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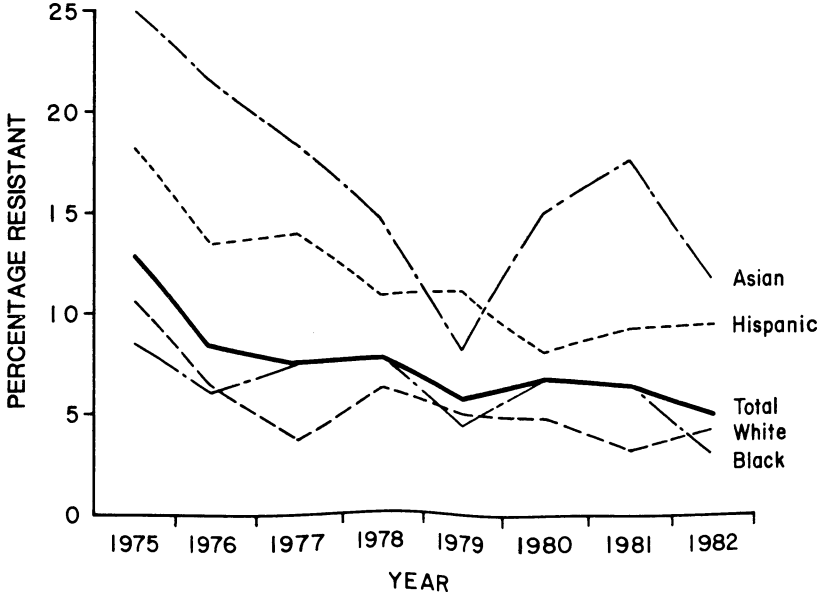
Primary Resistance to Antituberculosis Drugs — United States

From March 20, 1975, through September 30, 1982, 20 city and state laboratories throughout the United States submitted 12,157 mycobacterial cultures to CDC for drug susceptibility testing as part of a survey of primary drug resistance (PDR) (*1,2*). PDR is defined as drug resistance among persons with tuberculosis (TB) who are not known to have had prior treatment with antituberculosis (anti-TB) drugs. *Mycobacterium tuberculosis* organisms resistant to one or more anti-TB drugs were isolated from 6.9% of cases surveyed.

A marked decline occurred in the percentage of PDR over the period of the survey, and large differences were noted by race/ethnicity. Figure 1 shows the generally declining trend and the markedly higher percentages of PDR among Asian and Hispanic cases (overall percentages were 14.8% - Asians; 11.8% - Hispanics; 6.1% - blacks; 4.9% - whites; and 4.1% - American Indians). Too few cultures were submitted from American Indians for a meaningful display of the secular trend for this group.

A highly significant ($p = 0.005$) inverse relationship was noted between age and percentage of PDR. The PDR percentages ranged from 14.0% for ages 0-10 years to 3.6% for ages

FIGURE 1. Percentages of tuberculosis patients with primary drug resistance, by race/ethnic group — United States, 1975-1982



Antituberculosis Drugs — Continued

91-99 years. PDR percentages were highest for isoniazid (4.0%), streptomycin (3.8%), and ethionamide (1.1%). Percentages for other drugs tested (*p*-aminosalicylic acid [PAS]), rifampin, ethambutol, kanamycin, capreomycin, and cycloserine) were less than 1%.

Table 1 shows the variation in percentages of PDR by geographic area. Even after adjustment by logistic regression modeling for differences between areas in race/ethnic and age distributions, there were substantial and statistically significant differences among area-specific percentages, ranging from 3.9% for Washington State to 11.3% for the border region of south Texas surrounding Harlingen.

Reported by Div of Tuberculosis Control, Center for Prevention Svcs, Div of Bacterial Diseases, Center for Infectious Diseases, CDC.

Editorial Note: The occurrence of PDR is an indicator of transmission of resistant organisms from TB patients who have received inadequate or inappropriate treatment. Thus, PDR percentages can serve as one measure of the effectiveness of TB control programs.

The data from this survey show a relatively low level of PDR in the United States. Furthermore, there has been a declining trend for PDR during the past 8 years. The reason for this decline is uncertain; however, changing patterns of anti-TB therapy may be partly responsible. Using the drug combination of isoniazid and rifampin has been shown to decrease the likelihood that drug resistance will emerge during therapy (*3*). Increased use of chemotherapy with these two drugs may offer at least a partial explanation for the decline.

Data from this study show higher percentages of PDR among Asian and Hispanic populations and for areas where high concentrations of these groups reside. The proportion of the Asian and Hispanic population in this study who are foreign-born is not known; thus, it is impossible to ascertain whether the majority of drug-resistant infections in these populations were acquired in the United States or in other countries. Furthermore, because of language barriers, inaccurate histories about previous anti-TB treatment could partially explain the higher resistance percentages among Asians and Hispanics. However, PDR percentages are

TABLE 1. Percentages of tuberculosis patients with primary drug resistance, by state/city laboratory, March 20, 1975-September 30, 1982

State/city laboratory	Total tested	Number resistant	% resistant (unadjusted)	% resistant* (adjusted)
Alabama	1,357	54	4.0	5.1
Los Angeles, CA†	956	93	9.7	7.1
San Francisco, CA	831	68	8.2	5.5
Chicago, IL	323	27	8.4	6.5
Maryland	928	76	8.2	9.4
Massachusetts	754	40	5.3	6.0
Detroit, MI	474	24	5.1	5.5
Minnesota	318	23	7.2	7.7
Mississippi	1,052	88	8.4	9.9
New York, NY	387	37	9.6	8.8
Cleveland, OH	418	14	3.3	4.1
Oklahoma	745	33	4.4	5.9
Oregon	245	18	7.3	6.2
Philadelphia, PA	335	21	6.3	6.8
South Carolina	1,141	63	5.5	6.3
Harlingen, TX	484	70	14.5	11.3
San Antonio, TX	530	51	9.6	8.3
Washington	644	25	3.9	3.9
Wisconsin	235	18	7.7	9.2
Total	12,157	843	6.9	6.9

*Adjusted for race and age

†Two laboratories

Antituberculosis Drugs — Continued

known to be higher among TB patients from the developing countries of Asia and Latin America (*4*); in these countries, anti-TB drugs are available over the counter, and self-medication is common. TB control programs in these countries often do not have sufficient resources to give properly supervised therapy, nor can they afford to use effective chemotherapy regimens containing rifampin and isoniazid. These factors all increase the risk of PDR.

