

Mumps

Surveillance Protocol

Provider Responsibilities

1. Assure that healthcare workers who care for patients with mumps are immune to mumps by any of the following of the criteria:
 - a. Documentation of two doses of MMR vaccine at least one month apart on or after the first birthday, or
 - b. A positive IgG antibody test for mumps, or
 - c. Birth before 1957 except in an outbreak setting (use vaccine/antibody criteria)
2. Suspect mumps patients should be placed in isolation (droplet precautions) immediately. Isolation should be maintained for 5 days after the onset of parotitis.
3. Contact your local health department to coordinate testing of a suspected mumps case
4. **If testing is determined to be appropriate, collect a buccal swab.** The shipping of specimens to the Wisconsin State Laboratory of Hygiene should be coordinated through the West Virginia Office of Laboratory Services and the Division of Infectious Disease Epidemiology. Specimen submission form available at:
http://www.dhhr.wv.gov/oeps/disease/IBD_VPD/VPD/Documents/mumps/wv-mump-req.pdf
5. Report all suspected cases of mumps to your local health department immediately by phone and using the West Virginia Electronic Disease Surveillance System (WVEDSS) form available at:
http://www.dhhr.wv.gov/oeps/disease/IBD_VPD/VPD/Documents/Mumps_Case_Investigation_Form.pdf
6. Submit a copy of the laboratory report to the state via fax, mail or through WVEDSS.
7. For more information please see Mumps: A quick guide for practitioners at
http://www.dhhr.wv.gov/oeps/disease/IBD_VPD/VPD/Documents/Mumps_practitioner_guidance.pdf

Laboratory Responsibilities

- 1) Immediately notify the healthcare provider and the infection control practitioner of a positive laboratory result for mumps.
- 2) Immediately report a positive laboratory result of mumps to your local health department via fax or by phone; or West Virginia Division of Infectious Disease Epidemiology (DIDE) via fax at 304-558-8736.
- 3) CDC highly recommends testing a suspected symptomatic case of mumps by use of mumps viral isolation and serology. See: <http://www.cdc.gov/mumps/lab/specimen-collect.html> for detailed information.

Public Health Responsibilities

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- 1) Review the laboratory report of a suspect mumps case immediately upon receiving it, to see if PCR or viral culture was done. If not, **ensure appropriate testing is done by collecting buccal swab for mumps diagnosis** through the Wisconsin State Laboratory of Hygiene (please coordinate with DIDE and OLS).
- 2) Employees who will investigate a case of mumps should have:
 - a) Documentation of two doses of MMR vaccine at least one month apart on or after the first birthday, or
 - b) A positive IgG antibody test for mumps
- 3) Educate laboratories and providers to report a suspected case of mumps to your local health department immediately.
- 4) Educate providers and the general public about vaccination for mumps.
- 5) Investigate any suspected case of mumps immediately using the mumps WVEDSS form: http://www.dhr.wv.gov/oeps/disease/IBD_VPD/VPD/Documents/Mumps_Case_Investigation_Form.pdf The following components should be included in the case investigation:
 - a) Establish a diagnosis of mumps by using mumps case definition. Because clinical diagnosis of mumps may be unreliable, cases of mumps should be laboratory confirmed. Case definition can be found at: <https://wwwn.cdc.gov/nndss/conditions/case-definition/2012/>
 - b) Obtain accurate and complete immunization histories that document any doses of mumps-containing vaccine. Vaccination histories may be obtained from schools, medical providers or on immunization records provided by the patient. Verbal history of mumps vaccination is not considered adequate proof of vaccination.
 - c) Identify the source of infection for every confirmed case of mumps. Case-patients should be asked about contact with other known cases. When no history of contact with a known case can be elicited, opportunities for exposure to unknown cases should be sought. After determining when and where transmission likely occurred, investigative efforts should be directed to locations visited.
 - d) Assess potential transmission and identify contacts of the case-patient during the infectious period (2 days before and 5 days after onset of parotitis).
 - e) Assure that mumps viral isolation (buccal, nasopharyngeal or oropharyngeal swabs) are performed for all suspected mumps cases.
 - f) Document date of public health action in WVEDSS investigation.
- 6) Immediately identify all suspected or confirmed cases of mumps to initiate control

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measures to prevent the spread of the disease among susceptible persons.

- 7) Isolate (with droplet precautions) all symptomatic suspected mumps cases for five days after the onset of parotitis.
- 8) Notify your regional epidemiologist and DIDE immediately when you have a suspected case of mumps.
- 9) In a congregate setting such as a school or workplace, exclude persons without evidence of immunity* to mumps until:
 - a) They have received a dose of MMR or
 - b) At least 25 days have passed after the onset of parotitis in the last person with mumps.

