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Recommendations of the Immunization Practices Advisory Committee Mumps Prevention

This revised Immunization Practices Advisory Committee (ACIP) recommendation on mumps vaccine updates the 1982 recommendation (1). Changes include: a discussion of the evolving epidemiologic characteristics of mumps, introduction of a cutoff of 1957 as the oldest birth cohort for which mumps vaccination is routinely recommended, and more aggressive outbreak-control measures. Although there are no major changes in vaccination strategy, these revised recommendations place a greater emphasis on vaccinating susceptible adolescents and young adults. INTRODUCTION Mumps Disease

Mumps disease is generally self-limited, but it may be moderately debilitating. Naturally acquired mumps infection, including the estimated 30% of infections that are subclinical, confers long-lasting immunity.

Among the reported mumps-associated complications, strong epidemiologic and laboratory evidence for an association with meningoencephalitis, deafness, and orchitis has been reported (2). Meningeal signs appear in up to 15% of cases. Reported rates of mumps encephalitis range as high as five cases per 1000 reported mumps cases. Permanent sequelae are rare, but the reported encephalitis case-fatality rate has averaged 1.4%. Although overall mortality is low, death due to mumps infection is much more ikely to occur in adults; about half of mumps-associated deaths have been in persons greater than or equal to 20 years old (2). Sensorineural deafness is one of the most serious of the rare complications involving the central nervous system (CNS). It occurs with an estimated frequency of 0.5-5.0 per 100,000 reported mumps cases. Orchitis (usually unilateral) has been reported as a complication in 20%-30% of clinical mumps cases in postpubertal males (3). Some testicular atrophy occurs in about 35% of cases of mumps orchitis, but sterility rarely occurs. Symptomatic involvement of other organs has been observed less frequently. There are limited experimental, clinical, and epidemiologic data that suggest permanent pancreatic damage may result from injury caused by direct viral invasion. Further research is needed to determine whether mumps infection contributes to the pathogenesis of diabetes mellitus. Mumps infection during the first trimester of pregnancy may increase the rate of spontaneous abortion (reported to be as high as 27%). There is no evidence that mumps during pregnancy causes congenital malformations. Epidemiology

Following the introduction of the live mumps virus vaccine in 1967 and recommendation of its routine use in 1977, the incidence rate of reported mumps cases decreased steadily in the United States. In 1985, a record low of 2982 cases was reported, representing a 98% decline from the 185,691 cases reported in 1967. However, between 1985 and 1987, a relative resurgence of mumps occurred, with 7790 cases reported in 1986 and 12,848 cases in 1987 (4). During this 3-year period, the annual reported incidence rate rose almost fivefold, from 1.1 cases per 100,000 population to 5.2 cases per 100,000 population. In 1988, a provisional total of 4730 cases was reported, representing a 62% decrease from 1987. As in the prevaccine era, the majority of reported mumps cases still occur in school-aged children (5-14 years of

age). Almost 60% of reported cases occurred in this population between 1985 and 1987, compared with an average of 75% of reported cases between 1967 and 1971, the first 5-year period postlicensure. However, for the first time since mumps became a reportable disease, the reported peak incidence rate shifted from 5-9-year-olds to older age groups for two consecutive years (1986 and 1987). Persons greater than or equal to 15 years of age accounted for more than one third of the reported total between 1985 and 1987; in 1967-1971, an average of only 8% of reported cases occurred among this population. Although reported mumps incidence increased in all age groups from 1985 to 1987, the most dramatic increases were among 10-14-year-olds (almost a sevenfold increase) and 15-19-year-olds (more than an eightfold increase).

The increased occurrence of mumps in susceptible adolescents and young adults has been demonstrated in several recent outbreaks in high schools and on college campuses (5,6) and in occupational settings (7). Nonetheless, despite this age shift in reported mumps, the overall reported risk of disease in persons 10-14 and greater than or equal to 15 years of age is still lower than that in the prevaccine and early postvaccine era.

Consistent with previous findings (8), reported incidence rates are lower in states with comprehensive school immunization laws. The District of Columbia and 14 states that routinely reported mumps cases in 1987 had comprehensive laws that require proof of immunity against mumps for school attendance from kindergarten through grade 12 (K-12). In these 15 areas, the incidence rate in 1987 was 1.1 mumps cases per 100,000 population. In contrast, among the other states that routinely reported mumps cases in 1987, mumps incidence was highest in the 14 states without requirements for mumps vaccination (11.5 cases per 100,000 population), and intermediate (6.2 cases per 100,000 population) in the 18 states with partial vaccination requirements for school attendance (i.e., those that include some children but do not comprehensively include K-12). Furthermore, the shift in age-specific risk noted above occurred only in states without comprehensive K-12 school vaccination requirements.

