CENTERS FOR DISEASE CONTROL

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Recommendation of the Immunization Practices Advisory Committee (ACIP)

Measles Prevention

These revised ACIP Measles Prevention recommendations represent an update of the previous recommendations (MMWR 1978;27:427-30, 435-7) to include current information about vaccine effectiveness and measles elimination efforts. There are no basic changes in approach. Further discussion is included of atypical measles syndrome and of revaccination of prior recipients of killed measles virus vaccine. Recommendations for vaccination of persons with allergies are revised. As the incidence rate of measles declines, serologic confirmation becomes more important. New recommendations for international travel are included.

INTRODUCTION

Measles (rubeola) is often a severe disease, frequently complicated by middle ear infection or bronchopneumonia. Encephalitis occurs in approximately 1 of every 2,000 reported cases; survivors often have permanent brain damage and mental retardation. Death, predominantly from respiratory and neurologic causes, occurs in 1 of every 3,000 reported measles cases. The risk of death is known to be greater for infants and adults than for children and adolescents.

Measles illness during pregnancy increases fetal risk. Most commonly, this involves premature labor and moderately increased rates of spontaneous abortion and of low birth-weight infants. Results of 1 retrospective study in an isolated population suggest that measles infection in the first trimester of pregnancy was associated with an increased rate of congenital malformation.

Before measles vaccine was available, more than 400,000 measles cases were reported each year in the United States. Since the licensure of vaccine in 1963, the collaborative efforts of professional and voluntary medical and public health organizations in vaccination programs have resulted in a 99% reduction in the reported incidence of measles. In 1981, a provisional total of 3,032 cases were reported. In the pre-vaccine era, most measles cases affected preschool and young school-age children. In 1980, more than 60% of cases in which the age was known occurred among persons $\geq$10 years old. More than 25% of the cases were reported among the 10- to 14-year-old age group, and more than 20% were reported among the 15- to 19-year-old age group.

With the highly effective, safe measles vaccine now available, the degree of measles control that has been achieved in the United States has depended largely on the effectiveness of the continuing efforts to vaccinate all susceptible persons who can safely be vaccinated. An initiative to eliminate indigenous measles from the United States by fall of 1982 is proceeding satisfactorily.

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MEASLES VIRUS VACCINE

Live measles virus vaccine* available in the United States is prepared in chick embryo cell culture. The vaccine virus strain has been attenuated beyond the level of the original Edmonston B strain and is therefore known as a further attenuated strain. Vaccine prepared with the further attentuated measles virus causes fewer reactions than its predecessor, Edmonston B vaccine, which is no longer distributed in the United States. Measles vaccine is available in monovalent (measles only) form and in combinations: measles-rubella (MR) and measles-mumps-rubella (MMR) vaccines. All vaccines containing measles antigen are recommended for use at about 15 months of age under routine conditions. MMR is the vaccine of choice for use in routine infant-child vaccination programs. In all situations where measles vaccine is to be used, a combination vaccine should be given if recipients are likely to be susceptible to rubella and/or mumps as well as to measles.

Measles vaccine produces a mild or inapparent, non-communicable infection. Measles antibodies develop in at least 95% of susceptible children vaccinated at about 15 months of age or older with the current further attentuated vaccine. Protection against measles has been assessed both by measuring serum antibodies and by evaluating clinical protection in epidemiologic studies. Evidence now extending through 16 years indicates that although the titers of vaccine-induced antibodies are lower than those following natural disease, the protection conferred appears to be durable.

The most commonly employed test for measurement of immunity to measles is the hemagglutination-inhibition (HI) test. Most, but not all, immune individuals will have measles HI antibody levels of $\geq$4. More sensitive methods to determine measles immunity are not widely available at present. Routine serologic screening to determine measles immunity is not recommended.

Asymptomatic measles reinfection can occur in persons who have previously developed antibodies, whether from vaccination or from natural disease. Symptomatic reinfections have been reported rarely. These individuals have had $\geq$4-fold rises in measles HI antibody titers but have not had detectable measles-specific IgM antibodies in appropriately timed serum specimens. These rare symptomatic reinfections do not appear to be epidemiologically important.

Vaccine Shipment and Storage

Failure of protection against measles may result from the administration of improperly stored vaccine. Since 1979 a new stabilizer has been added to the vaccine that makes it more resistant to inactivation by heat. However, during storage before reconstitution, measles vaccine must be kept at 2-8 C (35.6-46.4 F) or colder. It must also be protected from light, which may inactivate the virus. Vaccine must be shipped at 10 C (50 F) or colder and may be shipped on dry ice.

VACCINE USAGE

General Recommendations

Persons can be considered immune to measles only if they have documentation of:

(1) Physician-diagnosed measles,

(2) Laboratory evidence of measles immunity, or

(3) Adequate immunization with live measles vaccine on or after the first birthday.

*Official name: Measles Virus Vaccine, Live, Attentuated

Measles — Continued

Most persons born before 1957 are likely to have been infected naturally and generally need not be considered susceptible. All other children, adolescents, and adults are considered susceptible and should be vaccinated, if there are no contraindications. This includes persons who may be immune to measles but who lack adequate documentation of immunity.

Dosage

At least 95% of vaccine recipients develop measles antibody following a single dose of live vaccine administered around 15 months of age. Since evidence now extending through 16 years indicates that the protection conferred is durable, there is no need for a "booster" dose of vaccine.

Concern has been raised that the small percentage of persons who continue to be susceptible after receiving a single dose might be able to sustain measles transmission, and therefore a second dose has been suggested for all vaccinees in order to reduce the proportion of susceptible persons to below the 5% that remain after initial vaccination.

There is no evidence that measles transmission can be sustained among the small percentage of persons who remain susceptible after receiving 1 dose of vaccine. In fact, measles has been eliminated in most areas of the country using the single-dose recommendation. Since it is impractical and inefficient to attempt to identify the small percentage of remaining susceptible persons, efforts should be concentrated on extending initial vaccination to the greatest number of recipients.

After weighing the evidence, the Committee continues to recommend only a single dose of measles vaccine around 15 months of age.

A single dose of live measles vaccine (as a monovalent or combination product) should be given subcutaneously in the volume specified by the manufacturer. Immune globulin (IG) should NOT be given with further attentuated measles virus vaccine.

Age at Vaccination

Measles vaccine is indicated for persons susceptible to measles, regardless of age, unless otherwise contraindicated (see below). Current evidence indicates that for a maximum rate of seroconversion, measles vaccine should preferably be given when children are about 15 months of age. Because cases continue to occur in preschool children, increased emphasis must be placed on vaccinating children promptly at 15 months of age. It is particularly important to vaccinate young children $\geq$15 months of age before they might encounter measles in day-care centers or other environments where young children cluster.

Because of the continuing occurrence of cases in older children and young adults, the immune status of all adolescents should be evaluated. Complete measles control will require protection of all susceptibles; therefore, increased emphasis must be placed on vaccinating susceptible adolescents and young adults. Susceptible persons include those who received inactivated vaccine or who were given live measles virus vaccine before their first birthday, as well as those who were never vaccinated or never had measles.

Revaccination of Persons Vaccinated According to Earlier Recommendations

Previous vaccination with live vaccine: Persons vaccinated with live measles vaccine before their first birthday should be identified and revaccinated.

There has been some confusion concerning the immunity of children vaccinated against measles at 12 months of age. Some recent data have indicated a slightly lower rate of seroconversion among children vaccinated at 12 months of age than among those vaccinated at 13 months or later. This difference is not sufficient to warrant routinely revaccinating persons who were vaccinated at 12 months of age since the vast majority are fully protected. If, how-

Measles – Continued

ever, the parents of a child vaccinated when 12-14 months old request revaccination for the child, there is no immunologic or safety reason to deny the request.

