

Mumps

Section 1: ABOUT THE DISEASE

A. Etiologic Agent

Mumps is caused by the mumps virus (genus *Rubulavirus*, family *Paramyxoviridae*).

B. Clinical Description

Mumps is a systemic disease characterized by swelling of one or more salivary glands, usually the parotid glands. Parotitis tends to occur early and may first be noted as an earache or pain on palpitation at the angle of the jaw. Symptoms tend to decrease after 1 week and usually resolve after 10 days. Prodromal symptoms are non-specific and may include myalgia, anorexia, malaise, headache, and low-grade fever. As many as 20-40% of mumps infections are asymptomatic and nearly 50% are associated with non-specific or primarily respiratory symptoms, particularly among children under 5 years of age.

Orchitis (swelling of one or both testicles) is the most common complication of mumps among post-pubertal males, but rarely causes sterility. Symptomatic aseptic meningitis occurs in up to 10% of cases. Patients usually recover without complications, but may require hospitalization. Encephalitis occurs rarely (0.01% of cases), and permanent sequelae or death are uncommon. Other rare complications include arthritis, oophoritis, mastitis, pancreatitis, and hearing impairment. While death attributed to mumps is rare, more than half of the fatalities occur in adults.

Mumps infection during the first trimester of pregnancy can increase the risk of spontaneous abortion, although there is no known evidence that mumps infection during pregnancy causes congenital malformations.

Note: Swelling of the salivary glands can also be caused by a wide variety of agents including parainfluenza virus types 1 and 3, influenza A, Coxsackie A, echovirus, *Staphylococcus aureus*, lymphocytic choriomeningitis virus, HIV, and noninfectious causes such as drugs (e.g., phenylbutazone, thiouracil, iodides), tumors, starch ingestion, metabolic disorders (diabetes, cirrhosis, and malnutrition), immunologic diseases, and obstruction of the salivary duct. However, other infectious causes of parotitis do not cause epidemic parotitis.

C. Reservoirs

Humans are the only known host for mumps virus. While persons with asymptomatic or non-classical infection can transmit the virus, no true carrier state is known to exist.

D. Modes of Transmission

Mumps virus is transmitted in respiratory droplets and by direct contact with nasopharyngeal secretions. While mumps virus can be transmitted by the airborne route, this is rare and should not be a parameter for determining exposure, especially in the school setting. Mumps virus is similar to influenza virus and rubella virus in infectiousness and is not as contagious as measles virus or varicella virus. Individuals with asymptomatic mumps virus infection can transmit mumps virus.

E. Incubation Period

The incubation period is usually 16–18 days, with a range of 12–25 days.

F. Period of Communicability or Infectious Period

Persons with mumps are usually considered infectious from 2 days before through 5 days after onset of parotid swelling. The initial day of swelling should be counted as day zero.

G. Epidemiology

Mumps occurs worldwide. The incidence of mumps in the U.S. declined significantly after an effective vaccine was licensed in 1967. The number of mumps cases reported in the U.S. continued to decline after 1989, when two doses of MMR was routinely recommended. However, during recent years in the U.S. mumps outbreaks have occurred, even among highly vaccinated populations. For example, in 2006, a large, multi-state mumps outbreak occurred principally among Midwestern college students, and starting in July 2009, another mumps outbreak began on the East Coast.

Mumps vaccine effectiveness has been estimated at 73-91% for one dose, and 76-95% for two doses. Most adults born in the U.S. before 1957 have been infected with and are probably immune to mumps virus. Mumps may occur in unimmunized children or adolescents. Mumps may also occur in individuals from other countries where mumps vaccine was not routinely given or where exposure to mumps virus is limited.

H. Prevention Measures

In addition to good personal hygiene (which consists of proper hand washing, disposal of used tissues, not sharing eating utensils, etc.), vaccination, including routine childhood vaccination, catch-up vaccination of adolescents, and targeted vaccination of high-risk adult groups, is the best preventive measure against mumps. Vaccination is recommended for individuals without acceptable proof of immunity, as defined below.