In the United States, drug susceptibility testing of the initial *M. tuberculosis* isolate is indicated for (1) groups known to have a higher prevalence of drug resistance, such as Asians and Hispanics, (2) persons with a history of previous treatment with anti-TB drugs, (3) persons who fail to become culture negative by the fourth month of therapy, and (4) persons who have been exposed to drug-resistant TB (*5*). Until results of drug susceptibility tests are available, a patient should be treated with a regimen that includes at least two drugs to which the infecting organisms are highly likely to be susceptible. Subsequent modification of the regimen should be made based upon test results and the patient's response to therapy.

References

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The Feasibility of Measles Elimination in Europe

Major progress toward the elimination of measles has been achieved in the United States and several other countries in recent years because of extensive vaccination of targeted populations (1). *These successful experiences suggest the technical feasibility of worldwide eradication of measles* (2). *Yet in many other areas—including much of Western Europe—measles incidence rates are 10-10,000 times higher than in the United States. The following report describes the current impact of measles in Europe and the current status of efforts to eliminate the disease from that region.*

The feasibility of measles elimination in Europe was discussed at an informal consultation held at the World Health Organization (WHO), Regional Office for Europe, in Copenhagen, on January 17-18, 1983. The past and present impact of measles in the Region was considered.

Although there is widespread belief among the public and some health professionals that measles is a mild illness, it caused thousands of deaths each year in the Region before measles vaccine was available. Even though the incidence of measles has been reduced substantially by the use of vaccine, measles continues to cause hundreds of deaths each year in the Region, as well as hundreds of thousands of cases of acute illness with accompanying school absenteeism and loss of work. In addition, acute nervous-system complications, pneumonia, and otitis continue to occur and may lead to permanent disability. Cases of subacute sclerosing panencephalitis (SSPE), a late complication of measles, also continue to occur in Europe.

Experience with measles vaccine in Europe has indicated that it is highly effective; when given during the second year of life, seroconversion rates above 90% are usual. Its effective-

Measles – Continued

ness in preventing disease in the face of exposure is comparable. Indications to date are that vaccine-induced immunity is durable and probably life-long. Measles cases among vaccinated individuals result from unsuccessful or faulty vaccination rather than from loss of immunity. In some countries, a second dose of vaccine is given to reduce even further the proportion of vaccine failures. Reactions to the vaccine are few and generally involve transient fever or rash in 5%-15% of recipients. More serious complications are extremely rare. Contraindications to vaccination in routine situations are few: compromised immune status (whether due to disease or medication), acute febrile illness (more serious than upper respiratory infection), and pregnancy. Although experience is limited, no evidence of risk to the fetus has been demonstrated when vaccine is administered to a pregnant woman. Problems observed earlier with vaccine failures resulting from fragility of the vaccine can be overcome by proper attention to vaccine handling (the "cold chain") and by use of newer, more stable vaccines (i.e., those meeting WHO criteria). As immunization levels rise, the proportion of cases that occur in vaccinated individuals can be expected to rise. These cases do not reflect waning immunity but are confined to the small proportion of children who did not seroconvert on initial vaccination.

Although there has been general agreement about the desirability of measles vaccination,

(Continued on page 530)

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

Disease	40th Week Ending			Cumulative, 40th Week Ending		
	October 8, 1983	October 9, 1982	Median 1978-1982	October 8, 1983	October 9, 1982	Median 1978-1982
Aseptic meningitis	440	354	332	8,734	6,799	5,989
Encephalitis: Primary (arthropod-borne & unspec.)	47	48	45	1,265	1,157	930
Post-infectious	-	-	4	62	63	165
Gonorrhea: Civilian	15,618	20,313	21,145	683,388	737,122	766,183
Military	343	561	561	18,537	20,868	20,951
Hepatitis: Type A	355	538	538	16,324	17,387	21,472
Type B	331	431	403	17,399	16,501	13,632
Non A, Non B	41	72	N	2,549	1,819	N
Unspecified	145	189	222	5,998	6,707	7,857
Legionellosis	11	19	N	534	471	N
Leprosy	3	2	2	190	158	158
Malaria	12	13	28	631	851	851
Measles: Total*	11	63	63	1,295	1,342	12,289
Indigenous	3	N	N	1,068	N	N
Imported	8	N	N	227	N	N
Meningococcal infections: Total	35	41	41	2,177	2,369	2,111
Civilian	35	40	40	2,162	2,355	2,095
Military	-	1	-	15	14	16
Mumps	29	61	90	2,573	4,393	7,300
Pertussis	40	51	38	1,791	1,205	1,205
Rubella (German measles)	6	26	33	807	2,059	3,354
Syphilis (Primary & Secondary): Civilian	569	653	564	24,685	25,316	20,377
Military	2	11	8	306	335	248
Toxic-shock syndrome	1	N	N	309	N	N
Tuberculosis	389	474	527	17,912	19,462	20,756
Tularemia	3	6	6	250	202	173
Typhoid fever	8	10	10	322	308	391
Typhus fever, tick-borne (RMSF)	13	18	17	1,086	885	958
Rabies, animal	39	105	118	4,631	4,943	4,943