Previous vaccination with killed vaccine or vaccine of unknown type: In the past, the Committee has recommended revaccination with live measles vaccine for persons vaccinated at any age with inactivated vaccine (available in the United States from 1963 to 1967) and for persons vaccinated with inactivated vaccine followed by live vaccine within 3 months. This recommendation was based on the knowledge that some persons who had received inactivated vaccine were at risk of developing severe atypical measles syndrome when exposed to the natural virus. Persons who developed atypical measles occasionally developed serious complications requiring hospitalization. The recommendation was also based on the belief that revaccination with live measles vaccine would usually protect such persons against atypical measles. Limited data suggest that a substantial percentage of persons revaccinated with live measles vaccine will be protected, although the duration of immunity and degree of protection are not known precisely.

A wide percentage range (4%-55%) of prior recipients of killed measles vaccine who were revaccinated with live measles vaccine have been reported to have had reactions to the live vaccine. Most of these reactions are mild and consist of local swelling and erythema with or without low-grade fever lasting 1-2 days. Rarely, more severe reactions, including prolonged high fevers and extensive local reactions, have been reported that have required hospitalization. Prior recipients of killed measles vaccine are more likely to have serious illness when exposed to natural measles than when given live measles virus vaccine.

The Committee has considered the risks and benefits of revaccination for prior recipients of inactivated measles vaccine and believes that if such persons are identified, they should be revaccinated with live measles virus vaccine to prevent atypical measles syndrome. Revaccination is particularly important when exposure to natural measles virus is considered likely.

These same recommendations apply to persons vaccinated between 1963 and 1967 with a vaccine of unknown type since their only vaccination may have been with inactivated vaccine. Since killed measles vaccine was not distributed in the United States after 1967, persons vaccinated after 1967 with a vaccine of unknown type need not be revaccinated.

Individuals Exposed to Disease

Use of vaccine: Exposure to measles is not a contraindication to vaccination. Available data suggest that live measles vaccine, if given within 72 hours of measles exposure, may provide protection. If the exposure did not result in infection, the vaccine should induce protection against subsequent measles infection.

Use of IG: IG can be given to prevent or modify measles in a susceptible person within 6 days of exposure. The recommended dose of IG is 0.25 ml/kg (0.11 ml/lb) of body weight (maximum dose—15 ml). IG may be especially indicated for susceptible household contacts of measles patients, particularly contacts under 1 year of age, for whom the risk of complications is highest. Live measles vaccine should be given about 3 months later when the passive measles antibodies should have disappeared, if the child is then at least 15 months old. *IG should not be used in an attempt to control measles outbreaks.*

SIDE EFFECTS AND ADVERSE REACTIONS

Experience with approximately 131 million doses of measles vaccine distributed in the United States through 1981 indicates an excellent record of safety. About 5%-15% of vaccinees may develop a temperature of ≥103 F (≥39.4 C) beginning about the sixth day after vaccination and lasting up to 5 days. Reports generally indicate that most persons with fever

Measles – Continued

are otherwise asymptomatic. Transient rashes have been reported in approximately 5% of vaccinees. Central nervous system conditions including encephalitis and encephalopathy have been reported once for approximately every million doses administered. The incidence rate of encephalitis or encephalopathy following measles vaccination is lower than the observed incidence rate of encephalitis of unknown etiology, suggesting that some or most of the reported severe neurologic disorders may be only temporally related to measles vaccination rather than due to vaccination. Limited data indicate that reactions to vaccine are not age-related.

Subacute sclerosing panencephalitis (SSPE) is a "slow virus" infection of the central nervous system associated with measles virus. Results from studies indicate that measles vaccine, by protecting against measles, significantly reduces the chance of developing SSPE. The recent decline in numbers of SSPE cases in the presence of careful surveillance is additional strong presumptive evidence of a protective effect of measles vaccination. However, there have been some reports of SSPE in children who did not have a history of natural measles but who did receive measles vaccine. Some of these cases may have resulted from unrecognized measles illness in the first year of life or possibly from the measles vaccine.

Revaccination Risks

There is no evidence of enhanced risk from receiving live measles vaccine in persons who have previously received live measles vaccine or had measles. Specifically, there does not appear to be any enhanced risk of SSPE.

On exposure to natural measles, some children who had been given inactivated measles virus vaccine previously have developed atypical measles, sometimes with severe symptoms. Reactions, such as local edema and induration, lymphadenopathy, and fever, have at times been observed when live measles virus vaccine was administered to recipients of inactivated vaccine. However, despite the risk of local reaction, persons born since 1956 who have previously been given inactivated vaccine (whether administered alone or followed by a dose of live vaccine within 3 months) should be revaccinated with live vaccine to avoid the severe atypical form of natural measles and to provide full and lasting protection. (See section **Previous vaccination with killed vaccine or vaccine of unknown type.**)

PRECAUTIONS AND CONTRAINDICATIONS

Pregnancy: Live measles vaccine should not be given to women known to be pregnant. This precaution is based on the theoretical risk of fetal infection, which applies to the administration of any live virus vaccine to women who might be pregnant or who might become pregnant shortly after vaccination. No evidence exists to substantiate this theoretical risk from measles vaccine. Considering the importance of protecting adolescents and young adults against measles with its known serious risks, asking women if they are pregnant, excluding those who are, and explaining the theoretical risks to the others are the recommended precautions in a measles immunization program.

Febrile illness: Vaccination of persons with febrile illness should be postponed until recovery. However, susceptible children with minor illnesses such as upper respiratory infections should be vaccinated. Considering the importance of protecting against measles, medical personnel should use every opportunity to vaccinate susceptible children.

Allergies: Live measles vaccine is produced in chick embryo cell culture. Hypersensitivity reactions very rarely follow the administration of live measles vaccine. Most of these reactions are considered minor and consist of wheal and flare or urticaria at the injection site. However, with over 131 million doses of measles vaccine distributed in the United States there have

Measles – Continued

been 3 reported cases of immediate allergic reactions in children who had histories of anaphylactoid reactions to egg ingestion. These reactions to vaccine could potentially have been life threatening. Two children experienced difficulty breathing; 1 of these had hypotension. Persons with a history of anaphylactoid reactions (hives, swelling of the mouth and throat, difficulty breathing, hypotension and shock) subsequent to egg ingestion should be vaccinated only with extreme caution. Evidence indicates that persons are not at increased risk if they have egg allergies that are not anaphylactoid in nature. Such persons should be vaccinated in the usual manner. There is no evidence to indicate that persons with allergies to chickens or feathers are at increased risk of reaction to the vaccine.

Since measles vaccine contains trace amounts of neomycin (25 μg), persons who have experienced anaphylactoid reactions to topically or systemically administered neomycin should not receive measles vaccine. Most often, neomycin allergy is manifested as a contact dermatitis which is a delayed-type (cell-mediated) immune response rather than anaphylaxis. In such individuals, the adverse reaction, if any, to 25 μg of neomycin in the vaccine would be an erythematous, pruritic nodule or papule at 48-96 hours. A history of contact dermatitis to neomycin is not a contraindication to receiving measles vaccine. Live measles virus vaccine does not contain penicillin.

Recent administration of IG: Vaccination should be deferred for 3 months after a person has received IG, whole blood, or other antibody-containing blood products because passively acquired antibodies might interfere with the response to the vaccine.

Tuberculosis: Tuberculosis may be exacerbated by natural measles infection. There is no evidence, however, that the live measles virus vaccine has such an effect. Therefore, tuberculin skin testing is not a prerequisite for measles vaccination. The value of protection against natural measles far outweighs the theoretical hazard of possibly exacerbating unsuspected tuberculosis. If there is a need for tuberculin skin testing, it can be done on the day of vaccination and read 48 to 72 hours later. If a recent vaccinee proves to have evidence of tuberculous infection, prompt investigation and, if indicated, preventive treatment or treatment for tuberculous disease should be initiated. It is prudent to wait 4-6 weeks after measles immunization before administering a tuberculin skin test since measles vaccination may temporarily suppress tuberculin reactivity.