Both the shift in risk to older persons and the relative resurgence of reported mumps activity noted in recent years are attributable to the relatively underimmunized cohort of children born between 1967 and 1977 (9). There is no evidence of waning immunity in vaccinated persons. During 1967-1977, the risk of exposure to mumps declined rapidly even though vaccination of children against mumps was only gradually being accepted as a routine practice. Simultaneously, mumps vaccine coverage did not reach levels greater than 50% in any age group until 1976 (5-9-year-olds); in persons 15-19 years old, vaccine coverage did not reach these levels until 1983. This lag in coverage relative to measles and rubella vaccines reflects the lack of an ACIP recommendation for routine mumps vaccine until 1977 and the lack of emphasis in ACIP recommendations on vaccination beyond toddler age until 1980. These facts and the observed shift in risk to older persons in states without comprehensive mumps immunization school laws provide further evidence that a failure to vaccinate, rather than vaccine failure, is primarily responsible for the recently observed changes in mumps occurrence. MUMPS VIRUS VACCINE

A killed mumps virus vaccine was licensed for use in the United States from 1950 through 1978. This vaccine induced antibody, but the immunity was transient. The number of doses of killed mumps vaccine administered between licensure of live attenuated mumps vaccine in 1967 until 1978 is unknown but appears to have been limited.

Mumps virus vaccine* is prepared in chick-embryo cell culture. More than 84 million doses were distributed in the United States from its introduction in December 1967 through 1988. The vaccine produces a subclinical, noncommunicable infection with very few side effects. Mumps vaccine is available both in monovalent (mumps only) form and in combinations: mumps-rubella and measles-mumps-rubella (MMR) vaccines.

The vaccine is approximately 95% efficacious in preventing mumps disease (10,11); greater than 97% of persons known to be susceptible to mumps develop measurable antibody following vaccination (12). Vaccine-induced antibody is protective and long-lasting (13,14), although of considerably lower titer than antibody resulting from natural infection (12). The duration of vaccine-induced immunity is unknown, but serologic and epidemiologic data collected during 20 years of live vaccine use indicate both the

persistence of antibody and continuing protection agains infection. Estimates of clinical vaccine efficacy ranging from 75% to 95% have been calculated from data collected in outbreak settings using different epidemiologic study designs (8,15). Vaccine Shipment and Storage

Administration of improperly stored vaccine may fail to protect against mumps. During storage before reconstitution, mumps 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. After reconstitution, the vaccine should be stored in a dark place at 2-8 C (35.6-46.4 F) and discarded if not used within 8 hours. VACCINE USAGE

(See also the current ACIP statement, "General Recommendations on Immunization" (16).) General Recommendations

Susceptible children, adolescents, and adults should be vaccinated against mumps, unless vaccination is contraindicated. Mumps vaccine is of particular value for children approaching puberty and for adolescents and adults who have not had mumps. MMR vaccine is the vaccine of choice for routine administration and should be used in all situations where recipients are also likely to be susceptible to measles and/or rubella. The favorable benefit-cost ratio for routine mumps immunization is more marked when vaccine is administered as MMR (17). Persons should be considered susceptible to mumps unless they have documentation of 1) physician-diagnosed mumps, 2) adequate immunization with live mumps virus vaccine on or after their first birthday, or 3) laboratory evidence of immunity. Because live mumps vaccine was not used routinely before 1977 and because the peak age-specific incidence was in 5-9-year-olds before the vaccine was introduced, most persons born before 1957 are likely to have been infected naturally between 1957 and 1977. Therefore, they generally may be considered to be immune, even if they may not have had clinically recognizable mumps disease. However, this cutoff date for susceptibility is arbitrary. Although outbreak-control efforts should be focused on persons born after 1956, these recommendations do not preclude vaccination of possibly susceptible persons born before 1957 who may be exposed in outbreak settings. Persons who are unsure of their mumps disease history and/or mumps vaccination history should be vaccinated. There is no evidence that persons who have previously either received mumps vaccine or had mumps are at any increased risk of local or systemic reactions from receiving live mumps vaccine. Testing for susceptibility before vaccination, especially among adolescents and young adults, is not necessary. In addition to the expense, some tests (e.g., mumps skin test and the complement-fixation antibody test) may be unreliable, and tests with established reliability (neutralization, enzyme immunoassay, and radial hemolysis antibody tests) are not readily available.