*See Provider Responsibilities no. 1 for criteria regarding evidence of immunity

10) Immunization Recommendations:

- a) Counties without an outbreak: Absent contraindications, all persons should be immunized with the first dose of MMR on or after the first birthday. Adults should have one dose (birth before 1957 may be used as presumptive evidence of immunity). A second dose may be given at any time ≥ 4 weeks after the first dose. A second dose should be given to:
 - i) School children
 - ii) Persons in college or other training after high school
 - iii) Health care workers (birth before 1957 may be used as presumptive evidence of immunity)
- b) Counties with an outbreak (2 or more cases or one case in a congregate setting): Absent contraindications, all persons should be immunized with the first dose of mumps containing vaccine on or after the first birthday. Adults should have one dose (birth before 1957 is NOT considered evidence of immunity). A second dose of mumps containing vaccine may be given at any time ≥ 4 weeks after the first dose of mumps containing vaccine. A second dose of mumps containing vaccine should be given to:
 - i) School children
 - ii) Persons in college or other training after high school
 - iii) Health care workers (birth before 1957 is NOT considered evidence of immunity during an outbreak)

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- iv) Others should be offered a second dose of MMR as indicated by outbreak epidemiology, e.g. Children age 1-4 years; or Adults

Persons previously vaccinated with two doses of mump virus-containing vaccine who are identified by public health authorities as being part of a group or population at increased risk for acquiring mumps because of an outbreak should receive a third dose of a mumps virus-containing vaccine to improve protection against mumps disease and related complications

Note: In outbreak settings, conduct active (enhanced) surveillance for mumps for at least two incubation periods (50 days, two times the maximum incubation period) following onset of parotitis in the last case, in all affected areas for persons with parotitis or other salivary gland inflammation.

Disease Control Objectives

When a case is identified, prevent additional cases by:

- 1) Assuring the case is placed in droplet isolation until 5 days after the onset of parotitis.
- 2) Early identification and vaccination of close contacts to cases if needed.

Disease Prevention Objectives

Prevent cases of mumps by encouraging mumps vaccination of all susceptible individuals per the ACIP recommendations.

Disease Surveillance Objectives

- 1) To determine the incidence of mumps and complications of mumps in West Virginia;
- 2) To determine the number of laboratory confirmed cases reported in West Virginia;
- 3) To determine whether cases are due to failure to vaccinate or vaccine failure;
- 4) To identify sources and sites of transmission;
- 5) To monitor the effectiveness of outbreak control strategies.
- 6) To identify risk factors for infection.

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Public Health Significance

The number of reported mumps cases in the United States has decreased more than 99% since licensure of the mumps vaccine in 1967, from 152,209 cases in 1968 to 2,982 in 1985. During 1986-1987, a resurgence occurred with more than 20,000 mumps cases reported, mainly a result of low vaccination levels among adolescents and young adults. In the late 1980s and early 1990s, outbreaks were reported among highly vaccinated populations. In 2003, only 231 cases were reported, the lowest annual number since reporting began. In 2006, however, another resurgence occurred, with 6,584 cases reported. The incidence was highest among persons aged 18-24 years, many of whom were college students. Approximately 63% of the case-patients with known vaccination status had received two doses of MMR vaccine.

Mumps continues to be endemic globally. Mumps vaccine is routinely used in 57% of countries in the world. Importation of mumps into the United States is now increasingly recognized.

Clinical Description

Mumps usually involves pain, tenderness and swelling in one or both parotid salivary glands. Swelling is first visible in front of the lower part of the ear. Swelling then extends downward and forward as fluid builds up in the skin and soft tissue of the face and neck. Swelling usually peaks in 1-3 days and then subsides during the next week. The swollen tissue pushes the angle of the ear up and out. As swelling worsens, the angle of the jawbone (mandible) below the ear is no longer visible. On palpation, often the jawbone cannot be felt because of swelling of the parotid.

One parotid may swell before the other, and in 25% of patients, only one side swells. Other salivary glands (submandibular and sublingual) under the floor of the mouth also may swell but do so less frequently (10%).

Mumps infection is most often confused with swelling of the lymph nodes of the neck. Lymph node swelling can be differentiated by the well-defined borders of the lymph nodes, their location behind the angle of the jawbone, and lack of the ear protrusion or obscuring of the angle of the jaw, which are characteristics of mumps.

The most common symptoms of mumps are fever, headache, myalgia, anorexia, and malaise followed by onset of parotitis (the classic symptom) which may be unilateral, or more commonly bilateral. Fever lasts 1-6 days, but parotitis may persist 10 days or longer. Up to half of infections in some studies have been associated with nonspecific or primarily respiratory symptoms.

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Complications and Unusual Presentations

More than 50% of cases of clinical mumps, cerebrospinal fluid (CSF) pleocytosis occurs. However, clinical evidence of central nervous system infection appears in < 10% of patients with mumps. Serious sequelae are rare. For example, deafness after mumps occurs in 0.5 to 5.0 per 100,000 cases. Death occurs in < 2% of mumps encephalitis cases.