Altered immunity: Replication of the measles vaccine virus may be potentiated in patients with immune deficiency diseases and by the suppressed immune responses that occur with leukemia, lymphoma, or generalized malignancy, or with therapy with corticosteroids, alkylating drugs, antimetabolites, or radiation. Patients with such conditions should not be given live measles virus vaccine. Since vaccinated persons do not transmit vaccine virus, the risk to these patients of being exposed to measles may be reduced by vaccinating their close susceptible contacts. Management of such persons, should they be exposed to measles, can be facilitated by prior knowledge of their immune status. If susceptible, they should receive IG following exposure (see below).

Management of Patients with Contraindications to Measles Vaccine

If immediate protection against measles is required for persons for whom live measles virus vaccine is contraindicated, passive immunization with IG, 0.25 ml/kg (0.11 ml/lb) of body weight, should be given as soon as possible after known exposure (maximum dose—15 ml). It is important to note, however, that IG, which will usually prevent measles in normal children, may not be effective in children with acute leukemia or other conditions associated with altered immunity.

Measles – Continued

Simultaneous Administration of Vaccines

The simultaneous administration of MMR and OPV has resulted in seroconversion rates and rates of side effects that are similar to those observed when the vaccines are administered separately. Field experience and antibody data regarding simultaneous administration of DTP and measles vaccine indicate that the protective response is satisfactory and the incidence of side effects is not increased. Because of the limited accessibility of some population subgroups, the Committee recommends taking maximal advantage of each clinic visit to promptly vaccinate susceptible persons ≥15 months of age, including, if necessary, administering MMR, OPV, and DTP simultaneously. See ACIP statement, **"General Recommendations on Immunization."**

MEASLES ELIMINATION

High priority is being placed on the elimination of indigenous measles transmission from the United States in 1982. The Measles Elimination Program was launched in 1978, and reported measles incidence rates reached record low levels in 1980 and 1981. The major components of the strategy to eliminate measles are achieving and maintaining high immunization levels, surveillance of disease, and prompt outbreak-control measures. The following recommendations are presented to help preserve the level of measles control already achieved, and to bring about the further reductions in morbidity that will be required to achieve elimination of indigenous measles transmission.

Ongoing Programs

The best means of reducing the incidence of measles is by having an immune population. Universal immunization as part of good health care should be accomplished through routine and intensive programs carried out in physicians' offices and public health clinics. Programs aimed at vaccinating children against measles at about 15 months of age should be established and maintained in all communities. In addition, all other persons thought to be susceptible, regardless of age, should be vaccinated when they are identified, unless vaccine is otherwise contraindicated.

Official health agencies should take whatever steps are necessary, including development and enforcement of school immunization requirements, to assure that all persons in schools (at all grade levels) and day-care settings are protected against measles. Enforcement of such requirements has been correlated with reduced measles incidence rates. Adequate evidence of immunity to measles should consist of either 1) a physician-documented history of measles disease, 2) laboratory evidence of measles immunity, or 3) a documented history of vaccination with live measles virus vaccine on or after the first birthday. Evidence of measles vaccination should be considered adequate only if the date of vaccination is provided.

Measles outbreaks have been and continue to be reported from places where young adults are concentrated, such as colleges. Measles control in these places may require careful evaluation of susceptibility and vaccination of those who are susceptible.

Measles outbreaks also have been and continue to be reported from places where preschool children are concentrated, such as day-care centers. Most states currently require evidence of immunity to measles for children enrolled in day-care centers. Measles control in preschool children requires careful evaluation of susceptibility and vaccination of those who are susceptible.

Concern is often expressed because of observations during outbreaks that cases occur in persons with a history of proper vaccination. Even under optimal conditions of storage and use, measles vaccine may have a 5% failure rate. A 90% or greater reduction in attack rates

Measles – Continued

has been demonstrated consistently in appropriately vaccinated persons when compared with others. As greater numbers of susceptibles become vaccinated and as the measles incidence rate is further reduced, there will be a relative increase in the proportion of cases seen among appropriately vaccinated persons.

Outbreak Control

All reports of suspected measles cases should be investigated rapidly. A measles outbreak exists in a community whenever a case is confirmed as measles. Once an outbreak occurs, preventing dissemination of measles depends on promptly vaccinating susceptible persons. Ideally, they will have been identified before the outbreak (by school record reviews, for example); if not, they must be quickly identified.

Speed in implementing control programs is essential in preventing the spread of measles. Control activities should not be delayed until laboratory results on suspected cases are received. All persons who cannot readily provide 1) a physician-*documented* history of measles, 2) laboratory evidence of measles immunity or 3) a *documented* history of vaccination with live measles virus vaccine on or after the first birthday should be vaccinated or excluded from school. Documentation of vaccination should be considered adequate only if the date of vaccination is provided. If a person's measles immunity is in doubt, he/she should be vaccinated.

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

DISEASE	17th WEEK ENDING			CUMULATIVE, FIRST 17 WEEKS		
	May 1 1982	May 2 1981	MEDIAN 1977-1981	May 1 1982	May 2 1981	MEDIAN 1977-1981
Aseptic meningitis	70	66	50	1,252	1,082	805
Brucellosis	4	5	5	37	38	51
Encephalitis: Primary (arthropod-borne & unspec.)	21	6	12	243	222	200
Post-infectious	–	3	3	19	29	54
Gonorrhea: Civilian	15,528	19,431	16,696	292,795	316,020	306,206
Military	457	450	439	8,443	9,364	8,746
Hepatitis: Type A	432	515	557	7,240	8,228	9,182
Type B	412	430	337	6,463	6,240	5,228
Non A, Non B	43	N	N	645	N	N
Unspecified	163	192	179	2,973	3,437	3,283
Legionellosis	14	N	N	114	N	N
Leprosy	2	6	4	57	73	53
Malaria	30	26	16	239	397	158
Measles (rubeola)	53	135	771	460	1,053	6,188
Meningococcal infections: Total	93	71	51	1,194	1,605	1,134
Civilian	93	70	51	1,190	1,600	1,124
Military	–	1	–	4	5	9
Mumps	176	105	359	2,444	1,784	6,694
Pertussis	34	18	20	359	342	342
Rubella(German measles)	82	80	452	893	946	5,476
Syphilis (Primary & Secondary): Civilian	593	503	503	10,744	9,842	7,893
Military	12	7	6	137	121	100
Tuberculosis	506	554	554	8,080	8,280	8,651
Tularemia	–	2	2	29	35	33
Typhoid fever	8	5	9	123	152	123
Typhus fever, tick-borne (RMSF)	10	25	9	41	52	32
Rabies, animal	150	213	150	1,847	2,385	1,413

TABLE II. Notifiable diseases of low frequency, United States

	CUM. 1982		CUM. 1982
Anthrax	–	Poliomyelitis: Total	1
Botulism (Calif. 1)	21	Paralytic	1
Cholera	–	Psittacosis (Mich. 1, Mo. 1, Ala. 1, Tex. 1, Calif. 2)	32
Congenital rubella syndrome	3	Rabies, human	–
Diphtheria	–	Tetanus (NYC 1, Ark. 1)	17
Leptospirosis	20	Trichinosis (Mass. 1, N.J. 1, Ohio 1)	38
Plague	2	Typhus fever, flea-borne (endemic, murine) (Ala. 1)	5

N: Not notifiable

TABLE III. Cases of specified notifiable diseases, United States, weeks ending May 1, 1982 and May 2, 1981 (17th week)

