Mumps
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Mumps

Overview[1, 2, 3]

Mumps is a systemic disease caused by a virus of the genus *Rubulavirus* in the *Paramyxoviridae* family. Because of successful vaccination programs, mumps are now uncommon in the United States. However, recent outbreaks of mumps have occurred from import-associated cases because mumps is common in many other countries. Persons who are unvaccinated put themselves and others at risk for this disease and related complications.

Orchitis is a commonly reported complication after puberty, but sterility rarely occurs. Rare complications include arthritis, thyroiditis, mastitis, glomerulonephritis, myocarditis, endocardial fibroelastosis, thrombocytopenia, cerebellar ataxia, transverse myelitis, encephalitis, pancreatitis, oophoritis, and permanent hearing impairment. In the absence of an immunization program, mumps typically occurs during childhood. Infection occurring among adults is more likely to result in complications. An association between maternal mumps infection during the first trimester of pregnancy and an increase in the rate of spontaneous abortion or intrauterine fetal death has been reported in some studies but not in others. Although mumps virus can cross the placenta, no evidence exists that this results in congenital malformation.

Humans are the only natural host of this disease. Mumps spreads from person to person via droplets of saliva or mucus from the mouth, nose, or throat of an infected person; usually when the person coughs, sneezes, or talks. The virus may also be spread indirectly when someone with mumps touches items or surfaces without washing their hands and then someone else touches the same surface and rubs their mouth or nose. Although persons with asymptomatic or nonclassical infection can transmit the virus, no carrier state is known to exist. The infectious period is considered to be from three days prior to symptom onset, to the five-day period after onset of parotitis. However, the virus has been isolated from saliva seven days before the onset of parotitis to nine days after onset of parotitis. Mumps is less contagious than measles or chickenpox.

The incubation period of mumps is 16 to 18 days, (range 12 to 25 days).[2] The prodromal symptoms are nonspecific and include myalgia, anorexia, malaise, headache, and low-grade fever. Mumps is generally characterized by swelling of one or more of the salivary glands, usually the parotid glands although as many as 20% of mumps infections are asymptomatic. An additional 40% to 50% may have only nonspecific or primarily respiratory symptoms.

For a more complete description of Mumps, refer to the following texts:

- *Control of Communicable Diseases Manual* (CCDM), American Public Health Association, 19th ed. 2008.
- American Academy of Pediatrics. *Red Book: 2012 Report of the Committee on Infectious Diseases.* 29th ed. 2012.
- Department of Health and Human Services, Centers for Disease Control and Prevention, *Epidemiology and Prevention of Vaccine-Preventable Diseases,* 12th ed. Revised May 2012.

2012 Case Definition - Mumps[4] – (8/13)

Case Classification

Confirmed

- A positive mumps laboratory confirmation for mumps virus with reverse transcription polymerase chain reaction (RT-PCR) or culture in a patient with an acute illness characterized by any of the following:
  - Acute parotitis or other salivary gland swelling, lasting at least 2 days
  - Aseptic meningitis
  - Encephalitis
  - Hearing loss
  - Orchitis
  - Oophoritis
  - Mastitis
  - Pancreatitis

Probable

- Acute parotitis or other salivary gland swelling lasting at least 2 days, or orchitis or oophoritis unexplained by another more likely diagnosis, in:
  - A person with a positive test for serum anti-mumps immunoglobulin M (IgM) antibody, **OR**
  - A person with epidemiologic linkage to another probable or confirmed case or linkage to a group/community defined by public health during an outbreak of mumps.

Suspect

- Parotitis, acute salivary gland swelling, orchitis, or oophoritis unexplained by another more likely diagnosis, **OR**
- A positive lab result with no mumps clinical symptoms (with or without epidemiological-linkage to a confirmed or probable case).

Epidemiologic Classification

Internationally imported case: An internationally imported case is defined as a case in which mumps results from exposure to mumps virus outside the United States as evidenced by at least some of the exposure period (12–25 days before onset of parotitis or other mumps-associated complications) occurring outside the United States and the onset of parotitis or other mumps-associated complications within 25 days of entering the United States and no known exposure to mumps in the U.S. during that time. All other cases are considered U.S.-acquired cases.

