 12, 1980 (28th week)

REPORTING AREA	ALL CAUSES, BY AGE (YEARS)					P & I** TOTAL
	ALL AGES	>65	45-64	25-44	<1	
NEW ENGLAND	686	447	153	44	19	43
Boston, Mass.	191	108	54	16	5	7
Bridgeport, Conn.	35	25	7	1	1	4
Cambridge, Mass.	24	19	2	1	2	3
Fall River, Mass.	34	24	6	2	–	–
Hartford, Conn.	53	32	14	4	1	–
Lowell, Mass.	31	25	4	2	–	1
Lynn, Mass.	15	11	4	–	–	–
New Bedford, Mass.	25	22	3	–	–	5
New Haven, Conn.	51	32	14	3	1	2
Providence, R.I.	47	27	12	5	2	3
Somerville, Mass.	7	4	2	1	–	–
Springfield, Mass.	77	55	9	4	6	12
Waterbury, Conn.	35	22	9	2	–	3
Worcester, Mass.	61	41	13	3	1	3
MID. ATLANTIC	2,514	1,584	606	190	57	90
Albany, N.Y.	55	36	12	4	–	–
Allentown, Pa.	17	14	3	–	–	–
Buffalo, N.Y.	124	80	25	13	2	7
Camden, N.J.	34	20	11	3	–	1
Elizabeth, N.J.	34	23	8	2	–	1
Erie, Pa.†	40	31	7	1	–	1
Jersey City, N.J.	62	38	16	4	2	1
Newark, N.J.	53	23	16	10	3	3
N.Y. City, N.Y.	1,256	779	303	117	22	34
Paterson, N.J.	26	14	8	2	1	–
Philadelphia, Pa.†	316	192	76	22	12	14
Pittsburgh, Pa.†	47	27	16	–	3	3
Reading, Pa.	33	29	4	–	–	3
Rochester, N.Y.	135	84	34	5	7	10
Schenectady, N.Y.	27	15	6	2	–	2
Scranton, Pa.†	44	33	8	2	–	3
Syracuse, N.Y.	109	77	24	1	4	2
Trenton, N.J.	43	23	18	1	–	1
Utica, N.Y.	33	23	8	1	1	1
Yonkers, N.Y.	26	23	3	–	–	3
E.N. CENTRAL	2,281	1,336	573	156	93	68
Akron, Ohio	61	45	11	2	1	–
Canton, Ohio	37	24	9	3	–	1
Chicago, Ill.	506	286	131	39	22	14
Cincinnati, Ohio	169	98	47	9	8	12
Cleveland, Ohio	165	84	43	15	9	4
Columbus, Ohio	134	69	40	14	6	4
Dayton, Ohio	106	67	23	5	3	2
Detroit, Mich.	281	155	74	26	11	9
Evansville, Ind.	69	45	15	4	1	5
Fort Wayne, Ind.	68	41	16	3	2	2
Gary, Ind.	26	10	8	2	3	1
Grand Rapids, Mich.	53	28	14	3	5	3
Indianapolis, Ind.	135	77	38	8	7	1
Madison, Wis.	31	19	6	2	4	–
Milwaukee, Wis.	134	92	28	8	2	3
Peoria, Ill.	37	22	7	1	3	2
Rockford, Ill.	34	23	7	1	1	2
South Bend, Ind.	41	30	8	2	–	1
Toledo, Ohio	127	79	35	4	3	2
Youngstown, Ohio	67	42	13	5	2	–
W.N. CENTRAL	769	485	166	42	41	33
Des Moines, Iowa	57	31	14	4	5	1
Duluth, Minn.	28	17	9	–	–	5
Kansas City, Kans.	26	15	3	1	4	1
Kansas City, Mo.	135	89	24	8	5	4
Lincoln, Nebr.	22	14	6	–	1	–
Minneapolis, Minn.	87	64	10	3	6	4
Omaha, Nebr.	94	53	27	5	6	1
St. Louis, Mo.	166	104	42	12	4	7
St. Paul, Minn.	64	44	13	1	2	2
Wichita, Kans.	90	54	18	8	8	8