Proof of Immunity to Mumps

Individuals meeting one of the criteria below are considered immune to mumps:

- Birth before January 1, 1957 (unless health care personnel)
- OR*
- Serologic proof of immunity
- OR*
- Documentation of adequate vaccination with live mumps vaccine:
 - one dose for preschool-aged children and adults not at high risk of infection
 - two doses for school-aged children (grades K-12) and for adults at high risk (health care personnel, international travelers, and students at post-high school educational institutions)

The Advisory Committee on Immunization Practices (ACIP) and the Centers for Disease Control and Prevention (CDC) recommend routine vaccination against mumps virus using MMR (measles, mumps, rubella) vaccine. Recommendations for vaccination with MMR vaccine are detailed below. Please note that “MMR” will be used throughout this document to indicate vaccination with MMR, MMRV (measles, mumps, rubella, varicella), or any other approved mumps-containing vaccine.

Recommendations for Routine Vaccination with MMR (Measles, Mumps, Rubella) Vaccine

- **Children** should routinely receive two doses of MMR vaccine. The first dose should be administered at age 12-15 months and the second dose should be administered at age 4-6 years (at the time of school entry). The minimum recommended interval between doses is 28 days.

- **Adults** who do not have proof of immunity, as defined above, should receive one or two doses of MMR vaccine depending on their risk of infection. The minimum recommended interval between doses is 28 days.
 - Adults at high risk of infection (including health care personnel, college students and international travelers) should receive two doses of MMR vaccine.
 - Adults not at high risk of infection should receive at least one dose of MMR vaccine.

For more information on MMR vaccination regarding:

- The most current version of the Advisory Committee on Immunization Practices (ACIP) statement on measles, rubella, and mumps, see citation listed in the References section.
- Frequently asked questions about the MMR vaccine, see: <http://www.cdc.gov/vaccines/vpd-vac/combo-vaccines/mmr/faqs-mmr-hcp.htm>.
- The MMR Vaccine Information Statement (VIS), see: <http://www.cdc.gov/vaccines/pubs/vis/>.

A Mumps Public Health Fact Sheet for the general public can be obtained from the WDPH website at: <http://www.dhs.wisconsin.gov/immunization/mumps.htm>.

Section 2: REPORTING CRITERIA AND LABORATORY TESTING

A. What to Report to the Wisconsin Division of Public Health (WDPH)

Report any of the following:

- An individual with a suspected case of mumps, as diagnosed by a health care provider;
- Isolation of mumps virus from a clinical specimen;
- Detection of mumps nucleic acid from a buccal swab (e.g. standard or real time PCR assays);
- Significant rise (four-fold or greater) in serum mumps immunoglobulin G (IgG) antibody titer between acute and convalescent sera by any standard serologic assay; or
- Positive serologic test for mumps immunoglobulin M (IgM) antibody.

Note: See Sections 3B and 3C for information on how to report a case.

B. Specimen Collection and Laboratory Testing

What specimens should be collected for testing?

- **Buccal Swabs:** Buccal swabs are the preferred specimen for PCR testing for mumps and should be collected as soon as mumps is suspected (preferably within 3 days of parotitis onset and not after 9 days of parotitis onset) for the best chance of detection of virus. Massage the parotid gland area for 30 seconds, then swab the area around Stensen's duct. For specific instructions and illustrations of specimen collection, go to: <http://www.cdc.gov/mumps/lab/detection-mumps.html>.
- **Acute Serum:** Collect the first (acute-phase) serum as soon as mumps disease is suspected. A second serum for repeat IgM testing (collected 5-7 days after onset of parotitis) may be useful if the first serum is negative for IgM antibody to mumps and was collected within 3 days of parotitis onset in an unvaccinated person.
- **Convalescent Serum:** A second (convalescent-phase) serum specimen should be collected 2-3 weeks after the first serum.
- **Urine:** Not recommended.

Which tests should be ordered?