REPORTING AREA	ASEPTIC MENINGITIS	BRUCELLOSIS	ENCEPHALITIS		GONORRHEA (Civilian)		HEPATITIS (Viral), by type				LEGIONELLOSIS	LEPROSY
			Primary	Post-infectious			A	B	NA,NB	Unspecified		
	1982	CUM. 1982	CUM. 1982	CUM. 1982	CUM. 1982	CUM. 1981	1982	1982	1982	1982	1982	CUM. 1982
UNITED STATES	70	37	243	19	292,795	316,020	432	412	43	163	14	57
NEW ENGLAND	1	–	12	3	7,115	7,816	13	24	2	8	1	1
Maine	–	–	–	–	331	395	–	2	–	–	–	–
N.H.	–	–	–	–	207	276	3	1	–	–	–	–
Vt.	–	–	–	–	153	131	–	–	–	–	–	–
Mass.	–	–	4	–	3,239	3,277	5	9	1	6	–	–
R.I.	–	–	–	–	496	371	1	2	–	1	–	–
Conn.	1	–	8	3	2,689	3,366	4	10	1	1	1	1
MID. ATLANTIC	13	–	35	2	36,473	36,879	34	61	6	18	1	3
Upstate N.Y.	1	–	14	–	5,986	5,841	4	9	–	2	–	–
N.Y. City	10	–	8	–	15,423	15,402	20	35	–	11	–	1
N.J.	–	–	6	–	6,435	7,064	10	17	6	5	1	1
Pa.	2	–	7	2	8,629	8,572	U	U	U	U	–	1
E.N. CENTRAL	7	–	49	6	38,889	49,791	29	51	2	19	5	–
Ohio	2	–	16	4	12,135	17,581	11	30	1	8	5	–
Ind.	2	–	12	2	5,021	3,893	1	4	1	3	–	–
Ill.	–	–	–	–	7,586	13,706	6	4	–	2	–	–
Mich.	2	–	19	–	10,108	10,276	8	11	–	5	–	–
Wis.	1	–	2	–	4,039	4,335	3	2	–	1	–	–
W.N. CENTRAL	2	4	11	1	14,169	14,667	16	15	4	4	5	–
Minn.	–	–	–	1	2,111	2,317	2	3	–	–	–	–
Iowa	1	1	6	–	1,547	1,538	2	6	–	–	5	–
Mo.	–	1	3	–	6,462	6,640	7	4	1	2	–	–
N. Dak.	–	–	–	–	197	196	–	–	–	–	–	–
S. Dak.	–	–	–	–	399	413	–	–	–	–	–	–
Nebr.	–	–	1	–	895	1,123	–	–	–	–	–	–
Kans.	1	2	1	–	2,558	2,440	5	2	3	2	–	–
S. ATLANTIC	16	12	34	3	73,202	77,431	44	57	10	24	–	4
Del.	–	–	–	–	1,191	1,103	2	–	–	–	–	–
Md.	2	–	10	–	9,896	8,527	2	6	2	2	–	2
D.C.	–	–	–	–	3,978	4,994	–	–	–	–	–	–
Va.	1	4	9	–	6,569	7,220	3	4	3	1	–	–
W. Va.	–	–	–	–	879	1,180	–	2	–	–	–	–
N.C.	1	–	3	–	12,627	12,087	7	9	–	7	–	–
S.C.	2	2	–	–	7,238	7,206	3	4	–	1	–	–
Ga.	–	1	–	–	9,483	15,341	6	15	1	2	–	–
Fla.	10	5	12	3	21,341	19,773	21	17	4	11	–	2
E.S. CENTRAL	6	3	13	1	24,352	25,973	10	33	2	3	–	–
Ky.	1	–	–	–	3,315	3,383	7	8	–	1	–	–
Tenn.	3	1	9	–	9,454	9,035	–	9	1	–	–	–
Ala.	2	1	3	1	7,057	8,107	1	10	1	2	–	–
Miss.	–	1	1	–	4,526	4,848	2	6	–	–	–	–
W.S. CENTRAL	7	10	25	–	41,943	42,863	154	53	4	58	–	7
Ark.	–	3	2	–	3,502	2,935	4	2	–	2	–	–
La.	1	2	4	–	7,539	6,746	16	7	–	8	–	–
Okla.	1	3	6	–	4,525	4,281	36	10	4	9	–	–
Tex.	5	2	13	–	26,377	28,901	98	34	–	39	–	7
MOUNTAIN	–	–	13	1	10,959	12,775	42	16	1	8	2	1
Mont.	–	–	–	–	458	464	–	–	–	–	–	–
Idaho	–	–	–	–	503	521	–	–	–	–	–	1
Wyo.	–	–	–	–	288	273	11	–	–	–	–	–
Colo.	–	–	3	1	2,905	3,382	3	3	1	–	–	–
N. Mex.	–	–	–	–	1,364	1,383	9	1	–	–	–	–
Ariz.	–	–	6	–	3,030	4,114	4	8	–	5	2	–
Utah	–	–	–	–	487	587	7	2	–	2	–	–
Nev.	–	–	4	–	1,924	2,051	8	2	–	1	–	–
PACIFIC	18	8	51	2	45,693	47,825	90	102	12	21	–	41
Wash.	2	–	5	–	3,905	4,226	6	13	2	–	–	3
Oreg.	–	–	1	–	2,485	3,282	3	5	2	3	–	–
Calif.	16	7	43	2	37,370	38,104	79	77	8	18	–	23
Alaska	–	1	2	–	1,134	1,261	–	5	–	–	–	1
Hawaii	–	–	–	–	799	952	2	2	–	–	–	14
Guam	U	–	–	–	19	48	U	U	U	U	U	–
P.R.	–	–	1	–	923	1,055	2	4	–	4	–	–
V.I.	–	–	–	–	60	37	–	–	–	–	–	–
Pac. Trust Terr.	U	–	–	–	36	140	U	U	U	U	U	1

N: Not notifiable U: Unavailable

TABLE III (Cont.'d). Cases of specified notifiable diseases, United States, weeks ending May 1, 1982 and May 2, 1981 (17th week)