U.S.-acquired case: A U.S.-acquired case is defined as a case in which the patient had not been outside the United States during the 25 days before onset of parotitis or other mumps-associated complications or was known to have been exposed to mumps within the United States. U.S.-acquired cases are sub-classified into four mutually exclusive groups:

- *Import-linked case*: Any case in a chain of transmission that is epidemiologically linked to an internationally imported case.
- *Imported-virus case*: A case for which an epidemiologic link to an internationally imported case was not identified but for which viral genetic evidence indicates an imported mumps genotype, i.e., a genotype that is not occurring within the United States in a pattern indicative of endemic transmission. An endemic genotype is the genotype of any mumps virus that occurs in an endemic chain of transmission (i.e., lasting ≥12 months). Any genotype that is found repeatedly in U.S.-acquired cases should be thoroughly investigated as a potential endemic genotype, especially if the cases are closely related in time or location.
- *Endemic case*: A case for which epidemiological or virological evidence indicates an endemic chain of transmission. Endemic transmission is defined as a chain of mumps virus transmission continuous for ≥12 months within the United States.
- *Unknown source case*: A case for which an epidemiological or virological link to importation or to endemic transmission within the U.S. cannot be established after a thorough investigation. These cases must be carefully assessed epidemiologically to assure that they do not represent a sustained U.S.-acquired chain of transmission or an endemic chain of transmission within the U.S.

***NOTE**: Internationally imported, import-linked, and imported-virus cases are considered collectively to be import-associated cases. States may also choose to classify cases as "out-of-state-imported" when imported from another state in the United States. For national reporting cases will be classified as either internationally imported or U.S-acquired.*

***COMMENTS**: With previous contact with mumps virus either through vaccination (particularly with 2 doses) or natural infection, serum mumps IgM test results may be negative; immunoglobulin G (IgG) test results may be positive at initial blood draw; and viral detection in RT-PCR or culture may have low yield if the buccal swab is collected too long after parotitis onset. Therefore, mumps cases should not be ruled out by negative laboratory results. Serologic tests should be interpreted with caution, as false positive and false negative results are possible with IgM tests.*

Information Needed for Investigation[5,6]

Establish a diagnosis of mumps: Obtain demographic, clinical and laboratory information on the case from the attending physician, hospital, and/or laboratory. Obtain the other epidemiological information necessary to complete the Disease Case Report (CD-1) and Mumps Report (IMMP-43) from the patient or a knowledgeable family member. *Clinical Diagnosis of mumps may be unreliable,* therefore if mumps is suspected, laboratory testing should be performed. Efforts should be made to obtain clinical specimens (buccal cavity/parotid duct fluids, throat swabs, urine,

or CSF) for viral isolation for all sporadic cases and at least some cases in each outbreak at the time of the initial investigation. Acute mumps infection can be detected by the presence of serum mumps IgM, a significant rise in IgG antibody titer in acute and convalescent-phase serum specimens, IgG seroconversion, positive mumps virus culture, or detection of virus by real-time reverse transcriptase polymerase chain reaction (rRT-PCR). ***NOTE****: However, in both unvaccinated and vaccinated persons, false positive results can occur because assays may be affected by other diagnostic entities that cause parotitis*. In addition, laboratory confirming the diagnosis of mumps in highly vaccinated populations may be challenging, and serologic tests should be interpreted with caution because false-negative results in vaccinated persons (i.e., a negative serologic test in a person with true mumps) are common. With previous contact with mumps virus either through vaccination (particularly with two doses) or natural infection, serum mumps IgM test results may be negative; IgG test results may be positive at the initial blood draw; and viral detection in RT-PCR or culture may have low yield if the buccal swab is collected more than three days after parotitis onset. *Therefore, mumps cases should not be ruled out by negative laboratory results. Enzyme immunoassay (EIA) is a highly specific test for diagnosing acute mumps infection*. The use of the IgM capture EIA is preferred over the Immunofluorescence assay (IFA). ***NOTE****: Commercially available EIA kits and IFA antibody assays for detection of mumps IgM are not currently FDA-approved. Therefore, each laboratory must validate these tests independently.*