REPORTING AREA	ALL CAUSES, BY AGE (YEARS)					P & I** TOTAL
	ALL AGES	>65	45-64	25-44	<1	
S. ATLANTIC	1,125	625	323	98	39	26
Atlanta, Ga.	99	57	28	13	1	3
Baltimore, Md.	180	92	55	18	8	1
Charlotte, N.C.	62	25	24	5	4	2
Jacksonville, Fla.††	90	50	25	7	2	2
Miami, Fla.	141	85	40	6	7	3
Norfolk, Va.	46	23	15	5	2	1
Richmond, Va.	72	39	21	5	3	2
Savannah, Ga.	31	14	13	4	–	1
St. Petersburg, Fla.	78	60	9	3	2	2
Tampa, Fla.	97	58	27	5	4	4
Washington, D.C.	188	98	51	26	6	5
Wilmington, Del.	41	24	15	1	–	–
E.S. CENTRAL	699	391	186	59	28	33
Birmingham, Ala.	102	50	34	11	4	1
Chattanooga, Tenn.	42	26	5	6	–	3
Knoxville, Tenn.	58	36	16	2	1	–
Louisville, Ky.	122	70	32	6	8	11
Memphis, Tenn.	168	101	38	11	7	9
Mobile, Ala.	57	32	15	7	2	1
Montgomery, Ala.	47	27	16	4	–	3
Nashville, Tenn.	103	49	30	12	6	5
W.S. CENTRAL	1,335	725	350	134	61	34
Austin, Tex.	34	19	7	6	1	2
Baton Rouge, La.	40	23	10	–	2	–
Corpus Christi, Tex.	34	24	4	–	4	1
Dallas, Tex.	179	77	62	18	14	–
El Paso, Tex.	55	37	10	2	2	4
Fort Worth, Tex.	73	35	19	9	5	1
Houston, Tex.	292	134	91	43	7	4
Little Rock, Ark.	78	41	18	7	6	1
New Orleans, La.	176	99	48	20	4	1
San Antonio, Tex.	204	127	41	18	10	8
Shreveport, La.	54	33	13	4	3	3
Tulsa, Okla.	116	76	27	7	3	9
MOUNTAIN	631	358	160	57	17	15
Albuquerque, N. Mex.††	64	34	17	8	1	3
Colo. Springs, Colo.	50	35	7	6	–	3
Denver, Colo.	105	69	24	6	–	2
Las Vegas, Nev.	63	25	20	12	1	2
Ogden, Utah	14	10	3	1	–	2
Phoenix, Ariz.	171	95	42	16	9	–
Pueblo, Colo.	20	13	4	1	–	2
Salt Lake City, Utah	42	21	15	2	1	1
Tucson, Ariz.	102	56	28	5	5	–
PACIFIC	1,602	1,022	348	116	50	50
Berkeley, Calif.	25	18	2	2	3	–
Fresno, Calif.	90	53	22	7	5	3
Glendale, Calif.	4	4	–	–	–	–
Honolulu, Hawaii	57	35	15	2	1	6
Long Beach, Calif.	91	60	22	4	4	3
Los Angeles, Calif.	346	213	77	27	7	10
Oakland, Calif.	71	50	11	6	1	5
Pasadena, Calif.	43	32	8	1	–	4
Portland, Oreg.	98	64	20	5	2	–
Sacramento, Calif.	66	43	10	6	3	5
San Diego, Calif.	149	88	38	15	4	–
San Francisco, Calif.	160	105	34	11	6	4
San Jose, Calif.	183	114	41	16	5	6
Seattle, Wash.	133	85	26	13	6	3
Spokane, Wash.	47	29	12	1	3	–
Tacoma, Wash.	39	29	10	–	–	1
TOTAL	11,642	6,973	2,865	896	405	392

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

**Pneumonia and influenza

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

††Data not available. Figures are estimates based on average percent of regional totals.