REPORTING AREA	MALARIA		MEASLES (RUBEOLA)			MENINGOCOCCAL INFECTIONS (Total)		MUMPS		PERTUSSIS	RUBELLA		
	1982	CUM. 1982	1982	CUM. 1982	CUM. 1981	1982	CUM. 1982	1982	CUM. 1982	1982	1982	CUM. 1982	CUM. 1981
UNITED STATES	30	239	53	460	1,053	93	1,194	176	2,444	34	82	893	946
NEW ENGLAND	3	18	–	7	30	2	63	2	129	2	1	10	72
Maine	–	–	–	–	2	–	2	–	25	–	–	–	31
N.H.	–	1	–	1	5	–	10	–	12	–	–	8	27
Vt.	–	–	–	2	2	–	4	–	4	–	–	–	–
Mass.	3	13	–	2	15	–	16	1	68	2	1	2	8
R.I.	–	1	–	–	–	–	9	1	10	–	–	–	–
Conn.	–	3	–	2	6	2	22	–	10	–	–	–	6
MID. ATLANTIC	2	25	1	32	343	20	194	18	165	11	2	58	116
Upstate N.Y.	–	4	–	15	172	2	50	3	33	5	1	30	50
N.Y. City	2	10	1	15	27	10	38	4	28	6	–	16	25
N.J.	–	7	–	–	33	4	46	1	27	–	1	12	37
Pa.	–	4	–	2	111	4	60	10	77	–	–	–	4
E.N. CENTRAL	4	17	6	28	58	15	143	122	1,433	9	9	94	214
Ohio	2	5	–	–	15	7	57	94	1,048	–	–	–	–
Ind.	–	1	–	1	3	–	13	2	25	1	2	16	61
Ill.	–	1	–	12	14	3	31	21	90	8	1	23	58
Mich.	2	9	6	15	25	3	31	5	199	–	6	38	29
Wis.	–	1	–	–	1	2	11	–	71	–	–	17	66
W.N. CENTRAL	–	7	–	2	4	3	48	6	155	3	–	24	53
Minn.	–	–	–	–	1	–	9	3	78	1	–	3	7
Iowa	–	3	–	–	1	–	5	–	21	1	–	–	–
Mo.	–	1	–	2	–	1	17	–	13	–	–	15	2
N. Dak.	–	–	–	–	–	–	4	–	–	–	–	–	–
S. Dak.	–	–	–	–	–	–	1	–	1	–	–	1	–
Nebr.	–	2	–	–	1	–	4	–	–	–	–	–	1
Kans.	–	1	–	–	1	2	8	3	42	1	–	5	43
S. ATLANTIC	5	40	1	27	248	18	246	4	155	2	7	28	84
Del.	–	–	–	–	–	–	–	–	3	–	–	–	–
Md.	–	6	–	2	1	2	11	–	12	–	5	10	1
D.C.	–	3	–	1	1	–	1	–	–	–	–	–	–
Va.	1	16	–	14	3	3	26	–	22	–	–	10	3
W. Va.	–	–	–	1	7	–	7	2	71	–	–	1	16
N.C.	–	–	–	–	3	3	38	–	5	–	–	–	4
S.C.	–	2	–	–	–	4	31	–	9	–	–	1	6
Ga.	2	4	–	–	80	1	62	1	4	2	–	1	21
Fla.	2	9	1	9	153	5	70	1	29	–	2	5	33
E.S. CENTRAL	–	1	–	5	–	7	77	1	25	–	1	31	18
Ky.	–	1	–	1	–	3	11	1	9	–	1	16	11
Tenn.	–	–	–	4	–	2	31	–	9	–	–	–	7
Ala.	–	–	–	–	–	1	31	–	4	–	–	–	–
Miss.	–	–	–	–	–	1	4	–	3	–	–	15	–
W.S. CENTRAL	5	13	3	16	179	10	155	8	91	1	4	59	59
Ark.	–	1	–	–	–	1	8	1	5	–	–	–	–
La.	–	2	–	–	–	4	24	2	3	–	–	–	8
Okla.	–	–	–	–	5	–	10	–	–	–	–	2	–
Tex.	5	10	3	16	174	5	113	5	83	1	4	57	51
MOUNTAIN	1	6	–	–	17	4	73	1	38	1	1	26	52
Mont.	–	–	–	–	–	–	4	–	3	–	–	3	1
Idaho	–	–	–	–	–	–	5	–	2	–	–	–	2
Wyo.	–	–	–	–	–	–	4	–	2	–	1	5	1
Colo.	1	4	–	–	4	2	27	1	7	–	–	1	26
N. Mex.	–	1	–	–	2	–	10	–	–	–	–	2	3
Ariz.	–	1	–	–	2	–	14	–	13	–	–	5	11
Utah	–	–	–	–	–	2	6	–	9	1	–	8	3
Nev.	–	–	–	–	9	–	3	–	2	–	–	2	5
PACIFIC	10	112	42	343	174	14	195	14	253	5	57	563	278
Wash.	–	6	–	15	1	1	22	1	40	–	3	19	39
Oreg.	–	3	–	–	–	3	38	–	–	–	1	3	31
Calif.	10	101	42	326	171	9	125	12	205	5	53	533	204
Alaska	–	–	–	–	–	–	7	1	6	–	–	1	–
Hawaii	–	2	–	2	2	1	3	–	2	–	–	7	4
Guam	U	2	U	1	4	U	–	U	1	U	U	1	–
P.R.	2	4	–	51	133	–	3	2	25	–	1	4	3
V.I.	–	–	–	–	6	–	–	–	–	–	–	–	–
Pac. Trust Terr.	U	–	U	–	–	U	–	U	–	U	U	–	1

U: Unavailable

TABLE III (Cont.'d). Cases of specified notifiable diseases, United States, weeks ending May 1, 1982 and May 2, 1981 (17th week)

REPORTING AREA	SYPHILIS (Civilian) (Primary & Secondary)		TUBERCULOSIS		TULAREMIA	TYPHOID FEVER		TYPHUS FEVER (Tick-borne) (RMSF)		RABIES, Animal
	CUM. 1982	CUM. 1981	1982	CUM. 1982	CUM. 1982	1982	CUM. 1982	1982	CUM. 1982	CUM. 1982
UNITED STATES	10,744	9,842	506	8,080	29	8	123	10	41	1,847
NEW ENGLAND	202	212	18	225	-	-	11	-	-	5
Maine	1	1	1	17	-	-	-	-	-	5
N.H.	-	9	-	9	-	-	-	-	-	-
Vt.	-	11	-	6	-	-	2	-	-	-
Mass.	145	130	14	155	-	-	8	-	-	-
R.I.	12	14	-	8	-	-	-	-	-	-
Conn.	44	47	3	30	-	-	1	-	-	-
MID. ATLANTIC	1,469	1,521	69	1,359	2	3	15	-	-	32
Upstate N.Y.	143	140	13	242	2	-	2	-	-	17
N.Y. City	905	949	30	523	-	3	11	-	-	-
N.J.	172	183	15	258	-	-	2	-	-	1
Pa.	249	249	11	336	-	-	-	-	-	14
E.N. CENTRAL	536	663	105	1,270	-	-	11	-	-	222
Ohio	105	86	16	228	-	-	6	-	-	30
Ind.	78	44	23	171	-	-	-	-	-	37
Ill.	219	390	35	481	-	-	1	-	-	92
Mich.	97	111	29	316	-	-	4	-	-	1
Wis.	37	32	2	74	-	-	-	-	-	62
W.N. CENTRAL	212	175	16	248	6	-	3	-	1	425
Minn.	35	63	-	43	-	-	-	-	-	75
Iowa	11	9	2	35	-	-	1	-	-	142
Mo.	129	87	11	115	5	-	1	-	1	52
N. Dak.	4	2	-	5	-	-	-	-	-	45
S. Dak.	-	2	-	6	-	-	-	-	-	18
Nebr.	7	3	1	9	-	-	-	-	-	44
Kans.	26	9	2	35	1	-	1	-	-	49
S. ATLANTIC	2,971	2,586	108	1,596	6	2	17	3	17	299
Del.	7	7	-	18	-	-	-	-	-	-
Md.	168	206	9	197	1	1	5	-	7	16
D.C.	190	232	4	59	-	-	-	-	-	-
Va.	211	248	22	182	1	-	2	-	-	146
W. Va.	8	7	2	40	-	-	2	-	-	14
N.C.	218	195	12	252	-	-	-	1	5	8
S.C.	142	181	6	155	3	-	2	1	4	21
Ga.	632	660	23	234	-	-	-	1	1	73
Fla.	1,395	850	30	459	1	1	6	-	-	21
E.S. CENTRAL	775	647	57	733	4	1	10	-	5	227
Ky.	38	24	21	207	-	-	-	-	-	41
Tenn.	216	254	16	251	4	-	2	-	1	155
Ala.	265	173	6	206	-	1	7	-	3	31
Miss.	256	196	14	69	-	-	1	-	1	-
W.S. CENTRAL	2,701	2,337	45	861	7	2	8	7	17	368
Ark.	77	42	6	88	5	-	1	-	2	52
La.	583	517	-	146	-	-	-	-	-	8
Okla.	58	66	10	129	2	-	2	4	7	82
Tex.	1,983	1,712	29	498	-	2	5	3	8	226
MOUNTAIN	286	237	27	244	3	-	5	-	-	43
Mont.	1	8	2	18	-	-	-	-	-	19
Idaho	16	2	-	10	1	-	-	-	-	-
Wyo.	9	3	-	2	1	-	-	-	-	2
Colo.	84	78	5	31	-	-	1	-	-	-
N. Mex.	61	53	5	44	-	-	-	-	-	5
Ariz.	63	51	10	100	-	-	3	-	-	17
Utah	10	5	2	13	1	-	1	-	-	-
Nev.	42	37	3	26	-	-	-	-	-	-
PACIFIC	1,592	1,464	61	1,544	1	-	43	-	1	226
Wash.	41	55	1	89	1	-	2	-	-	-
Oreg.	45	33	2	57	-	-	1	-	-	-
Calif.	1,464	1,341	45	1,276	-	-	39	-	1	164
Alaska	6	4	-	18	-	-	-	-	-	62
Hawaii	36	31	13	104	-	-	1	-	-	-
Guam	-	-	U	2	-	U	-	U	-	-
P.R.	188	245	U	101	-	-	1	-	-	17
V.I.	-	2	-	1	-	-	-	-	-	-
Pac. Trust Terr.	-	-	U	19	-	U	-	U	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending May 1, 1982 (17th week)