- PCR Testing: PCR is the preferred test for the diagnosis of mumps. It is used to detect the presence of mumps virus in buccal swab specimens. PCR can also be used for the molecular characterization of the virus.
- Mumps IgM Serology Testing: The detection of serum mumps IgM antibodies indicates recent mumps infection or recent mumps vaccination. However, false negative results among previously vaccinated persons may occur because IgM is rarely measurable in this population. False positives may occur with some commercial assays.
- Mumps IgG Serology Testing: A four-fold or greater rise in serum mumps IgG antibody level between acute and convalescent specimens indicates recent mumps infection. However, false negative results may occur among previously vaccinated persons because acute IgG titers may already be high.
- Mumps Culture Testing: Isolation of mumps virus is not recommended as a routine method to diagnose mumps, but virus isolates are extremely important for molecular epidemiologic surveillance to help determine the geographic origin of the virus and the viral strains circulating in the U.S.

Where should specimens be sent for testing?

- If the patient is suspected of having mumps, the specimens should be sent to the Wisconsin State Laboratory of Hygiene (WSLH) for testing. Note: The WSLH does not perform mumps IgM serology testing of acute serum or mumps virus culture. Aliquots of serum specimens will be forwarded to CDC for IgM and culture testing as appropriate.
 - More details about specimen collection, transport, and testing can be found at the WSLH website: <http://www.slh.wisc.edu/comdis/mumps.dot>.
 - Contact your local health department for details on fee-exempt testing (<http://www.dhs.wisconsin.gov/localhealth/counties/countyalphalist.htm>).
- If serum specimens were collected for immune status testing only, they should be sent to a commercial laboratory and only the IgG serology test should be ordered.

Negative results do not rule out mumps infection due to the following:

- The amount of virus shed at the time of sample collection may have been too low to be detected.
- Inadequate specimen collection, processing, shipping or storage can significantly reduce the likelihood of detecting mumps virus or mumps RNA.
- Mumps IgM antibody may be transient or undetectable in previously vaccinated individuals.
- The full clinical and epidemiologic picture must be taken into consideration when interpreting test results.

Section 3: REPORTING RESPONSIBILITIES AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify cases and susceptible exposed people rapidly to prevent further spread of the disease.
- To distinguish between failure to vaccinate and vaccine failure, and to address the problem.

B. Laboratory and Health Care Provider Reporting Requirements

Mumps is a Category II Reportable Disease according to WDPH regulations (DHS 145.04). Within 72 hours, health care providers should report the case to the local health department (LHD) online through the Wisconsin Electronic Disease Surveillance System (WEDSS) or by fax using an Acute and Communicable Disease Case Report ([F44151](#)).

Laboratories performing examinations on any specimens derived from Wisconsin residents that yield evidence of mumps infection should report the case to the local health department (LHD) online through the Wisconsin Electronic Disease Surveillance System (WEDSS) or by fax using an Acute and Communicable Disease Case Report ([F44151](#)).

LHD contact information can be found here:

<http://www.dhs.wisconsin.gov/localhealth/counties/countyalphalist.htm>.

C. Local Health Department (LHD) Reporting and Follow-up Responsibilities

Reporting Requirements

Each LHD must report any case of mumps or suspected case of mumps, as defined by the reporting criteria in Section 2A, to both of the following entities:

- WDPH regional immunization contact person, immediately by phone (<http://www.dhs.wisconsin.gov/immunization/regiondepts.htm>).
- WDPH, using the appropriate case report form in WEDSS.

Case Investigation

Below are questions the LHDs should ask the health care provider and patient at the start of the case investigation. LHDs should also gather all of the information necessary to complete the WEDSS case report form.