Mount St. Helens – Continued

these are not available or do not fit (they do not fit children), a handkerchief can be wet and fitted over the nose and mouth.

Meningitis Associated with Enteroviral Infection – Texas, Canada, 1979

Large outbreaks of aseptic meningitis associated with enteroviral infection were reported in San Antonio, Texas, and in 2 areas in Canada in 1979.

Texas: Between April 1 and October 31, 1979, 68 cases of aseptic meningitis were diagnosed in 67 pediatric patients seen at Bexar County Hospital and Wilford Hall U.S. Air Force Medical Center in San Antonio.* Most of the cases occurred between June and September. The meningitis was associated with a documented enteroviral infection in 38 (79%) of 48 cases (47 children) for which viral isolation studies were performed.

An enterovirus agent was isolated from most (71%) of the cerebrospinal fluid (CSF) specimens tested (Table 2). Except for 1 coxsackie B4 and 1 coxsackie B5 virus infection, all of the enteroviruses isolated were echoviruses; no single echovirus type predominated. Type 11 was isolated from 9 patients; type 7 (from 5); type 4 (from 4); and types 1, 17, and 25 (each from 2 patients).

TABLE 2. Enterovirus isolates from rectal, throat, and cerebrospinal fluid specimens from 48 children with aseptic meningitis, San Antonio, April-October, 1979

Type of specimen	Specimens	
	Number obtained	Number (percent positive)
Cerebrospinal fluid	38	27 (71)
Rectal	34	24 (71)
Throat	30	15 (50)

The ages of the patients with enterovirus-associated aseptic meningitis ranged from 2½ weeks to 15 years, with 79% of patients under 1 year of age. Forty-nine percent of infants were less than 3 months old. The most common clinical manifestations in this age group included irritability (100%), fever (96%), and decreased appetite (42%).

Reported by CV Sumaya, MD, Bexar County Hospital District, University of Texas Health Science Center at San Antonio; LI Corman, MD, Wilford Hall USAF Medical Center; Epidemiology Div, USAF School of Aerospace Medicine, Brooks Air Force Base, Texas; CR Webb Jr, MD, State Epidemiologist, Texas State Dept of Health.

Saskatchewan: From May through October, 80 cases of aseptic meningitis were reported to the health department in the city of Saskatoon (pop. 125,000); cases peaked in the summer months. Slightly more males than females were affected, and over half the patients were under the age of 15 years.

Among 109 aseptic meningitis patients on whom specimens were received at the Virus Laboratory at the University Hospital of Saskatoon, an etiologic enteroviral agent was identified in 54: 46 by virus isolation (ECHO 11–44; ECHO 30–2), and 8 by serology (ECHO 11–7; coxsackie B4–1). Isolations were made from the CSF in 32 (70%) of the 46 cases (ECHO 11–31; ECHO 30–1) feces in 9 (all ECHO 11), throat in 3 (ECHO 11–2; ECHO 30–1), and from the throat and feces in 2 (both ECHO 11).

*One infant developed 2 separate episodes of aseptic meningitis 2 months apart. Echovirus 11 was isolated from cerebrospinal fluid (CSF) during the first episode; echovirus 25 was isolated from the CSF during the second episode.

Meningitis – Continued

Reported by A Zbitnew, MSc, University Hospital, C Anderson, BSN, City of Saskatoon Health Dept; S Stead, MD, University of Saskatchewan; and the Virology Laboratory Staff, University Hospital, Saskatoon, Saskatchewan, in the Canada Diseases Weekly Report 1979;5:237-8.

National Capital Region: From May through September, outbreaks of echovirus types 7 and 11 infections, almost exclusively involving young children, occurred in the National Capital Region—the metropolitan Ottawa area including Hull, Quebec. Echovirus type 11 had last been isolated from a clinical case in this region in 1969. One echovirus type 7 isolate had been reported in 1977, and none in 1978.