***Unvaccinated persons*:** IgM antibody is detectable within 5 days after onset of symptoms, reaches a maximum level about a week after onset, and remains elevated for several weeks or months. If an acute-phase serum sample collected ≤3 days after parotitis onset is negative for IgM, testing a second sample collected 5–7 days after symptom onset is recommended since the IgM response may require more time to develop.

***Vaccinated persons*:** Patients that mount a secondary immune response to mumps, as seen in most previously vaccinated persons, may not have an IgM response or it may be transient and not detected depending on the timing of specimen collection. Because of this, a high number of false-negative results may occur in previously vaccinated individuals. False-positive IgM results may also occur and appear to be more prevalent with certain IgM test formats, such as the IFA. There is some evidence that serum collected ≥10 days after parotitis onset may improve the ability to detect IgM among persons who have received one or two doses of MMR vaccine (CDC unpublished data). *However, persons with a history of mumps vaccination may not have detectable mumps IgM antibody regardless of the timing of specimen collection.*

Obtaining accurate, complete immunization histories: Mumps case investigations should include complete immunization histories that are verified by documentation of administration of all doses. Verbal history of receipt of mumps vaccine is not considered adequate proof of vaccination. Some case-patients or their caregivers may have personal copies of immunization records available that include dates of administration; these are acceptable for reporting purposes. Acceptable presumptive evidence of mumps immunity includes at least one of the following:

1. Written documentation of receipt of one or more doses of a mumps-containing vaccine administered on or after the first birthday for preschool-aged children and adults not at high risk, and two doses of mumps-containing vaccine for school-aged children and adults at high

risk (i.e., healthcare personnel, international travelers, and students at post high school educational institutions);
2. Laboratory evidence of immunity;
3. Birth before 1957; or
4. Documentation of physician-diagnosed mumps.

Persons who do not meet the above criteria are considered susceptible. Healthcare settings have slightly different criteria for acceptable presumptive evidence of immunity, and these criteria are detailed below:

1. Documentation of vaccination with 2 doses of live mumps virus-containing vaccine, or
2. Laboratory evidence of immunity, or
3. Laboratory confirmation of disease, or
4. Born before 1957.

Vaccination recommendations during outbreaks differ from routine recommendations for this group. During an outbreak of mumps, healthcare facilities should recommend 2 doses of MMR vaccine at the appropriate interval for unvaccinated healthcare personnel regardless of birth year who lack laboratory evidence of mumps immunity or laboratory confirmation of disease.[6]

Identifying the source of infection: Efforts should be made to identify the source of infection for every confirmed case of mumps (i.e., case-patients should be asked about contact with other known patients). However, this is not always possible, especially with sporadic cases, and this should not occur at the expense of higher public health priorities. If it can be determined when and where transmission likely occurred, investigative efforts should be directed to these locations.

Assessing potential transmission and identifying contacts: The potential for further transmission should be assessed. Identification of suspected or confirmed cases of mumps is important in the initiation of control measures to prevent the spread of the disease among persons who do not have presumptive evidence of immunity. Once a sporadic case has been identified, several factors should be taken into consideration before initiating a public health response, such as epidemiological risk factors, vaccination status, and other etiologies. *However, in transmission settings with high risk, such as households, schools, and camps, health departments may want to be a little more aggressive. In these settings, health departments should consider conducting case investigations and assessing immune status of close contacts* ***before laboratory results are known*** *or before additional cases are identified*. Nonetheless, control measures are unlikely to be implemented until either the laboratory results are back or until at least two infected persons have a confirmed epidemiological link. *Contacts of the mumps case-patient during the two days prior through five days after onset of parotitis should be identified, assessed for immunity, offered vaccine as appropriate, and educated about signs and symptoms.* CDC recommends a five-day period after onset of parotitis for: 1*) isolation of persons with mumps in the community and for 2) use of droplet precautions, in addition to standard precautions in healthcare settings.*