REPORTING AREA	ALL CAUSES, BY AGE (YEARS)						P&I** TOTAL
	ALL AGES	≥65	45-64	25-44	1-24	<1	
NEW ENGLAND	669	474	139	28	12	15	47
Boston, Mass.	156	97	41	7	5	6	17
Bridgeport, Conn.	56	44	7	3	1	1	3
Cambridge, Mass.	20	16	4	–	–	–	5
Fall River, Mass.	32	23	9	–	–	–	–
Hartford, Conn.	65	38	19	3	2	3	2
Lowell, Mass.	32	25	5	1	1	–	2
Lynn, Mass.	27	17	8	2	–	–	3
New Bedford, Mass.	23	20	2	1	–	–	1
New Haven, Conn.	59	39	13	4	2	1	1
Providence, R.I. §	53	49	–	1	1	1	5
Somerville, Mass.	6	5	1	–	–	–	–
Springfield, Mass.	44	29	10	4	–	1	2
Waterbury, Conn.	48	35	12	–	–	1	3
Worcester, Mass.	48	37	8	2	–	1	3
MID. ATLANTIC	2,594	1,734	607	146	52	55	120
Albany, N.Y.	34	22	9	–	2	1	1
Allentown, Pa.	20	17	3	–	–	–	2
Buffalo, N.Y.	150	103	32	5	5	5	9
Camden, N.J.	41	20	17	3	–	1	–
Elizabeth, N.J.	19	10	7	1	–	1	2
Erie, Pa.†	45	33	10	2	–	–	3
Jersey City, N.J.	47	25	13	4	2	3	2
N.Y. City, N.Y.	1,418	937	336	95	26	24	43
Newark, N.J.	59	27	21	9	2	–	2
Paterson, N.J.	27	18	5	1	2	1	4
Philadelphia, Pa.†	223	137	60	10	9	7	18
Pittsburgh, Pa.†	88	59	23	3	–	3	2
Reading, Pa.	33	28	3	1	–	1	5
Rochester, N.Y.	123	90	23	6	1	3	9
Schenectady, N.Y.	25	16	6	1	1	1	1
Scranton, Pa.†	33	27	5	1	–	–	1
Syracuse, N.Y.	88	65	17	2	2	2	7
Trenton, N.J.	49	39	7	1	–	2	3
Utica, N.Y.	39	35	4	–	–	–	4
Yonkers, N.Y.	33	26	6	1	–	–	2
E.N. CENTRAL	2,270	1,478	490	141	61	99	63
Akron, Ohio	72	57	8	3	2	2	–
Canton, Ohio	56	37	15	1	2	1	2
Chicago, Ill.	520	305	125	50	23	17	7
Cincinnati, Ohio	110	77	17	2	4	10	11
Cleveland, Ohio	181	97	56	15	3	10	2
Columbus, Ohio	135	88	27	7	4	9	4
Dayton, Ohio	94	54	32	4	2	2	3
Detroit, Mich.	340	208	71	35	9	17	6
Evansville, Ind.	49	38	7	1	–	3	1
Fort Wayne, Ind. §	52	50	1	–	–	1	3
Gary, Ind.	21	13	5	–	1	2	–
Grand Rapids, Mich.	50	35	9	1	1	4	3
Indianapolis, Ind.	140	89	36	2	2	11	1
Madison, Wis.	35	25	5	3	2	–	4
Milwaukee, Wis.	149	108	32	4	2	3	2
Peoria, Ill.	38	23	9	4	1	1	6
Rockford, Ill.	41	31	8	–	1	1	2
South Bend, Ind.	44	32	8	3	–	1	2
Toledo, Ohio §	88	80	1	2	1	3	2
Youngstown, Ohio	55	31	18	4	1	1	2
W.N. CENTRAL	721	501	147	30	17	26	33
Des Moines, Iowa	61	45	13	1	1	1	1
Duluth, Minn.	26	20	5	1	–	–	3
Kansas City, Kans.	42	26	10	1	2	3	2
Kansas City, Mo.	112	83	17	4	4	4	8
Lincoln, Nebr.	56	39	14	2	–	1	4
Minneapolis, Minn.	79	54	13	5	2	5	1
Omaha, Nebr.	101	71	17	7	1	5	1
St. Louis, Mo.	126	83	32	4	6	1	7
St. Paul, Minn.	71	53	15	2	–	1	3
Wichita, Kans.	47	27	11	3	1	5	3
S. ATLANTIC	1,254	764	321	94	33	41	41
Atlanta, Ga.	148	92	34	10	5	7	3
Baltimore, Md.	347	216	84	34	7	6	6
Charlotte, N.C.	74	36	26	4	4	4	1
Jacksonville, Fla.	86	53	25	6	1	1	4
Miami, Fla.	78	48	20	6	2	2	2
Norfolk, Va.	56	30	16	4	2	4	1
Richmond, Va.	72	44	18	3	3	4	4
Savannah, Ga.	31	17	12	2	–	–	1
St. Petersburg, Fla.	99	79	11	4	2	3	2
Tampa, Fla.	52	38	11	2	1	–	4
Washington, D.C.	167	85	53	15	4	9	8
Wilmington, Del.	44	26	11	4	2	1	5
E.S. CENTRAL	740	477	180	40	16	27	30
Birmingham, Ala.	113	73	24	8	5	3	4
Chattanooga, Tenn.	46	25	17	3	–	1	5
Knoxville, Tenn.	49	32	13	3	1	–	1
Louisville, Ky.	94	60	24	5	1	4	4
Memphis, Tenn.	202	129	50	12	6	5	8
Mobile, Ala.	47	30	8	3	1	5	1
Montgomery, Ala.	51	29	15	1	–	6	2
Nashville, Tenn.	138	99	29	5	2	3	5
W.S. CENTRAL	1,288	731	326	114	60	57	31
Austin, Tex.	58	40	9	5	1	3	1
Baton Rouge, La.	29	17	6	1	1	4	1
Corpus Christi, Tex.	46	28	13	1	1	3	1
Dallas, Tex.	184	104	56	12	8	4	4
El Paso, Tex.	46	23	12	5	4	2	1
Fort Worth, Tex.	82	54	16	6	2	4	6
Houston, Tex.	333	159	87	47	22	18	3
Little Rock, Ark.	64	32	23	3	4	2	4
New Orleans, La.	121	75	31	7	3	5	–
San Antonio, Tex.	176	109	38	17	6	6	5
Shreveport, La.	49	27	13	3	3	3	–
Tulsa, Okla.	100	63	22	7	5	3	5
MOUNTAIN	647	387	153	42	24	41	34
Albuquerque, N. Mex.	74	40	18	10	2	4	6
Colo. Springs, Colo.	36	26	6	1	1	2	3
Denver, Colo.	146	87	37	10	1	11	6
Las Vegas, Nev.	65	37	19	3	2	4	4
Ogden, Utah	23	13	5	2	1	2	1
Phoenix, Ariz.	155	88	37	11	11	8	4
Pueblo, Colo.	17	12	5	–	–	–	2
Salt Lake City, Utah	53	32	6	2	4	9	1
Tucson, Ariz.	78	52	20	3	2	1	7
PACIFIC	1,872	1,379	278	83	60	56	113
Berkeley, Calif.	23	16	4	2	1	–	2
Fresno, Calif.	54	40	7	4	3	–	6
Glendale, Calif. §	25	25	–	–	–	–	1
Honolulu, Hawaii	54	32	15	4	1	2	4
Long Beach, Calif.	95	72	14	5	1	3	2
Los Angeles, Calif. §	581	522	4	9	18	13	24
Oakland, Calif.	77	46	22	4	3	2	4
Pasadena, Calif.	27	21	3	1	1	1	1
Portland, Oreg.	148	87	35	10	5	10	5
Sacramento, Calif.	78	49	19	4	2	4	8
San Diego, Calif.	150	99	31	9	6	5	12
San Francisco, Calif.	150	103	32	7	3	5	9
San Jose, Calif.	183	122	38	13	8	2	20
Seattle, Wash.	125	75	34	7	3	6	5
Spokane, Wash.	51	36	9	1	3	2	5
Tacoma, Wash.	51	34	11	3	2	1	5
TOTAL	12,055††	7,925	2,641	718	335	417	512

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

**Pneumonia and influenza

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

††Total includes unknown ages.