Sixty-nine of the 1979 cases were confirmed by isolation; approximately half were echovirus type 7, and half, echovirus type 11. The predominant symptoms of the 69 patients—all of whom were admitted to the hospital—included aseptic meningitis or meningismus (41%), diarrhea and/or vomiting (36%), and fever (10%). Upper respiratory tract infections were reported in 3 patients, and convulsions in 1. Sixty-five percent of the patients were less than 1 year of age, and 28% were less than 3 months old. No isolates were made from patients over the age of 15 years.

Reported by JM Weber, PhD, Viral Surveillance Section, Viral Diagnostic Services Div, Bur of Microbiology, Laboratory Centre for Disease Control, Health Protection Br, Ottawa, in the Canada Diseases Weekly Report 1979;5:238-40.

Editorial Note: Although enteroviruses (including echoviruses, coxsackie A, coxsackie B, and polioviruses) may cause a wide spectrum of clinical manifestations, in recent years aseptic meningitis has been the syndrome most commonly reported through CDC's national Enterovirus Surveillance Program. In 1979, meningitis accounted for 1,171 (40%) of the total cases with known clinical syndrome; in 1980, through April, this syndrome has been associated with 31 (24%) of enterovirus infections. Echoviruses constituted 68% of all enterovirus isolates during 1979, and through April 1980, 40%; echoviruses have comprised 80% of all cases of aseptic meningitis for the 16-month period since January 1979.

Meningitis, however, may not necessarily be the most common clinical manifestation associated with enteroviral illness. In controlled studies (*1,2*), it has been shown that most infections are either asymptomatic or associated with only minor illness. The apparent predominance of meningitis may reflect preferential selection of only the most seriously ill patients for virus isolation studies.

Enterovirus infections are most commonly found in the youngest age groups. During the 10-year period 1970-1979, 64% of nationally reported cases were in children less than 10 years old, and 29% were in infants under 1 year old. The cases reported from the National Capital Region of Canada in 1979 had an even more striking predominance of those under 1 (65%). In the United States in 1979, 513 (34%) of 1,507 ECHO 11 infections and 239 (47%) of 513 ECHO 7 infections were in patients 0-4 years old; 23% of the former group and 36% of the latter group were in those less than 1 year old.

Echovirus 11 was by far the most commonly reported enterovirus isolated in the United States in 1979 (44% of all enteroviruses isolated). It has also been the most commonly isolated enterovirus reported through April of 1980 (42 isolates; 26%). This agent had not circulated extensively in this country since 1972, when a smaller nationwide peak of activity occurred. For the 16-month period since January 1, 1979, 46% of reported ECHO 11 infections with a known clinical syndrome have been associated with aseptic meningitis; 15%, with encephalitis; 10%, with respiratory syndromes; 8%, with nonspecific febrile illness; 2%, with rash, 0.6%, with carditis; 0.4%, with paralysis; and 17%, with other known syndromes. Nearly three-fourths of all ECHO 11 infections were docu-

Meningitis — Continued

mented by isolation from an alimentary tract specimen (stool, 32%; throat, 30%; rectal swab, 8%; the remainder were documented primarily by isolation from CSF (22%), followed by isolation from the nasopharynx (2%), urine (2%), tissue specimens (1%), and other known sources (3%).

Echovirus 7 was the second most frequently reported enterovirus isolated in the United States in 1979 (15% of all enteroviruses isolated), but only 1 echovirus 7 isolate was reported in 1980, through April. The 1979 peak was the first evidence of major ECHO 7 activity in over 10 years. For the 16-month period since January 1, 1979, 52% of ECHO 7 infections were associated with aseptic meningitis; 14%, with respiratory tract disease; 9%, with encephalitis; 7%, with nonspecific febrile illness; 2%, with rash; 1%, with carditis; 0.6%, with paralysis; and 15% with other known syndromes. Four-fifths of all ECHO 7 isolates were from alimentary tract specimens (stool, 41%; throat, 27%; rectal swab, 11%); most of the remainder were from CSF (15%), followed by nasopharynx (1%), urine (0.5%), tissue specimens (0.3%), and other known sources.