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1983		Cum. 1983
Anthrax	-	Plague	35
Botulism: Foodborne	14	Poliomyelitis: Total	4
Infant	47	Paralytic	4
Other	-	Psittacosis (Ohio 1)	95
Brucellosis (Iowa 1)	150	Rabies, human	2
Cholera	1	Tetanus (Fla. 1)	63
Congenital rubella syndrome	18	Trichinosis	27
Diphtheria	3	Typhus fever, flea-borne (endemic, murine)	42
Leptospirosis (Hawaii 1)	38		

*Five of the 11 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 October 8, 1983 and October 9, 1982 (40th week)

Reporting Area	Aseptic Meningitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionellosis	Leprosy	Malaria
		Primary	Post-infectious			A	B	NA,NB	Unspecified			
	1983	Cum. 1983	Cum. 1983	Cum. 1983	Cum. 1982	1983	1983	1983	1983	1983	Cum. 1983	Cum. 1983
UNITED STATES	440	1,265	62	683,388	737,122	355	331	41	145	11	190	631
NEW ENGLAND	8	52	-	17,815	17,893	7	22	1	12	3	3	28
Maine	-	-	-	860	907	1	1	-	-	-	-	1
N.H.	-	5	-	568	610	-	-	-	-	-	2	-
Vt.	1	1	-	349	332	2	2	-	-	-	-	1
Mass.	1	25	-	7,543	8,144	2	9	-	12	1	-	13
R.I.	4	1	-	979	1,177	1	3	-	-	2	-	4
Conn.	2	20	-	7,516	6,723	1	7	1	-	-	1	9
MID ATLANTIC	87	101	4	87,779	91,660	39	48	8	8	-	25	86
Upstate N.Y.	34	26	-	13,951	14,935	5	14	2	1	-	-	26
N.Y. City	5	10	-	34,938	37,344	12	3	-	-	-	24	21
N.J.	-	17	-	16,609	16,958	17	18	3	7	-	-	24
Pa.	48	48	4	22,281	22,423	5	13	3	-	-	1	15
E.N. CENTRAL	141	453	20	94,958	105,627	44	33	9	7	1	6	50
Ohio	48	158	9	25,585	28,038	22	15	4	5	1	1	8
Ind.	U	157	1	10,120	12,585	U	U	U	U	U	-	7
Ill.	-	17	7	23,978	30,291	9	4	-	1	-	2	16
Mich.	93	87	-	26,587	25,253	13	14	5	1	-	3	14
Wis.	-	34	3	8,688	9,460	-	-	-	-	-	-	5
W.N. CENTRAL	36	101	9	31,958	34,788	11	21	1	3	2	6	25
Minn.	6	23	1	4,574	5,040	6	2	-	-	-	4	7
Iowa	10	50	-	3,577	3,652	-	1	1	-	-	-	3
Mo.	15	22	-	15,305	16,684	2	10	-	3	2	1	5
N. Dak.	-	-	-	344	460	-	-	-	-	-	-	2
S. Dak.	-	1	2	831	937	3	1	-	-	-	-	1
Nebr.	1	4	-	2,061	2,067	-	2	-	-	-	-	1
Kans.	4	1	6	5,266	5,948	-	5	-	-	-	1	6
S. ATLANTIC	54	183	15	178,102	193,620	43	117	10	25	1	9	105
Del.	2	-	-	3,246	3,036	-	4	-	-	-	-	1
Md.	9	19	-	23,021	24,440	-	19	1	7	-	1	21
D.C.	1	-	-	12,277	11,362	1	4	-	-	-	-	15
Va.	11	44	2	16,191	15,149	2	11	3	3	-	1	24
W. Va.	1	38	-	1,996	2,197	3	1	1	-	-	-	1
N.C.	5	36	-	27,531	30,564	6	10	-	2	-	-	3
S.C.	8	4	-	16,735	18,905	5	22	-	1	-	-	5
Ga.	1	7	1	35,161	38,408	4	10	-	1	-	1	9
Fla.	16	35	12	41,944	49,559	22	36	5	11	1	6	26
E.S. CENTRAL	72	59	1	57,591	63,800	29	31	5	3	-	-	11
Ky.	5	13	-	6,779	8,608	20	6	2	-	-	-	1
Tenn.	6	16	-	23,632	25,263	5	16	2	-	-	-	-
Ala.	57	22	-	17,851	18,675	2	7	1	3	-	-	6
Miss.	4	8	1	9,329	11,254	2	2	-	-	-	-	4
W.S. CENTRAL	18	133	2	98,313	101,009	118	32	3	80	1	28	56
Ark.	-	6	-	7,698	8,414	3	4	1	5	-	-	1
La.	-	17	-	19,125	17,886	16	6	1	4	-	1	8
Okla.	7	26	1	11,300	11,181	31	2	1	8	1	-	10
Tex.	11	84	1	60,190	63,528	68	20	-	63	-	27	37
MOUNTAIN	16	55	4	22,075	24,777	29	15	4	6	-	12	24
Mont.	-	2	-	903	1,015	1	-	-	-	-	-	-
Idaho	1	1	-	979	1,205	1	2	-	-	-	-	2
Wyo.	-	2	-	597	725	1	-	-	-	-	-	1
Colo.	15	30	-	6,124	6,722	7	2	-	2	-	2	8
N. Mex.	-	1	-	2,725	3,334	3	-	-	-	-	-	5
Ariz.	-	9	4	6,271	6,478	10	3	1	2	-	9	5
Utah	-	10	-	1,064	1,213	3	1	-	1	-	1	3
Nev.	-	-	-	3,412	4,085	3	7	3	1	-	-	-
PACIFIC	8	128	7	94,797	103,948	35	12	-	1	3	101	246
Wash.	8	13	1	7,380	8,816	10	8	-	1	3	15	12
Oreg.	-	-	3	5,178	6,168	25	4	-	-	-	1	9
Calif.	U	107	3	77,788	84,443	U	U	U	U	U	57	224
Alaska	-	-	-	2,563	2,584	-	-	-	-	-	-	-
Hawaii	-	8	-	1,888	1,937	-	-	-	-	-	28	1
Guam	U	-	-	87	107	U	U	U	U	U	-	2
P.R.	-	1	1	1,893	2,152	8	11	-	29	-	-	2
V.I.	-	-	-	209	213	-	-	-	-	-	-	-
Pac. Trust Terr.	U	-	-	-	350	U	U	U	U	U	-	-