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

Measles — Continued

An effective means of terminating school outbreaks and increasing rates of immunization quickly is to exclude all children or adolescents who cannot present valid evidence of immunity through vaccination or prior disease. Experience with outbreak control indicates that almost all students who are excluded from school because they lack evidence of immunity to measles, quickly comply with requirements and are promptly readmitted to school. Exclusion should include pupils who have been exempted from measles vaccination because of medical, religious or other reasons. Exclusion should continue until at least 2 weeks after the onset of rash of the last case of measles in the community. Less rigorous approaches such as voluntary appeals for vaccination have not been effective in terminating outbreaks.

Recent studies have indicated that some persons vaccinated before 11 months of age may have a less predictable immune response to measles vaccine when revaccinated on or after the first birthday. Approximately 50% of infants who failed to seroconvert initially will, after revaccination, develop HI antibody that is persistent; the remaining 50% will not develop sustained levels of HI antibody. Evaluations in 1 study showed that all these children, whether HI antibody negative or positive, had antibody detectable by a sensitive neutralization test. There is no evidence to indicate that these children are susceptible to measles.

The risk of measles complications resulting from measles is high among infants less than 1 year of age. Therefore, considering the benefits and risks, the Committee recommends that infants as young as 6 months of age may be vaccinated as pre-exposure prophylaxis when exposure to natural measles is considered likely. Because infants vaccinated before the first birthday have a significantly lower rate of seroconversion, they should be revaccinated when they are about 15 months old to ensure protection.

IG should not be used in an attempt to control measles outbreaks.

Importations

Measles importations are a continuing source of reported measles cases in the United States. With the recent substantial decline in measles incidence, the proportion of reported cases that are due to importations has increased. Although most imported measles cases result in limited transmission, several large outbreaks have occurred recently. Because of the possibility of multistate outbreaks if exposure of susceptible persons to a patient occurs on a common carrier, such as an airplane, rapid reporting of such imported cases to state and local health departments is important so that other state health departments can be notified to identify exposed contacts as well as to initiate surveillance and control measures.

International Travel

Persons born after 1956 who travel abroad should be protected against measles, since measles is endemic in many countries throughout the world. No immunization or record of immunization is required for entry into the United States. However, it is recommended that international travelers should have immunity to measles consisting of physician's verification of prior measles disease, laboratory evidence of measles immunity, or verified measles vaccination on or after the first birthday. Since the risk of serious complications and death is greater for adults, it is especially important to protect young adults who have escaped measles disease and have not been vaccinated. Most persons born before 1957 need not be considered susceptible.

SURVEILLANCE

As the incidence rate of measles declines in the United States, aggressive surveillance becomes increasingly important. Known or suspected measles cases should be reported im-

Measles – Continued

mediately to local health departments. Serologic confirmation should be attempted for every suspected case of measles that cannot be linked to a confirmed case. Measles infection can be serologically confirmed by a 4-fold rise in CF or HI antibody titer. The acute-phase serum specimen should be drawn as soon after rash onset as possible, preferably within the first 7 days after rash onset. The convalescent-phase serum specimen should be drawn 10 or more days after the acute-phase serum specimen. If the acute-phase specimen is drawn more than 7 days after rash onset, a 4-fold rise in antibody titer may not be apparent. Occassionally 4-fold rises may not be detected even if the first specimen is drawn within the first 7 days after rash onset. Measles infection may also be serologically confirmed by demonstrating measles-specific IgM antibody. A single serum specimen should be drawn between 1 and 2 weeks after rash onset. Although measles-specific IgM antibody may be detected shortly after rash onset, false negative results may occur if the specimen is drawn earlier than 1 week or later than 2 weeks following rash onset. Reporting of suspect cases and implementation of outbreak-control activities should not be delayed while awaiting laboratory results.

Effective surveillance of measles and its complications can delineate inadequate levels of protection, further define groups needing special attention, and assess the effectiveness of control activities. Continuous and careful review of adverse events following measles vaccination is also important. All adverse events following vaccination should be evaluated and reported in detail to local and state health officials as well as to the manufacturer.

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Current Trends

Childhood Immunization Initiative, United States — 5-Year Follow-Up

In 1977, approximately 20 million of the 50 million persons in the United States who were <15 years old were estimated to need at least 1 dose of 1 vaccine in order to be considered fully protected against the 7 diseases for which vaccines are routinely administered in childhood—i.e., diphtheria, measles, mumps, pertussis, poliomyelitis, rubella, and tetanus. To remedy this situation, the Department of Health, Education, and Welfare (now Department of Health and Human Services) announced, on April 6, 1977, a nationwide Childhood Immunization Initiative. The Initiative had 2 stated objectives: 1) To attain immunization levels in the nation's children of at least 90% by October 1979. 2) To establish mechanisms to maintain high immunization levels by ensuring that children received vaccinations at the proper times.

The Initiative mobilized the public as well as the private sectors with extensive involvement by volunteers and voluntary organizations, including a major public information and education campaign. More than 28 million individual immunization records of school children were reviewed to identify children in need of vaccinations and to refer them for these vaccinations. School immunization requirements were enacted and enforced by state and local governments. Government agencies that had not formerly been involved in immunization activities established standards for immunization levels among their constituents. A major increase in federal support for immunization grant programs helped to eliminate the backlog of unimmunized and incompletely immunized children and to create systems to maintain high levels of immunization.

The results of the Childhood Immunization Initiative are reflected in the following: 1) Immunization levels of children entering school for the first time in the fall of 1980 were 96% for measles, rubella, and diphtheria-tetanus-pertussis (DTP); 95% for poliomyelitis; and 92% for mumps. Immunization levels of children entering school for the first time in 1981 are not yet available. 2) Disease incidences are at or near record low levels. In 1981, provisional data indicate that measles, mumps, paralytic poliomyelitis, rubella, and tetanus all reached record low

Childhood Immunization – Continued

levels, with diphtheria and pertussis being at near record low levels (Table 1). 3) All 50 states now have laws requiring documentation of immunity as a condition of first entry to school. For measles, in 40 states these laws extend from kindergarten through 12th grade. 4) In all 50 states, a standard immunization record has been developed and distributed for use in both the public and private sector to ease problems of documention of immunizations. 5) In 35 states, systems have been instituted in public clinics throughout the state to ensure that children actually receive needed vaccinations. This involves scheduling visits for immunizations and recalling children who fail to come in for these visits. 6) In 15 states, hospital-based maternal education programs have been implemented to provide new mothers in over 90% of targeted hospitals with information about vaccinations before they are discharged with their infants. 7) The initial success in the Childhood Immunization Initiative was so encouraging that a new target was enunciated—i.e., the elimination of indigenous measles from the United States by fall of 1982. As documented in numerous previous articles, this program is proceeding on schedule. 8) Since 1978 approximately 120,000,000 doses of childhood vaccines have been administered by the public sector.

Reported by Immunization Div, Center for Prevention Svcs, CDC.

TABLE 1. Reported incidence of vaccine-preventable diseases, United States, 1980-1981

	1981* (Percentage decrease)	1980
Diphtheria	4	3
Measles†	3,032 (↓77%)	13,506
Mumps†	4,729 (↓45%)	8,576
Pertussis	1,189 (↓31%)	1,730
Poliomyelitis† (paralyic)	6	8
Rubella†	2,060 (↓47%)	3,904
Tetanus†	60 (↓37%)	95

†Record low
*Provisional

Problems Encountered with Using Fansidar as Prophylaxis for Malaria

The drug combination Fansidar* (sulfadoxine-pyrimethamine) has recently become commercially available in the United States. Since the drug was licensed, CDC has received numerous inquiries seeking clarification about the use of Fansidar as prophylaxis for malaria. The case histories of the 2 patients discussed below illustrate some important points that need clarification.