To assess the likelihood that a suspect case is a true case prior to laboratory testing, the LHD should ask about:

1. Clinical presentation, including date of onset of symptoms, particularly parotitis, duration of parotitis, and complications (e.g., meningitis, deafness, encephalitis, mastitis, or orchitis);
2. Mumps immunization history;
3. Country of origin and length of residence in U.S. (in order to assess history of disease and immunization status);
4. Recent history of travel (to where and dates);
5. Whether there were any recent out-of-town visitors (from where and dates);
6. Whether there was any recent contact with anyone with similar symptoms;
7. Risk factors for disease;
8. Possible transmission setting (e.g., childcare, school, health care setting); and
9. Laboratory information, including viral isolation and serologic test results.

Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LHD to understand, and if necessary, institute the control guidelines listed in Section 4.

Section 4: CONTROLLING FURTHER SPREAD

This section provides detailed control guidelines regarding how to control disease in a case-patient and protect contacts of a case-patient from becoming infected. The LHD will take the lead on implementing control measures, in collaboration with the WDPH.

A. Control of Disease in a Case

1. Implement control measures before laboratory confirmation. If the laboratory results are negative, the decision to continue control measures should be made in consultation with the treating physician, the LHD, and the WDPH.
2. Exclude and isolate the case-patient through 5 days after onset of parotitis, counting the day of swelling onset as day zero. The case-patient may return to normal activities on the 6th day.
3. Gather information from the case-patient about possible sources of his/her infection, such as
 - a. Contact with a known or suspect case of mumps, and
 - b. Travel during the 12–25 days prior to disease onset.
4. Investigate by asking the case-patient other questions as outlined in Section 3C.

B. Protection of Contacts of a Case

1. Define the dates during which the case-patient was infectious, using the standard mumps infectious period described in Section 1F. (Persons with mumps are usually considered infectious from 2 days before through 5 days after onset of parotid swelling. The initial day of swelling should be counted as day zero.)
2. Identify all individuals who were exposed to the case-patient during the case-patient's infectious period. Exposure is considered to be contact within 3 feet of droplets from nasal or oral secretions or direct contact with saliva. To identify the exposed individuals, hereafter referred to as "contacts" of the case-patient, consider members of the following groups: household members; classmates; coworkers; staff and patients at the medical facility where the patient was seen; religious/social groups; sports teams and other extracurricular groups; bus/carpool mates; close friends; etc.
3. Identify contacts who are at high risk of mumps infection and ensure that they are properly referred:
 - a. Pregnant women should be referred to their obstetricians for screening and management. (Particularly in childcare or school settings, remember to determine whether any teachers, student teachers, staff, or students are pregnant.)
 - b. Immunosuppressed individuals should be referred to their health care providers.
 - c. Infants <12 months of age should be referred to their pediatricians.
4. Identify contacts who are susceptible to mumps infection. These are individuals without proof of immunity, including those with medical or religious exemptions to immunization. Proof of immunity is defined as:

Proof of Immunity to Mumps

Individuals meeting one of the criteria below are considered immune to mumps:

- Birth before January 1, 1957 (unless health care personnel)
OR
- Serologic proof of immunity
OR
- Documentation of adequate vaccination with live mumps vaccine:
 - one dose for preschool-aged children and adults not at high risk of infection
 - two doses for school-aged children (grades K-12) and for adults at high risk (health care personnel, international travelers, and students at post-high school educational institutions)

5. Immunize all who do not have proof of immunity to mumps who are ≥ 12 months of age and who do not have a contraindication for mumps vaccination. Note: Vaccination is not expected to prevent illness or development of disease after infection in someone recently exposed to mumps. Exposed individuals should be vaccinated to protect against subsequent exposures.
6. Keep in mind the following:
 - a. MMR should not be given to children < 12 months of age.
 - b. Vaccinating an exposed individual who may be incubating mumps virus is not harmful.
 - c. The minimum recommended interval between doses of MMR is 28 days.
 - d. Immune globulin (IG) is of no value as post-exposure prophylaxis and is not recommended.
7. In the school setting, exclude school-aged contacts from school and public activities according to the following guidelines (requirements for health care personnel are more rigorous. See Section 4C for more details):
 - a. Individuals with zero doses of mumps-containing vaccine should be excluded from school. Individuals who receive their first dose of mumps-containing vaccine post-exposure may be readmitted to school.
 - b. Individuals with one dose of mumps-containing vaccine should be recommended to receive a second dose of mumps-containing vaccine. Those who do not receive a second dose may be subject to exclusion.
 - c. Exclude all remaining susceptible persons (including those with medical or religious exemptions) on days 12–25 after exposure, or if there are multiple cases, for 25 days after onset of parotitis in the last reported case in the outbreak setting. They may return on the 26th day.
8. Ideally, in the work setting (non-health care) also exclude contacts from work and public activities according to the following guidelines:
 - a. Individuals with zero doses of mumps-containing vaccine should be excluded from work. Individuals who receive their first dose of mumps-containing vaccine post-exposure may be readmitted to work.