N: Not notifiable U: Unavailable

TABLE III. (Cont.'d). Cases of specified notifiable diseases, United States, weeks ending October 8, 1983 and October 9, 1982 (40th week)

Reporting Area	Measles (Rubeola)					Menin-gococcal Infections	Mumps			Pertussis			Rubella		
	Indigenous		Imported*		Total										
	1983	Cum. 1983	1983	Cum. 1983	Cum. 1982	Cum. 1983	1983	Cum. 1983	Cum. 1982	1983	Cum. 1983	Cum. 1982	1983	Cum. 1983	Cum. 1982
UNITED STATES	3	1,068	8	227	1,342	2,177	29	2,573	4,393	40	1,791	1,205	6	807	2,059
NEW ENGLAND	-	2	-	14	14	113	3	109	169	4	60	47	-	13	17
Maine	-	-	-	-	-	8	1	17	41	-	4	4	-	-	-
N.H.	-	-	-	3	3	3	-	21	16	1	8	4	-	4	10
Vt.	-	-	-	-	2	9	-	14	7	-	8	2	-	3	-
Mass.	-	2	-	3	3	38	2	28	72	3	34	21	-	6	2
R.I.	-	-	-	-	-	9	-	13	15	-	5	11	-	-	1
Conn.	-	-	-	8	6	46	-	16	18	-	1	5	-	-	4
MID ATLANTIC	-	70	8	41	161	362	10	215	279	8	332	238	3	138	101
Upstate N.Y.	-	1	-	11	111	114	5	83	68	4	106	96	3	29	49
N.Y. City	-	43	8 § †	26	42	68	-	33	46	-	51	34	-	86	33
N.J.	-	26	-	1	4	58	1	37	41	-	19	21	-	3	18
Pa.	-	-	-	3	4	122	4	62	124	4	156	87	-	20	1
E.N. CENTRAL	1	628	-	56	77	395	5	1,213	2,297	3	372	276	1	114	184
Ohio	-	72	-	13	1	118	-	541	1,576	-	127	79	-	2	-
Ind.	U	396	U	4	2	45	U	35	37	U	48	19	U	23	28
Ill.	-	157	-	33	24	120	1	133	263	-	110	117	1	48	67
Mich.	1	3	-	5	50	69	4	433	308	1	34	23	-	16	49
Wis.	-	-	-	1	-	43	-	71	113	2	53	38	-	25	40
W.N. CENTRAL	-	-	-	7	49	127	1	142	566	2	108	63	-	39	59
Minn.	-	-	-	-	-	20	-	27	437	-	40	25	-	8	5
Iowa	-	-	-	-	-	14	-	37	32	-	6	7	-	-	-
Mo.	-	-	-	1	2	63	-	21	10	-	15	14	-	-	38
N. Dak.	-	-	-	-	-	4	-	-	-	-	2	-	-	-	-
S. Dak.	-	-	-	-	-	4	-	-	1	-	7	5	-	-	1
Nebr.	-	-	-	-	3	2	-	2	-	2	2	1	-	-	-
Kans.	-	-	-	6	44	20	1	55	86	-	36	11	-	31	15
S. ATLANTIC	2	172	-	31	42	450	1	176	264	5	210	216	-	94	80
Del.	-	-	-	-	-	11	-	8	12	-	3	6	-	-	1
Md.	-	6	-	4	3	43	-	29	29	-	17	51	-	3	34
D.C.	-	-	-	-	1	5	-	-	-	-	-	1	-	-	-
Va.	-	10	-	13	14	65	-	31	35	2	48	24	-	3	12
W. Va.	-	-	-	-	3	2	1	45	92	-	9	7	-	-	1
N.C.	-	-	-	1	-	88	-	10	16	1	27	36	-	10	1
S.C.	-	-	-	4	-	47	-	10	16	-	13	16	-	1	1
Ga.	-	8	-	-	-	73	-	43	18	-	56	35	-	11	13
Fla.	2	148	-	9	21	116	-	-	46	2	37	40	-	66	17
E.S. CENTRAL	-	1	-	5	7	132	-	49	50	-	27	47	-	14	46
Ky.	-	-	-	1	1	27	-	21	17	-	11	5	-	13	28
Tenn.	-	-	-	-	6	44	-	23	19	-	6	25	-	-	2
Ala.	-	1	-	4	-	39	-	2	8	-	5	5	-	1	-
Miss.	-	-	-	-	-	22	-	3	6	-	5	12	-	-	16
W.S. CENTRAL	-	39	-	35	108	230	4	218	188	13	370	86	2	112	106
Ark.	-	5	-	8	-	17	-	2	7	-	17	3	-	-	1
La.	-	-	-	25	2	44	-	45	6	-	7	18	1	10	1
Okla.	-	1	-	-	27	28	-	-	-	10	266	5	-	-	3
Tex.	-	33	-	2	79	141	4	171	175	3	80	60	1	102	101
MOUNTAIN	-	-	-	3	21	88	3	122	90	4	200	59	-	33	78
Mont.	-	-	-	-	-	16	-	2	3	-	1	1	-	6	5
Idaho	-	-	-	-	-	6	-	6	4	-	15	11	-	8	6
Wyo.	-	-	-	-	1	2	1	1	2	-	6	3	-	4	7
Colo.	-	-	-	2	8	32	-	28	17	4	122	16	-	1	6
N. Mex.	-	-	-	-	-	7	-	-	-	-	12	6	-	-	6
Ariz.	-	-	-	1	12	16	2	74	38	-	22	21	-	6	14
Utah	-	-	-	-	-	8	-	6	20	-	22	1	-	7	22
Nev.	-	-	-	-	-	1	-	5	6	-	-	-	-	1	12
PACIFIC	-	156	-	35	863	280	2	329	490	1	112	173	-	250	1,388
Wash.	-	1	-	4	40	42	-	40	64	-	16	22	-	12	38
Oreg.	-	7	-	2	12	42	-	-	-	1	8	27	-	13	6
Calif.	U	147	U	27	805	187	U	258	406	U	81	96	U	223	1,332
Alaska	-	-	-	2	1	2	-	13	9	-	4	-	-	1	5
Hawaii	-	1	-	-	5	7	2	18	11	-	3	28	-	1	7
Guam	U	1	U	1	6	1	U	1	5	U	-	-	U	-	2
P.R.	-	94	-	-	124	11	4	119	80	-	11	21	1	5	11
V.I.	-	-	-	5	-	-	-	-	4	-	-	-	-	2	1
Pac. Trust Terr.	U	-	U	-	-	-	U	-	5	U	-	-	U	-	-