Provide information about mumps to persons at risk and/or the general public. As appropriate, healthcare personnel should be aware that mumps outbreaks have occurred in highly vaccinated populations in high transmission settings, including school settings (e.g., elementary

school, middle school, high school, and college students). Therefore, mumps should not be ruled out on the assumption that individuals have evidence of mumps immunity because of vaccination. ***All mumps contacts should be educated on symptoms of mumps, instructed to watch for symptoms from 12 to 25 days after the last exposure, and told to isolate themselves and contact the health department if symptoms develop***. An excellent Question-&-Answer mumps information sheet in **.PDF** format is available from the Immunization Action Coalition.

Conduct enhanced surveillance: During outbreaks, active surveillance for mumps should be conducted for every confirmed and probable mumps case. Active surveillance should be maintained for at least two incubation periods (50 days) following parotitis onset in the last case. Two incubation periods allow for the identification of transmission from subclinical infections or unrecognized cases. Previously unreported cases may be identified by reviewing laboratory records.

Notification

- Contact the District Communicable Disease Coordinator, the Senior Epidemiology Specialist for the District, or the Missouri Department of Health and Senior Services (MDHSS) - BCDCP, phone #(573) 751-6113, Fax # (573) 526-0235, or for afterhours notification contact the MDHSS/ERC at (800) 392-0272 (24/7) immediately if an outbreak* of mumps is suspected.
- If a case(s) is associated with a childcare center, BCDCP or the local public health agency (LPHA) will contact the Bureau of Environmental Health Services, phone # (573) 751-6095, Fax # (573) 526-7377 and the Section for Child Care Regulation, phone # (573) 751-2450, Fax # (573) 526-5345.
- If a case(s) is associated with a long-term care facility, BCDCP or the LPHA will contact the Section for Long Term Care Regulation, phone # (573) 526-8524, Fax # (573) 751-8493.
- If a case is associated with a hospital, hospital-based long-term care facility, or ambulatory surgical center BCDCP or the LPHA will contact the Bureau of Health Services Regulation phone # (573) 751-6303, Fax # (573) 526-3621.

*Outbreak is defined as the occurrence in a community or region, illness(es) similar in nature, clearly in excess of normal expectancy and derived from a common or a propagated source.

Control Measures[2,5]

The main strategy for controlling mumps is to define the population(s) at risk and transmission setting(s), and to rapidly identify and vaccinate persons without presumptive evidence of immunity, and everyone should be brought up to date with age appropriate vaccination (one or two doses). If a contraindication exists for mumps-containing vaccine, exclude persons without presumptive evidence of immunity from the setting to prevent exposure and transmission. The recommended period for contact tracing for mumps is two days before through five days after parotitis onset.[5] Persons who do not receive the mumps immunization should be excluded from the setting until at least 26 days after onset of parotitis in the last person with mumps.[2] CDC recommends isolating mumps patients for the five-day period after onset of parotitis. ***NOTE***: *Initial preparation for control activities may need to be started before laboratory results are known*, but are unlikely to be

implemented until either the laboratory results are back or until at least two infected persons have a confirmed epidemiological link.

*Mumps vaccine has **not** been demonstrated to be e*ffective in preventing infection after a mumps exposure. However, MMR vaccine can be given after exposure, because immunization will provide protection against subsequent exposures. Immunization during the incubation period presents no increased risk. ***NOTE***: *Immune globulin (IG) preparations are not effective as postexposure prophylaxis for mumps.*[2]

Pregnant women *should not* receive mumps vaccine, although the risk in this situation is theoretic. There is no evidence that mumps vaccine virus causes fetal damage. Pregnancy should be avoided for 4 weeks after vaccination with MMR vaccine. For additional information on the contraindications and precautions associated with MMR and MMRV vaccines see: Morbidity and Mortality Weekly Report (*MMWR*), *Prevention of Measles, Rubella, Congenital Rubella Syndrome, and Mumps, 2013: Summary Recommendations of the Advisory Committee on Immunization Practices (ACIP), Recommendations and Reports*, June 14, 2013 / 62(RR04);1-34 http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm.