Patient 1: On August 4, 1981, a 38-year-old male geologist was seen in a clinic in Toronto, Canada, with a history of recurrent fever and chills since July 15, 1981. The patient had traveled through the savannah and rain-forest areas of Peru and parts of the Bolivian altiplano in the period April 7-May 15, 1981. He had then returned to Canada for several weeks,

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

Fansidar — Continued

but spent an additional week between June 8 and 15 in a tropical rain-forest region of Brazil. He had no other history of foreign travel. The patient had begun taking Fansidar 2 weeks before his initial trip to South America, and had continued to take 1 tablet/week until his first clinic visit 6 weeks after he returned from Brazil. He denied having missed any doses.

At the time of his clinic visit, a peripheral blood smear contained *Plasmodium vivax* parasites. He was given a therapeutic course of chloroquine and primaquine, rapidly became asymptomatic, and continued to be asymptomatic when examined 2 months after the therapy.

Patient 2: A 28-year-old male geologist returned to Canada on November 24, 1981, after a 2-month stay in southwestern Brazil. He had begun taking chloroquine phosphate (500 mg) and 1 tablet of Fansidar/week beginning 1 week before he left for Brazil. He continued to take both drugs once a week without interruption. One week before returning to Canada, he began having episodes of fever and sweating that recurred every 48 hours. He was admitted to a hospital in Toronto on November 28, 1981.

The only notable finding on physical examination was splenomegaly. Blood smears contained *P. falciparum* ring forms, with 1% of red blood cells infected. Malaria indirect fluorescent antibody titers obtained 1 month after diagnosis were 1,024 and 16 for *P. falciparum* and *P. vivax*, respectively. These results were compatible with a recent *falciparum* infection. A serum sulfonamide level obtained at the time of diagnosis was consistent with the prophylaxis history.

The patient was then treated with quinine sulfate, 600 mg every 8 hours for 3 days, and tetracycline, 500 mg every 6 hours for 10 days. His parasitemia and fever resolved within 48 hours after this therapy began.

Reported by JS Keystone, MD, J Yang, PhD, L McIntyre, MD, SL Chee, RT, Tropical Disease Unit, Toronto General Hospital, AS Macpherson, MD, Office of Health, City of Toronto, Canada; Malaria Br, Div of Parasitic Diseases, Center for Infectious Diseases, CDC.

Editorial Note: CDC concurs with the recently published recommendations of the World Health Organization stating that the sole indication for the use of Fansidar is the prophylaxis or treatment of chloroquine-resistant *P. falciparum* malaria (*1*). Some information contained in the package insert distributed with the drug in the United States is inconsistent with published data on the use and efficacy of Fansidar. The cases described above illustrate several of these discrepancies.

Although patient 1 took Fansidar as malaria prophylaxis, he still developed *P. vivax* infection. The package insert states that the drug is indicated for the treatment or prophylaxis of "susceptible strains of *Plasmodia*." In fact, while Fansidar has been efficacious in the treatment or prophylaxis of chloroquine-resistant *P. falciparum*, it cannot be recommended as the sole prophylactic drug for the other 3 species of human malaria. Specifically, there is now considerable evidence that Fansidar is not the most effective drug for treatment or prophylaxis of *P. vivax* infections (*2,3*). This inefficacy of Fansidar is related to the widespread resistance of *P. vivax* to pyrimethamine. The effectiveness of Fansidar against *P. ovale* and *P. malariae* has not been adequately evaluated. Chloroquine remains the drug of choice for the prophylaxis of malaria in areas with transmission of any malaria species other than *P. falciparum*. CDC recommends that travelers who will be exposed both to chloroquine-resistant *P. falciparum* and to other species of malaria take chloroquine plus Fansidar as prophylaxis.

The infection acquired by the second patient raises the question of Fansidar resistance. Drug resistance of the parasite is generally implied when malaria parasitemia develops in a patient taking prophylaxis or when parasitemia fails to be eradicated following drug therapy. However, it has been demonstrated that drug combinations such as Fansidar may not supp-

Fansidar – Continued

ress or cure infections (with sensitive strains of malaria) due to a host-drug interaction that impairs the drug action on the parasite (*4*). The exact mechanism of "host-failure" in the case of Fansidar-like drugs is not yet known, but is not correlated with serum drug levels (*5-6*).

The ineffectiveness of Fansidar in treating malaria has been reported to be highly prevalant along the Thai-Kampuchean border (*7*). As-yet-unpublished data documenting Fansidar treatment failures in Brazil are being accumulated. There is currently no *in vitro* method to test for Fansidar resistance. Therefore, the distinction between parasite drug resistance and host failure can only be inferred epidemiologically. Whether patient 2 was infected with a truly resistant strain of parasite or whether host failure occurred cannot be determined. This case history does, however, illustrate the fact that *P. falciparum* from widely dispersed geographic areas can be resistant to multiple drugs including Fansidar, and that a febrile illness experienced by a traveler may well be malaria, despite a history of appropriate prophylaxis.

The 2 patients discussed above were effectively treated following the failure of their prophylaxis regimens. The first patient was appropriately treated with primaquine in order to prevent a relapse of the *P. vivax* infection. Indeed, patients with documented *P. vivax* or *P. ovale* infection are candidates for primaquine therapy. In contrast to this therapeutic use of primaquine, the Fansidar package insert states that prophylaxis with Fansidar should be followed by a "regimen of primaquine." Since the only demonstrated indication for using Fansidar prophylaxis is for suppression of infections with *P. falciparum* (a non-relapsing species of malaria), there is little basis for the routine prophylactic use of primaquine following Fansidar. When primaquine is considered for terminal prophylaxis, an assessment of the intensity and duration of exposure to relapsing malaria should be made, as well as the potential risk of primaquine toxicity, especially when treating persons who may be deficient in glucose-6 -phosphate dehydrogenase (G6PD). Indeed, patients with documented *P. vivax* or *P. ovale* infection are candidates for primaquine.

In order to clarify these and other current issues regarding malaria proplylaxis and treatment, the CDC Malaria Branch has prepared an MMWR supplement entitled *Prevention of Malaria in Travelers, 1982.* This document is designed for use by medical and public health personnel who have responsibility for advising travelers. It will not be distributed automatically to all MMWR subscribers; however, copies can be obtained by writing to Chief, Malaria Branch, Division of Parasitic Diseases, Center for Infectious Diseases, CDC, Atlanta, Georgia 30333.

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Epidemiologic Notes and Reports

Update on Contaminated Prepodyne Solution

CDC has confirmed contamination of 2 additional lots of Prepodyne Solution (manufactured by West Chemical, Inc.) (*1*).* Lot C203137 (1-pint bottles) is contaminated with *Pseudomonas aeruginosa*, and lot C203197 (1-pint bottles) is contaminated with an unidentified gram-negative rod. One lot (C203197) was not distributed, and the other was distributed only to 2 hospitals. The distributor (AMSCO/Medical Products Division of American Sterilizer Co.) has notified the 2 hospitals that received the contaminated lot concerning the recent laboratory results. Currently, the company is performing microbiologic sampling of lots manufactured since August 1981 and of new lots before they are released. No additional incidence of patient infection has been reported to be associated with the use of Prepodyne Solution. Investigation by CDC and FDA is continuing.

Reported by Hospital Infections Program, Hepatitis and Viral Enteritis Div, Center for Infectious Diseases, CDC.

Reference

1. CDC. *Pseudomonas aeruginosa* peritonitis attributed to a contaminated iodophor solution—Georgia. MMWR 1982;31:197-8.

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

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

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