*For measles only, imported cases includes both out-of-state and international importations. U: Unavailable †International §Out-of-state

TABLE III. (Cont.'d). Cases of specified notifiable diseases, United States, weeks ending October 8, 1983 and October 9, 1982 (40th week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1983	Cum. 1982	1983	1983	Cum. 1983	Cum. 1983	Cum. 1983	Cum. 1983	Cum. 1983
UNITED STATES	24,685	25,316	1	389	17,912	250	322	1,086	4,631
NEW ENGLAND	520	448	-	25	525	4	12	6	30
Maine	17	4	-	2	29	-	-	-	8
N.H.	18	5	-	-	31	-	-	1	4
Vt.	1	2	-	-	10	-	-	-	1
Mass.	324	302	-	13	272	3	10	2	11
R.I.	16	19	-	2	43	1	-	-	-
Conn.	144	116	-	8	140	-	2	3	6
MID ATLANTIC	3,188	3,446	-	77	3,204	1	57	26	210
Upstate N.Y.	230	371	-	21	546	1	7	6	69
N.Y. City	1,909	2,053	-	41	1,268	-	21	2	-
N.J.	631	464	-	15	674	-	23	8	24
Pa.	418	558	-	-	716	-	6	10	117
E.N. CENTRAL	1,213	1,524	-	49	2,423	3	51	79	422
Ohio	336	238	-	5	380	-	14	42	56
Ind.	92	156	U	U	267	-	3	14	28
Ill.	525	831	-	27	1,041	1	24	14	220
Mich.	191	225	-	15	610	1	10	7	17
Wis.	69	74	-	2	125	1	-	2	101
W.N. CENTRAL	302	425	-	9	558	79	9	54	673
Minn.	117	96	-	7	120	-	2	-	116
Iowa	18	24	-	1	49	-	-	-	164
Mo.	112	246	-	1	275	55	6	28	90
N. Dak.	2	7	-	-	6	-	-	1	67
S. Dak.	11	1	-	-	32	8	-	5	107
Nebr.	12	11	-	-	20	8	-	3	60
Kans.	30	40	-	-	56	8	1	17	69
S. ATLANTIC	6,702	6,889	1	104	3,681	13	53	453	1,579
Del.	28	19	1	2	51	-	-	4	5
Md.	465	372	-	3	297	5	8	40	613
D.C.	295	375	-	3	149	-	3	-	1
Va.	448	466	-	15	376	1	15	61	538
W. Va.	20	22	-	5	111	-	2	12	106
N.C.	641	559	-	33	544	6	4	190	21
S.C.	418	420	-	5	332	-	2	77	26
Ga.	1,198	1,438	-	10	687	1	2	65	174
Fla.	3,189	3,218	-	28	1,134	-	17	4	95
E.S. CENTRAL	1,724	1,755	-	63	1,606	17	8	101	311
Ky.	128	98	-	43	420	1	3	22	70
Tenn.	472	499	-	5	470	11	1	48	171
Ala.	685	656	-	6	414	-	1	24	70
Miss.	439	502	-	9	302	5	3	7	-
W.S. CENTRAL	6,460	6,602	-	31	2,133	103	45	352	868
Ark.	154	163	-	10	262	63	2	37	147
La.	1,342	1,481	-	-	286	3	3	1	27
Okla.	161	143	-	-	196	29	2	224	87
Tex.	4,803	4,815	-	21	1,389	8	38	90	607
MOUNTAIN	524	629	-	16	475	24	12	13	206
Mont.	7	5	-	-	41	5	1	6	66
Idaho	7	24	-	-	23	2	-	2	15
Wyo.	10	16	-	-	11	5	-	2	11
Colo.	127	174	-	2	59	3	1	-	20
N. Mex.	143	149	-	-	89	3	1	-	12
Ariz.	132	145	-	10	195	1	7	1	33
Utah	20	19	-	2	32	4	1	1	9
Nev.	78	97	-	2	25	1	1	1	40
PACIFIC	4,052	3,598	-	15	3,307	6	75	2	332
Wash.	143	128	-	5	194	2	3	-	2
Oreg.	117	90	-	5	144	2	3	-	1
Calif.	3,719	3,284	U	U	2,726	2	67	2	314
Alaska	12	11	-	-	56	-	-	-	15
Hawaii	61	85	-	5	187	-	2	-	-
Guam	-	1	U	U	4	-	-	-	-
P.R.	648	580	-	16	379	-	-	-	46
V.I.	17	25	-	-	2	-	-	-	-
Pac. Trust Terr.	-	-	U	U	-	-	-	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending October 8, 1983 (40th week)