Dosage. A single dose of vaccine in the volume specified by the manufacturer should be administered subcutaneously. While not recommended routinely, intramuscular vaccination is effective and safe.

Age. Live mumps virus vaccine is recommended at any age on or after the first birthday for all susceptible persons, unless a contraindication exists. Under routine circumstances, mumps vaccine should be given in combination with measles and rubella vaccines as MMR, following the currently recommended schedule for administration of measles vaccine. It should not be administered to infants less than 12 months old because persisting maternal antibody might interfere with seroconversion. To insure immunity, all persons vaccinated before the first birthday should be revaccinated on or after the first birthday. Persons Exposed to Mumps

Use of Vaccine. When given after exposure to mumps, live mumps virus vaccine may not provide protection. However, if the exposure did not result in infection, vaccine should induce protection against infection from subsequent exposures. There is no evidence that the risk of vaccine-associated adverse events increases if vaccine is administered to persons incubating disease.

Use of Immune Globulin. Immune globulin (IG) has not been demonstrated to be of established value in postexposure prophylaxis and is not recommended. Mumps immune globulin has not been shown to be effective and is no longer available or licensed for use in the United States. Adverse Effects of Vaccine Use

In field trials before licensure, illnesses did not occur more often in vaccinees than in unvaccinated controls (18). Reports of illnesses following mumps vaccination have mainly been episodes of parotitis and low-grade fever. Allergic reactions including rash, pruritus, and purpura have been temporally associated with mumps vaccination but are uncommon and usually mild and of brief duration. The reported occurrence of encephalitis within 30 days of receipt of a mumps-containing vaccine (0.4 per million doses) is not greater than the observed background incidence rate of CNS dysfunction in the normal population. Other manifestations of CNS involvement, such as febrile seizures and deafness, have also been infrequently reported. Complete recovery is usual. Reports of nervous system illness following mumps vaccination do not necessarily denote an etiologic relationship between the illness and the vaccine.
Contraindications to Vaccine Use

Pregnancy. Although mumps vaccine virus has been shown to infect the placenta and fetus (19), there is no evidence that it causes congenital malformations in humans. However, because of the theoretical risk of fetal damage, it is prudent to avoid giving live virus vaccine to pregnant women. Vaccinated women should avoid pregnancy for 3 months after vaccination. Routine precautions for vaccinating postpubertal women include asking if they are or may be pregnant, excluding those who say they are, and explaining the theoretical risk to those who plan to receive the vaccine. Vaccination during pregnancy should not be considered an indication for termination of pregnancy. However, the final decision about interruption of pregnancy must rest with the individual patient and her physician.

Severe Febrile Illness. Vaccine administration should not be postponed because of minor or intercurrent febrile illnesses, such as mild upper respiratory infections. However, vaccination of persons with severe febrile illnesses should generally be deferred until they have recovered.

Allergies. Because live mumps vaccine is produced in chick-embryo cell culture, persons with a history of anaphylactic reactions (hives, swelling of the mouth and throat, difficulty breathing, hypotension, or shock) after egg ingestion should be vaccinated only with caution using published protocols (20,21). Known allergic children should not leave the vaccination site for 20 minutes. Evidence indicates that persons are not at increased risk if they have egg allergies that are not anaphylactic in nature. Such persons may 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 mumps vaccine contains trace amounts of neomycin (25 ug), persons who have experienced anaphylactic reactions to topically or systemically administered neomycin should not receive mumps 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 persons, the adverse reaction, if any, to 25 ug 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 mumps vaccine. Live mumps virus vaccine does not contain penicillin.

Recent IG Injection. Passively acquired antibody can interfere with the response to live, attenuated-virus vaccines. Therefore, mumps vaccine should be given at least 2 weeks before the administration of IG or deferred until approximately 3 months after the administration of IG.

Altered Immunity. In theory, replication of the mumps 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. In general, patients with such conditions should not be given live mumps virus vaccine. Because vaccinated persons do not transmit mumps vaccine virus, the risk of mumps exposure for those patients may be reduced by vaccinating their close susceptible contacts.