- b. Individuals with one dose of mumps-containing vaccine should be recommended to receive a second dose of mumps-containing vaccine and are allowed to remain at work regardless of receipt of a second dose.
 - c. Exclude all remaining susceptible persons (including those with medical or religious exemptions) on days 12–25 after exposure, or if there are multiple cases, for 25 days after onset of parotitis in the last reported case in the outbreak setting. They may return on the 26th day.
9. Conduct active surveillance for mumps for two incubation periods (50 days) after onset of the last case.

C. Managing Mumps in Health Care Settings

1. Assess immune status of health care personnel (HCP). HCP (regardless of age) are considered immune by any *one* of the following:
 - a. Laboratory evidence of immunity, i.e., a positive IgG antibody titer; or
 - b. Documentation of two doses of a mumps-containing vaccine given after the age of 12 months and at least 28 days apart.
2. Vaccinate susceptible, medically eligible HCP with a mumps-containing vaccine.
 - a. The second dose must be given at least 28 days after the first dose.
 - b. Because tests for immunity following vaccination may not detect low levels of protective IgG antibody, post-vaccine antibody tests to assess vaccine effectiveness are not recommended.
3. Exclude HCP with active mumps illness.
 - a. All HCP should report any signs and symptoms of mumps, regardless of immune status.
 - b. HCP with active mumps illness should be excluded from work and remain on home isolation until 5 days after onset of parotitis or other illness onset if parotitis does not occur.
 - c. While positive laboratory results can confirm mumps infection, negative results cannot rule out mumps, and therefore cannot be the basis for removing a symptomatic HCP from isolation.
 - d. A diagnosis of mumps should be considered in an exposed HCP with non-specific respiratory illness, even in the absence of parotitis.
4. Exclude susceptible HCP exposed to cases of mumps.
 - a. An exposure is defined as being within 3 feet of someone with mumps in which either the HCP were not wearing a surgical or procedural mask or the infected person was not wearing a surgical or procedural mask.
 - b. HCP should be excluded from work from day 12 after the first exposure through day 25 after the last exposure. Exclusion from other public activities during this time period is recommended.
 - c. HCP who receive their first dose of vaccine after an exposure are not considered immune and still need to be excluded from work from days 12 through 25 following exposure, since post-exposure vaccination does not prevent mumps disease in the exposed person. See Table 1 below. Exclusion from other public activities during this time period is recommended.

- d. HCP who have received one dose of vaccine prior to exposure do not need to be furloughed or quarantined after exposure but should receive a second dose as soon as possible (no sooner than 28 days after the first dose), and should be monitored for signs and symptoms of mumps illness. See Table 1 below.

Table 1. Assessing Immunity/Susceptibility to Mumps among Exposed Health Care Personnel, by Number of Doses Received of Mumps-Containing Vaccine

Number of Pre-Exposure Doses of Mumps-Containing Vaccine	Number of Post-Exposure Doses of Mumps-Containing Vaccine	Considered Immune/Susceptible to Mumps
0	0	Susceptible
0	1	Susceptible
1	0	Susceptible
1	1	Immune
2	0	Immune

5. Emphasize use of appropriate infection control measures of affected patients.
- All patients presenting with signs and symptoms of mumps should be managed with droplet (use of surgical or procedural mask when within 3 feet of the patient) and standard precautions.
 - Inpatients suspected of having mumps should be placed on droplet precautions in addition to standard precautions for 5 days after onset of parotitis.
6. Conduct active surveillance for mumps for two incubation periods (50 days) after onset of the last case.