Reporting Area	All Causes, By Age (Years)						P&I** Total
	All Ages	≥65	45-64	25-44	1-24	<1	
NEW ENGLAND	665	462	137	34	12	20	28
Boston, Mass.	196	124	40	11	6	15	14
Bridgeport, Conn.	34	26	7	1	-	-	2
Cambridge, Mass.	15	12	1	2	-	-	-
Fall River, Mass.	35	31	3	-	-	1	-
Hartford, Conn.	57	44	10	3	-	-	-
Lowell, Mass.	28	16	9	2	1	-	1
Lynn, Mass.	20	13	7	-	-	-	-
New Bedford, Mass.	27	22	4	1	-	-	1
New Haven, Conn.	59	39	14	4	-	2	2
Providence, R.I.	65	49	12	2	1	1	5
Somerville, Mass.	7	7	-	-	-	-	-
Springfield, Mass.	34	25	7	1	1	-	1
Waterbury, Conn.	29	18	7	3	1	-	2
Worcester, Mass.	59	36	16	4	2	1	-
MID. ATLANTIC	2,390	1,630	493	160	46	61	96
Albany, N.Y.	67	45	10	7	2	3	2
Allentown, Pa.	21	15	5	1	-	-	-
Buffalo, N.Y.	116	76	29	6	-	5	13
Camden, N.J.	42	27	9	1	2	3	2
Elizabeth, N.J.	20	14	4	-	1	1	2
Erie, Pa.†	33	24	6	1	2	-	1
Jersey City, N.J.	46	31	10	2	2	1	-
N.Y. City, N.Y.	1,296	884	255	107	27	23	41
Newark, N.J.	42	17	10	12	1	2	3
Paterson, N.J.	28	16	9	2	-	1	1
Philadelphia, Pa.†	295	198	72	12	2	11	15
Pittsburgh, Pa.†	63	40	18	1	1	3	1
Reading, Pa.	32	28	3	-	1	-	3
Rochester, N.Y.	112	84	20	3	-	5	6
Schenectady, N.Y.	21	18	2	1	-	-	-
Scranton, Pa.†	26	20	5	-	1	-	-
Syracuse, N.Y.	43	28	10	2	1	2	1
Trenton, N.J.	34	24	8	-	2	-	1
Utica, N.Y.	22	17	4	-	1	-	2
Yonkers, N.Y.	31	24	4	2	-	1	2
E.N. CENTRAL	2,182	1,413	518	118	64	69	76
Akron, Ohio	77	49	18	1	3	6	-
Canton, Ohio	35	27	6	2	-	-	1
Chicago, Ill	519	337	135	29	13	5	12
Cincinnati, Ohio	137	94	31	7	4	1	14
Cleveland, Ohio	133	80	32	9	3	9	2
Columbus, Ohio	133	75	43	4	7	4	1
Dayton, Ohio	106	64	33	4	2	3	4
Detroit, Mich.	248	135	65	27	9	12	5
Evansville, Ind.	52	42	7	3	-	-	1
Fort Wayne, Ind.	48	27	16	4	-	1	2
Gary, Ind.	18	11	5	1	1	-	-
Grand Rapids, Mich.	66	46	12	3	1	4	4
Indianapolis, Ind.	144	95	28	6	8	7	2
Madison, Wis.	33	25	5	1	-	2	3
Milwaukee, Wis.	154	114	25	7	4	4	8
Peoria, Ill	38	28	5	1	1	3	3
Rockford, Ill.	48	27	14	1	4	2	4
South Bend, Ind.	36	25	7	2	2	-	1
Toledo, Ohio	90	66	18	2	-	4	8
Youngstown, Ohio	67	46	13	4	2	2	1
W.N. CENTRAL	687	483	110	40	23	28	27
Des Moines, Iowa	58	45	8	2	3	-	3
Duluth, Minn.	31	21	2	5	2	1	-
Kansas City, Kans.	32	19	3	4	2	4	2
Kansas City, Mo.	115	80	20	4	3	5	8
Lincoln, Nebr.	26	19	3	1	2	1	3
Minneapolis, Minn.	63	48	10	3	-	2	1
Omaha, Nebr.	87	55	21	5	4	2	4
St. Louis, Mo.	160	108	25	12	6	9	3
St. Paul, Minn.	62	45	14	2	-	1	1
Wichita, Kans.	53	43	4	2	1	3	2
S. ATLANTIC	1,194	721	296	86	37	54	52
Atlanta, Ga.	147	87	41	10	7	2	4
Baltimore, Md.	246	141	65	17	8	15	4
Charlotte, N.C.	61	39	12	5	2	3	2
Jacksonville, Fla.	80	49	21	3	3	4	4
Miami, Fla.	110	64	32	9	3	2	2
Norfolk, Va.	50	27	11	4	2	6	2
Richmond, Va.	90	48	26	7	4	5	6
Savannah, Ga.	44	26	12	5	1	-	4
St. Petersburg, Fla.	100	82	14	-	1	3	3
Tampa, Fla.	71	47	11	4	3	6	4
Washington, D.C.	133	73	37	17	2	4	6
Wilmington, Del.	62	38	14	5	1	4	11
E.S. CENTRAL	619	392	147	50	16	14	28
Birmingham, Ala.	87	47	21	10	5	4	1
Chattanooga, Tenn.	33	26	3	2	-	2	3
Knoxville, Tenn.	45	22	14	7	2	-	-
Louisville, Ky.	92	64	20	7	-	1	8
Memphis, Tenn.	114	73	27	8	3	3	6
Mobile, Ala.	77	57	17	2	1	-	4
Montgomery, Ala.	31	21	7	2	-	1	-
Nashville, Tenn.	140	82	38	12	5	3	6
W.S. CENTRAL	1,429	815	368	123	79	43	47
Austin, Tex.	23	11	4	5	3	-	-
Baton Rouge, La.	36	19	13	-	1	3	1
Corpus Christi, Tex.	34	18	10	5	-	1	2
Dallas, Tex.	168	95	46	13	10	4	2
El Paso, Tex.	46	23	10	5	6	2	2
Fort Worth, Tex.	92	56	18	11	4	2	4
Houston, Tex.	537	275	154	57	35	16	5
Little Rock, Ark.	87	62	13	3	5	4	4
New Orleans, La.	128	70	38	10	7	3	1
San Antonio, Tex.	163	108	41	6	5	3	19
Shreveport, La.	25	19	3	1	1	1	1
Tulsa, Okla.	90	59	18	7	2	4	6
MOUNTAIN	563	333	129	47	22	32	30
Albuquerque, N.Mex.	50	24	18	4	2	2	3
Colo. Springs, Colo.	32	20	5	3	3	1	4
Denver, Colo.	115	73	21	8	2	11	5
Las Vegas, Nev.	63	38	17	5	2	1	3
Ogden, Utah	20	15	3	-	1	1	5
Phoenix, Ariz.	134	74	35	13	7	5	3
Pueblo, Colo.	22	17	1	1	2	1	-
Salt Lake City, Utah	53	23	14	9	2	5	-
Tucson, Ariz.	74	49	15	4	1	5	7
PACIFIC	1,417	889	322	107	51	45	78
Berkeley, Calif.	19	16	3	-	-	-	-
Fresno, Calif.	59	40	9	4	4	2	2
Glendale, Calif.	3	2	1	-	-	-	-
Honolulu, Hawaii	55	29	24	1	1	-	6
Long Beach, Calif.	85	64	17	2	2	-	1
Los Angeles, Calif.	246	132	55	38	17	2	9
Oakland, Calif.	51	31	11	5	1	3	1
Pasadena, Calif.	28	23	4	1	-	-	5
Portland, Oreg.	101	64	23	9	1	3	3
Sacramento, Calif.	70	46	13	4	2	5	6
San Diego, Calif.	126	87	26	4	2	7	13
San Francisco, Calif.	172	98	40	19	3	12	3
San Jose, Calif.	155	102	36	7	9	1	17
Seattle, Wash.	131	86	30	6	4	5	4
Spokane, Wash.	50	28	14	2	3	3	7
Tacoma, Wash.	66	41	16	5	2	2	1
TOTAL	11,146††	7,138	2,520	765	350	366	462