Outbreak Control[2,5]

During an outbreak, the first dose of MMR vaccine should be offered to all unimmunized people 12 months of age and older, and a second dose of MMR vaccine should be offered to school and post-high school students and health care personnel born during or after 1957 who have only received 1 dose of MMR vaccine. A second dose of mumps-containing vaccine may be considered for preschool-aged children and adults who have only received one dose of mumps-containing vaccine, depending on the epidemiology of the outbreak (e.g., the age groups and/or institutions involved).

Although mumps-containing vaccination ***has not been*** shown to be effective in preventing mumps in persons already infected, it will prevent infection in those persons who are not yet exposed or infected. If persons without evidence of immunity can be vaccinated early in the course of an outbreak, they can be protected prior to exposure. However, because of the long incubation period for mumps, cases are expected to continue to occur for at least 25 days among newly vaccinated persons who may have been infected before vaccination. As with all vaccines, some individuals will not develop protective immunity after receipt of mumps vaccine.

Currently, data are insufficient to recommend for or against the use of a third dose of MMR vaccine for mumps outbreak control. CDC has issued guidance for considerations for use of a third dose in specifically identified target populations along with criteria for public health departments to consider for decision making. Criteria to consider prior to administering a third dose in a target population for mumps outbreak control include:

- High two-dose vaccination coverage (i.e., vaccination coverage >90%);
- Intense exposure settings likely to facilitate transmission (e.g., schools, colleges, correctional facilities, congregate living facilities) or healthcare settings;

- High attack rates (i.e., >5 cases per 1,000 population); and evidence of ongoing transmission for at least two weeks in the target population (i.e., population with the high attack rates).

Additional data on the effectiveness and impact of a third dose of MMR vaccine for mumps outbreak control are needed to guide control strategies in future outbreaks. Authorities who decide to administer a third dose as part of mumps outbreak control are encouraged to collect data to evaluate the impact of the intervention. The following data should be collected:

- Incidence of mumps in target population (before and after the intervention, by vaccination status),
- Incidence of adverse events following vaccination with a third dose, and
- Costs associated with the intervention (vaccine, personnel).

Catch-up vaccination efforts to ensure that populations at risk are up to date with the recommended number of vaccine doses, as well as reducing opportunities for close contact, remain the recommended strategies for mumps outbreak control.

Control of Outbreaks in Schools and Other Institutions[2,5]

To assist with control of mumps outbreaks in schools and colleges, students with zero doses of MMR vaccine and with no other evidence of mumps immunity should be excluded from schools/colleges affected by a mumps outbreak or other schools that are unaffected but deemed by local public health authorities to be at risk for transmission of disease. Excluded students can be readmitted immediately after they are vaccinated. Students who have a history of one dose of MMR vaccination should receive their second vaccine dose and be allowed to remain in school. Students who have been exempted from mumps vaccination for medical, religious, or other reasons should be excluded until the 26th day after the onset of parotitis in the last person with mumps in the affected school. Children with mumps should be excluded for the five-day period after onset of parotitis.

Prevention and Control Strategies in Healthcare Settings[5, 6]

An effective vaccination program is the best approach to prevent healthcare-associated mumps transmission. Healthcare Infection Control Practices Advisory Committee (HICPAC) and CDC have recommended that secure, preferably computerized, systems should be used to manage vaccination records for healthcare personnel so records can be easily retrieved as needed. Facilities are also encouraged to review employee evidence of immunity status for mumps and other vaccine preventable infections. *To prevent disease and transmission in health-care settings, health-care institutions should ensure that **all persons** who work in health-care facilities have documentation of adequate vaccination against mumps or other acceptable evidence of immunity to mumps.* [6]
Healthcare facilities should provide MMR vaccine to all personnel without evidence of mumps immunity at no charge.