Each summer, especially in August, physicians may see cases of "summer meningitis" due to enteroviral agents. Apparent communitywide outbreaks of meningitis may be due to a single agent, but more often they are caused by multiple agents, as was seen last year in the areas of Texas and Canada reported above.

Reported by Enteric and Neurotropic Viral Diseases Br, Viral Diseases Div, Bur of Epidemiology, CDC.

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Follow-up on the Health Status of the Cuban Refugees

All of the approximately 115,000 Cuban refugees who arrived in the United States from April 21-July 6, 1980, have been medically screened. The U.S. Public Health Service (USPHS) screened approximately 103,000; the Metro Dade County Department of Public Health in Miami screened the other 12,000 before the USPHS assumed responsibility for the program.

The number of Cuban refugees entering the United States has decreased to less than 100 per day. These persons are being screened daily at the USPHS outpatient clinic in Miami.

The Opa-Locka screening center in Miami was closed on June 27. The 4 remaining centers are providing follow-up services for refugees who have reactive positive serologies for syphilis and suspected active tuberculosis.

As of July 6, 88,971 refugees had received chest X rays. Of these, 398 (0.5%) demonstrated suspected active or active tuberculosis (class A), and 1,210 (1.4%), suspected inactive tuberculosis (class B). All persons found during the screening process to have

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The editor welcomes accounts of interesting cases, outbreaks, environmental hazards, or other public health problems of current interest to health officials. Send reports to: Center for Disease Control, Attn: Editor, Morbidity and Mortality Weekly Report, Atlanta, Georgia 30333.

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Cuban Refugees – Continued

suspected class A or class B tuberculosis receive sputum examinations; thus far, 25 persons have had positive sputum examinations.

To date, 88,907 persons 15 years of age and older have received serologic tests for syphilis; 3,806 (4.3%) were reactive. Sixteen persons were diagnosed as having primary syphilis and 15, secondary syphilis. Of those patients with reactive serologies, 3,440 (90%) have been treated thus far.

A total of 9,898 children and young adults have been immunized with the multiple-antigen measles-mumps-rubella (MMR) vaccine.

One case of noninfectious leprosy was detected at Camp McCoy, Wisconsin, in a 33-year-old male. He had been under treatment for several years in Cuba.

To date, 7 confirmed cases of meningococcal meningitis have been reported among the refugees. Four cases occurred while the refugees were stationed in the processing centers (Fort Chaffee, Arkansas, 2; Fort Indiantown Gap, Pennsylvania, 1; Camp McCoy 1). The other 3 cases occurred from 4 to 11 days after the refugees were discharged from the centers. (These patients were stationed at Fort Indiantown Gap, Fort Chaffee, and Opa-Locka.) None of the cases was fatal. Isolates from 3 cases were submitted to CDC for serogrouping and susceptibility testing. These isolates were serogroup B and were resistant to sulfonamides. Close contacts of each patient received rifampin prophylaxis, and no further cases have occurred.

Reported by the Cuban Refugee Activity, Quarantine Div, Special Pathogens Br, Bacterial Diseases Div, Bur of Epidemiology, CDC.

Erratum, Vol. 29, No. 24

p293 In the article "Chickenpox – Texas," it was stated that the severity of chickenpox incubating in children could be reduced by administration of 0.6 cc/kg of gamma globulin within 3 days of exposure. The dose "0.6 cc/kg" is misleading. In a widely cited study demonstrating protective effect of gamma globulin in children (*1*), increasing effect was found with increasing doses ranging from 0.2 cc/lb (0.4 cc/kg) to 0.6 cc/lb (1.3 cc/kg). The use of regular gamma globulin in the prophylaxis of chickenpox in adult patients has not been formally evaluated, although it has been used for this purpose by some clinicians.

Reference

1. Ross AH. Modification of chickenpox in family contacts by administration of gamma globulin. N Engl J Med 1962;267:369-76.

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