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

** Pneumonia and influenza

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

†† Total includes unknown ages.

TABLE V. Years of potential life lost, deaths, and death rates, by cause of death, and estimated number of physician contacts, by principal diagnosis, United States

Cause of morbidity or mortality (Ninth Revision ICD, 1975)	Years of potential life lost before age 65 by persons dying in 1981[1]	Estimated mortality May 1983		Estimated number of physician contacts May 1983[4]
		Number[2]	Annual Rate/100,000[3]	
ALL CAUSES (TOTAL)	9,879,590	164,770	831.2	105,900,000
Accidents and adverse effects (E800-E949)	2,587,140	7,990	40.3	5,700,000
Malignant neoplasms (140-208)	1,821,900	36,060	181.9	1,600,000
Diseases of heart (390-398, 402, 404-429)	1,621,290	61,890	312.2	6,300,000
Suicides, homicides (E950-E978)	1,403,560	3,960	20.0	—
Cerebrovascular diseases (430-438)	275,000	12,980	65.5	800,000
Chronic liver disease and cirrhosis (571)	267,350	2,180	11.0	100,000
Pneumonia and influenza[5] (480-487)	123,420	4,300	21.7	1,000,000
Chronic obstructive pulmonary diseases and allied conditions (490-496)	116,280	5,470	27.6	1,900,000
Diabetes mellitus (250)	105,960	2,780	14.0	2,800,000
Prenatal care[6]				2,300,000
Infant mortality[6]		3,300	10.9 /1,000 live births	

[1]Years of potential life lost for persons between 1 year and 65 years old at the time of death are derived from the number of deaths in each age category as reported by the National Center for Health Statistics, *Monthly Vital Statistics Report* (MVSR), Vol. 30, No. 13, December 20, 1982, multiplied by the difference between 65 years and the age at the mid-point of each category. As a measure of mortality, "Years of potential life lost" underestimates the importance of diseases that contribute to death without being the underlying cause of death.

[2]The number of deaths is estimated by CDC by multiplying the estimated annual mortality rates (MVSR Vol. 32, No. 6, September 21, 1983, pp. 8-9) and the provisional U.S. population in that month (MVSR Vol. 32, No. 5, August 15, 1983, p.1) and dividing by the days in the month as a proportion of the days in the year.

[3]Annual mortality rates are estimated by NCHS (MVSR Vol. 32, No. 6, September 21, 1983, pp. 8-9), using the underlying cause of death from a 10% systematic sample of death certificates received in state vital statistics offices during the month and population estimates from the Bureau of the Census.

[4]IMS America *National Disease and Therapeutic Index* (NDTI), Monthly Report, May 1983, Section III. This estimate comprises the number of office, hospital, and nursing home visits and telephone calls prompted by each medical condition based on a stratified random sample of office-based physicians (2,100) who record all private patient contacts for 2 consecutive days each quarter. The accuracy of the estimates is unknown, and the nubmer provided should be used only as a gross indicator of morbidity.

[5]Data for "infectious diseases and their sequelae" as a cause of death and physician visits comparable to other multiple-code categories (e.g., "malignant neoplasms") are not presently available.

[6]"Prenatal care" (NDTI) and "Infant mortality" (MVSR Vol. 32, No. 5, August 15, 1983, p.1) are included in the table because "Years of potential life lost" does not reflect deaths of children < 1 year.

Measles – Continued

there has been variable implementation of programs throughout the Region. Vaccine coverage rates ranging from less than 10% to 90% have been reported from different countries. In general, the impact on measles incidence has paralleled vaccine coverage. Great success in reducing measles incidence has been reported from several countries, and studies have demonstrated the highly favorable cost/benefit ratio resulting from measles vaccination. In many countries, even further benefits have been realized by the use of combined measles-rubella (MR) or measles-mumps-rubella (MMR) vaccines.