An exception to these general recommendations is in children infected with human immunodeficiency virus (HIV); all asymptomatic HIV-infected children should receive MMR at 15 months of age (22). If measles vaccine is administered to symptomatic HIV-infected children, the combination MMR vaccine is generally preferred (23). Patients with leukemia in remission whose chemotherapy has been terminated

for at least 3 months may also receive live mumps virus vaccine. Short-term (less than 2 weeks' duration) corticosteroid therapy, topical steroid therapy (e.g., nasal, skin), and intraarticular, bursal, or tendon injection with corticosteroids do not contraindicate mumps vaccine administration. However, mumps vaccine should be avoided if systemic immunosuppressive levels are reached by prolonged, extensive, topical application.

Other. There is no known association between mumps vaccination and pancreatic damage or subsequent development of diabetes mellitus (24). MUMPS CONTROL

The principal strategy to prevent mumps is to achieve and maintain high immunization levels, primarily in infants and young children. Universal immunization as a part of good health care should be routinely carried out in physicians' offices and public health clinics. Programs aimed at vaccinating children with MMR should be established and maintained in all communities. In addition, all other persons thought to be susceptible should be vaccinated unless otherwise contraindicated. This is especially important for adolescents and young adults in light of the recently observed increase in risk of disease in these populations.

Because access to some population subgroups is limited, the ACIP recommends taking maximal advantage of clinic visits to vaccinate susceptible persons greater than or equal to 15 months of age by administering MMR, diphtheria-tetanus-pertussis (DTP), and oral polio vaccine (OPV) simultaneously if all are needed. Health agencies should take necessary steps, including the development, adoption, and enforcement of comprehensive immunization requirements, to ensure that all persons in schools at all grade levels and in day-care settings are protected against mumps. Similar requirements should be considered for colleges, as recommended by the American College Health Association (25), and selected places of employment where persons in this age cohort are likely to be concentrated or where the consequences of disease spread may be more severe (e.g., medical-care settings).

In determining means to control mumps outbreaks, exclusion of susceptible students from affected schools and schools judged by local public health authorities to be at risk for transmission should be considered. Such exclusion should be an effective means of terminating school outbreaks and quickly increasing rates of immunization. Excluded students can be readmitted immediately after vaccination. Pupils who have been exempted from mumps vaccination because of medical, religious, or other reasons should be excluded until at least 26 days after the onset of parotitis in the last person with mumps in the affected school. Experience with outbreak control for other vaccine-preventable diseases indicates that almost all students who are excluded from the outbreak area because they lack evidence of immunity quickly comply with requirements and can be readmitted to school. MUMPS DISEASE SURVEILLANCE AND REPORTING OF ADVERSE EVENTS

There is a continuing need to improve the reporting of mumps cases and complications and to document the duration of vaccine effectiveness. Thus, for areas in which mumps is a reportable disease, all suspected cases of mumps should be reported to local or state health officials. The National Childhood Vaccine Injury Compensation Program established by the National Childhood Vaccine Injury Compensation Act of 1986 requires physicians and other health-care providers who administer vaccines to maintain permanent immunization records and to report occurrences of certain adverse events to the U.S. Department of Health and Human Services. Recording and reporting requirements took effect on March 21, 1988. Reportable adverse events include those listed in the Act for mumps (26) and events specified in the manufacturer's vaccine package insert as contraindications to further doses of mumps vaccine.

Although there eventually will be one system for reporting adverse events following immunizations, two separate systems currently exist. The appropriate reporting method currently depends on the source of funding used to purchase the vaccine (26). Events that occur after receipt of a vaccine purchased with public (federal, state, and/or local government) funds must be reported by the administering health provider to the appropriate local, county, or state health department. The state health department completes and submits the correct forms to CDC. Reportable events that follow administration of vaccines

purchased with private money are reported by the health-care provider directly to the Food and Drug Administration. RECOMMENDATIONS FOR INTERNATIONAL TRAVEL

Mumps is still endemic throughout most of the world. While vaccination against mumps is not a requirement for entry into any country, susceptible children, adolescents, and adults would benefit by being vaccinated with a single dose of vaccine (usually as MMR), unless contraindicated, before beginning travel. Because of concern about inadequate seroconversion due to persisting maternal antibodies and because the risk of serious disease from mumps infection is relatively low, persons less than 12 months of age need not be given mumps vaccine before travel.

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