ADDITIONAL INFORMATION

The following is the formal Centers for Disease Control and Prevention (CDC) surveillance case definition for mumps. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the WDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting to the WDPH, always use the criteria outlined in Section 2A.

Note: The most up-to-date CDC case definitions are available on the CDC website at: http://www.cdc.gov/nceh/diseases/nndss/casedef/case_definitions.htm.

Case Definition for Mumps (As Defined by CSTE, 2008)

Clinical Case Definition

An illness with acute onset of unilateral or bilateral tender, self-limited swelling of the parotid or other salivary gland(s), lasting ≥ 2 days and without other apparent cause.

Clinically Compatible Illness

Infection with mumps virus may present as aseptic meningitis, encephalitis, hearing loss, orchitis, oophoritis, parotitis or other salivary gland swelling, mastitis or pancreatitis.

Laboratory Criteria for Diagnosis

- Isolation of mumps virus from clinical specimen, or
- Detection of mumps nucleic acid (e.g., standard or real time RT-PCR assays), or
- Detection of mumps IgM antibody, or
- Demonstration of specific mumps antibody response in absence of recent vaccination, either a four-fold increase in IgG titer as measured by quantitative assays, or a seroconversion from negative to positive using a standard serologic assay of paired acute and convalescent serum specimens.

Case Classification

Confirmed

A case that 1) meets the clinical case definition or has clinically compatible illness, and 2) is either laboratory confirmed or is epidemiologically linked to a confirmed case.

Probable

A case that meets the clinical case definition without laboratory testing and is epidemiologically-linked to a clinically compatible case.

Suspect

A case with clinically compatible illness or meets the clinical case definition without laboratory testing, or a case with laboratory tests suggestive of mumps without clinical information.

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Mumps

LHD Action Steps

This form does not need to be submitted to the WDPH with the case report form. It is for LHD use and is meant as a quick-reference guide to mumps case investigation activities.

LHD staff should follow these steps when mumps is suspected or confirmed in the community. For more detailed information, including disease epidemiology, reporting, case investigation, and follow-up, refer to the preceding chapter.

Reporting

- Immediately notify, by telephone, the WDPH Regional Immunization Representative, (<http://www.dhs.wisconsin.gov/immunization/regiondepts.htm>) to report any confirmed or suspect case(s) of mumps.
- Enter all known information on the case into the Wisconsin Electronic Disease Surveillance System (WEDSS).

Case Investigation

- Ensure that appropriate clinical specimens are collected and submitted to the WSLH.
- Obtain the information necessary for completion of the case report form in WEDSS, including source of exposure, clinical information, vaccination history, laboratory results, and source of infection.

Prevention and Control

- Institute isolation requirements as they apply to a particular case.
- Identify high-risk and susceptible individuals, including those with medical or religious exemptions.
- Vaccinate susceptible individuals with mumps-containing vaccine (if not contraindicated). MMR vaccine is preferred.
- Conduct surveillance for two incubation periods (50 days) after onset of the last case.

Managing Mumps in Schools and Other Non-Health Care Settings

In addition to the prevention and control measures described above:

- Notify and educate staff or students.
- Test and exclude symptomatic individuals.
- Isolate remaining susceptible contacts (in some settings, susceptibles may be readmitted if they receive post-exposure vaccination.)

Managing Mumps in Health Care Settings

In addition to the prevention and control measures described above:

- Notify infection control or employee health of confirmed or suspect case(s) in institution.
- Ensure all health care personnel have proof of immunity appropriate for health care setting.
- In health care settings, remaining susceptibles are not allowed to return until the end of the exclusion period (25 days after last exposure). See Table 1 below.

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0	1	Susceptible
1	0	Susceptible
1	1	Immune
2	0	Immune