Initial success in reducing the occurrence of measles has led several countries to consider elimination of indigenous disease, i.e., cases of measles that can be traced directly (within a few generations of transmission) to a foreign source. This definition falls short of total eradication and acknowledges that periodic importations will certainly occur. At least three countries in the Region are known to have established elimination goals—Czechoslovakia, Finland, and Sweden. In Czechoslovakia (*3*), measles incidence has been reduced to a level of only 25 cases during 1982 (almost all of them imported). Sweden and Finland have only recently begun their programs (using combined MMR vaccine).

Experience to date indicates that elimination of measles is technically feasible and that successful strategies will include at least three elements: achievement and maintenance of high immunization levels (certainly in excess of 90%), effective surveillance, and aggressive response to cases.

Implementing the first element will clearly involve substantial efforts to educate the general public about the dangers of measles and desirability of prevention. The mass media may be useful in this regard. Physicians and other health-care providers also need to be reminded of the severity of the disease and the effectiveness of immunization. Endorsement from professional associations (particularly those of pediatricians) can help achieve this, as can educational devices such as journal articles and sets of slides. Review of immunization status at the time of entry to day nurseries, kindergartens, schools, and similar institutions is a useful means of assuring high coverage.

Surveillance of disease is a critical element, and surveillance programs need to be strengthened to minimize the present (variable) degree of underreporting. Measles should be a notifiable disease in all countries. Periodic serologic surveys are valuable to monitor immunity levels in the population. Ongoing review of programs is essential.

Once suspected cases are detected, prompt investigation and outbreak control measures, including identification and vaccination of susceptibles, are needed. Experience in the German Democratic Republic indicates that outbreaks are smaller and shorter when aggressive outbreak control measures are applied than when they are not.

Since measles is a highly contagious disease and since there is a great movement of people within the Region, a coordinated regional approach to elimination is essential. WHO can aid both the development and the implementation of detailed elimination strategies to meet the different situations in different countries. Regional meetings to develop coordinated strategies and monitor progress would be most helpful. The time required to achieve elimination will differ from country to country, depending on the present state of measles immunization and control. In some countries, it should be achieved in a few years, and in most countries, it should be achievable by 1990.

Reported by WHO Weekly Epidemiological Record *1983:58;229-30; Div of Immunization, Center for Prevention Svcs, CDC.*

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Lignite Fly Ash and the Interferon System

Lignite fly ash, the combustible product of lignite coal, is the largest constituent of the particulate emissions produced when coal is burned to generate electric power. An estimated million plus metric tons of fly ash were released into the atmosphere of the United States during 1974 (*1*). This atmospheric burden is predicted to increase with increased use of new technologies for coal combustion, such as fluidized bed combustion. Because coal fly ash contains mutagenic and carcinogenic agents (*2,3*), it may pose a potential hazard to human health.

Previous research has shown that certain chemicals and particulates can interfere with the production of interferon, a cellular defense mechanism.* The process of interferon induction is initiated in the cell by invading viruses. Among the agents known to interfere with the process are asbestos fibers (*4*), diesel engine emissions (*5*), mutagens (*6*), and carcinogens (*7*).

To determine if lignite fly ash has an inhibiting effect on the production of interferon, investigators at the National Institute for Occupational Safety and Health (NIOSH) have examined the effect of fly ash on the interferon system (*8*). The amount of interferon produced in the presence of various materials was assessed by measuring the degree to which Sendai virus activity was inhibited. Induction of interferon by influenza virus was evaluated in monolayers of Rhesus monkey kidney cells pretreated with lignite fly ash (*9*). Results indicated that about 50% less interferon was produced in these pretreated cells than in untreated cells. When interferon was added to the cells, however, the presence of fly ash did not impair the ability of the interferon to protect the cells against viral infection. In cells pretreated with fly ash, influenza virus multiplied to twice the levels noted in untreated cells. In contrast, unburned lignite coal had a minimal effect on viral growth and interferon induction; the degree of biologic activity was correlated with the "rank" of the coal (*10*).†

To study the nature of the inhibitor(s) present in lignite fly ash, the fly ash was extracted with both polar and nonpolar solvents and with horse serum. Interferon induction was inhibited by extracts of lignite fly ash when either polar (methanol) or nonpolar (dichloromethane) solvents were used; this finding suggests that there may be more than one inhibitor present. Fly ash was also extracted with horse serum, which forms complexes with some heavy metals and organic compounds and has a chemical constitution similar to alveolar fluids from the lung. These extracts, with and without the addition of disodium ethylenediamine tetraacetic acid (EDTA), a metal chelator, yielded additional compounds that suppressed the induction of interferon by viruses. Furthermore, the residual particulates of fly ash left after extraction with horse serum were able to inhibit the induction of interferon. These results indicate that several soluble components of lignite fly ash, and components in the particulate matrix as a whole, acting singly or together, may alter cellular defenses.

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

Editorial Note: The findings presented here demonstrate that lignite fly ash and several soluble components (both organic and inorganic) adsorbed to or inherent in these particulates adversely affected the induction of interferon. Because the growth of influenza virus was enhanced in vitro in the presence of lignite fly ash and correlated with suppression of interferon production, exposure to lignite fly ash may affect human host responses to viral infection.

*Interferons are proteins secreted by cells in response to invading microorganisms or other substances in a process called induction. The interferon system, an important component of the host's nonimmunologic defenses, is not only a primary protective response to viral infection, but also may modulate immune responses and influence the growth and biochemical activities of both normal and malignant cells.

†"High-rank" coal is older coal of higher carbon content, such as anthracite and bituminous coal. The results of studies at NIOSH indicate that high-rank coal depresses interferon production, while lower-rank coals appear to be progressively less antagonistic.)

Lignite Fly Ash – Continued

Findings of this study indicate that studying the process of viral induction of interferon can be useful in detecting both soluble and particulate reactants potentially hazardous to human health. Future studies should attempt to detect the stage during coal combustion at which fly ash contains potentially harmful chemicals, to minimize these occurrences, and to determine the health risk, if any, to the workers in the plants and to persons in the communities nearby.

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