During an outbreak of mumps, health-care facilities should recommend 2 doses of MMR vaccine at least 28 days apart for unvaccinated health-care personnel *regardless of birth year* who lack laboratory evidence of measles or mumps immunity or laboratory confirmation of disease. Serologic screening before vaccination is not recommended during outbreaks because rapid vaccination is necessary to halt disease transmission. If documentation of adequate evidence of immunity has not already been collected, it might be difficult to quickly obtain documentation of immunity for health-care personnel during an outbreak or when an exposure occurs. Therefore, health-care facilities might want to ensure that the measles, rubella, and mumps immunity status of health-care personnel is routinely documented and can be easily accessed.[6]

Healthcare personnel who **lack evidence of immunity** and have had unprotected exposures to mumps should be excluded from work from the 12th day after the first unprotected exposure to mumps through the 25th day after the last exposure. The mumps vaccine cannot be used to prevent the development of mumps after exposure. ***NOTE**: Unprotected exposures are defined as being within three feet of a patient with a diagnosis of mumps without the use of proper personal protective equipment.*

- Healthcare personnel who had been previously vaccinated for mumps, but received only one dose of mumps vaccine may continue working following an unprotected exposure to mumps. Such personnel should receive a second dose as soon as possible, but no sooner than 28 days after the first dose. They should be educated about symptoms of mumps, including nonspecific presentations, and should notify occupational health if they develop these symptoms.

- Healthcare personnel with evidence of immunity do not need to be excluded from work following an unprotected exposure. However, two doses of MMR vaccine do not provide 100% protection from mumps. Some vaccinated personnel may remain at risk for mumps. Therefore, healthcare personnel should be educated about symptoms of mumps, including nonspecific presentations, and should notify occupational health if they develop these symptoms.

***COMMENT**: Irrespective of their immune status, all exposed healthcare personnel should report any signs or symptoms of illness during the incubation period, from 12 through 25 days after exposure*. Patients in whom mumps is suspected should be isolated and droplet precautions implemented in addition to standard precautions. Healthcare personnel with mumps should be excluded for five days after the onset of parotitis.

Laboratory Procedures

Virus is usually present in saliva for about one (1) week, from 2 to 3 days before, to 4 to 5 days after the onset of parotitis; however, virus has been isolated from saliva as early as 6 days before onset and as late as 9 days after onset of parotitis.[6] Mumps viral RNA has been detected by PCR in clinical swabs of healthy children after the administration of mumps vaccine.[6] For information on the collection or shipment of specimens, refer to the Missouri State Public Health Laboratory website at: http://health.mo.gov/lab/mumps.php.

Reporting Requirements

Mumps is a Category 3 disease and shall be reported to the local health authority or to the Department of Health and Senior Services within three (3) calendar days of first knowledge or suspicion.

As a Nationally Notifiable Condition, **confirmed** and **probable** mumps cases are a **STANDARD** report to the Centers of Disease Control and Prevention (CDC). **STANDARD** reporting requires the Missouri Department of Health and Senior Services (MDHSS) to report to CDC by electronic transmission via WebSurv within the next normal reporting cycle.

1. For probable and confirmed cases, complete a "Disease Case Report" (CD-1) and a Mumps Report (IMMP-43).
2. Entry of the CD-1 into the WebSurv database negates the need for the paper CD-1 to be forwarded to the District Health Office.
3. MDHSS will submit weekly electronic reports to CDC.
4. Send the completed secondary investigation form(s) to the District Health Office.
5. All outbreaks or "suspected" outbreaks must be reported as soon as possible (by phone, fax or e-mail) to the District Communicable Disease Coordinator. This can be accomplished by completing the Missouri Outbreak Surveillance Report (CD-51).
6. Within 90 days from the conclusion of an outbreak, submit the final outbreak report to the District Communicable Disease Coordinator.

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Other Sources of Information

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