Orchitis is a common complication after puberty, occurring in up to 37% of cases in post-pubertal males, but sterility rarely occurs. One or both testes may be involved, with lower abdominal pain, fever, and chills and possibly epididymitis. The involved testis and adjacent skin become swollen and red. Orchitis occurs within 1 week of parotitis and usually lasts 4 days.

Oophoritis occurs in 5% of post pubertal females with mumps and is characterized by pelvic pain and tenderness. Infertility generally does not occur. Mastitis may also occur.

Less common complications of mumps infection include pancreatitis, glomerulonephritis, myocarditis, arthritis, thyroiditis, thrombocytopenia, cerebellar ataxia, transverse myelitis, deafness, and spontaneous abortion. Patients with or without parotitis may develop complications of mumps.

Etiologic Agent

Mumps is caused by an RNA virus classified as a Rubulavirus of the Paramyxoviridae family.

Reservoir

Humans are the only known natural reservoirs.

Mode of Transmission

The virus is spread by mucus or droplets from the nose or throat of an infected person, usually when a person coughs or sneezes. It can also transmit through fomites such as toys.

Incubation Period

The incubation period is between 12 to 25 days, with an average of 16 to 18 days.

Period of Communicability

Maximum infectiousness occurs between 2 days before to 5 days after onset of parotitis.

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Outbreak Recognition

An outbreak may be defined as two or more cases in a county or one or more cases in a congregate setting (such as school or workplace).

Case Definition

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).

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.

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

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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.

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Comment

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.

States may also choose to classify cases as “out-of-state-imported” when imported from another state in the United States. For national reporting, however, cases will be classified as either internationally imported or U.S-acquired.

Laboratory Diagnosis

- 1) Specific laboratory diagnosis should be sought in all cases of suspected mumps. Viral parotitis can also be caused by Epstein –Barr virus, coxsackievirus and other enteroviruses, lymphocytic choriomeningitis virus and influenza A and parainfluenza viruses. Acute suppurative parotitis can be caused by *Staphylococcus aureus*, *Streptococcus* species, anaerobes and gram negative rods.
- 2) The gold standard for mumps diagnosis is cell culture isolation from buccal swabs.

Interpretation of laboratory results

- 1) A positive mumps viral culture or a positive mumps RT-PCR from any site from a person with acute illness consistent with mumps confirms the diagnosis of mumps.
- 2) Interpretation of serological results is problematic in the patient with a history of immunization or disease because IgM antibody may be absent or decreased, and the rise in IgG antibody may occur too rapidly for detection. With previous contact with mumps virus either through vaccination (particularly with 2 doses) or natural infection, serum mumps IgM test results may be negative; IgG test results may be positive at initial blood draw and viral detection in RT-PCR or culture may have low yield. 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.
- 3) Presence of mumps IgM antibody is useful in persons without a history of immunization or disease. If the acute IgM is positive, a convalescent specimen is not necessary. If the acute IgM is negative, a second serum specimen should be collected

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approximately 2-3 weeks later. The convalescent specimen should be tested for IgM, as well as IgG paired with the acute specimen.

- 4) In the absence of recent vaccination, a four-fold increase in IgG titer as measured by quantitative assays, or a seroconversion from negative to positive using a standard serologic assay on acute to convalescent serum specimens is considered a positive diagnostic result for mumps.

Specimen collection

Collect buccal swab and throat (nasopharyngeal or oropharyngeal) swabs on all patients. The specimen that will be positive will depend on the stage of infection.

- o Buccal Swab or Throat Swab specimens: Specimens should be collected as soon as mumps is suspected, for RT-PCR detection or isolation (i.e. viral culture) of mumps virus. The preferred viral specimen is a parotid (or the other salivary gland) duct swab, following massage of the salivary glands for 30 seconds. Use a plain Dacron swab or a commercial product designed for collection of throat cultures (Do not use cotton swabs which may contain substances that are inhibitory to enzymes used in RT-PCR). Collect a specimen from the buccal area of the mouth. This is between the cheek area opposite the molars or where the molars should be. Place swab in a tube containing 2-3 mls of viral transport medium or cell culture medium (MEM or Hanks Balanced Salt Solution) or other sterile isotonic solution (phosphate buffered saline). Label and place specimen on ice (keep it cold (4°C)). A buccal specimen should be collected as close to symptom onset as possible, preferably within 1-3 days of onset of parotitis.

Specimen transport

- Coordinate the shipping of specimens through the Office of Laboratory Services
- Prior to shipping specimens, the submitting laboratory (OLS) should notify the Wisconsin State Laboratory at 608-262-6386 during normal working hours or at 608-263-3280 after normal working hours.
- Complete a specimen collection form, available at:
http://www.dhhr.wv.gov/oeps/disease/IBD_VPD/VPD/Documents/mumps/wv-mump-req.pdf
- If specimen can be received at Wisconsin State Laboratory *within 24 hours*: ship all specimens together on cold packs.
- If specimen *cannot be received within 24 hours*: Freeze specimens for viral culture at -70°C and ship on dry ice.

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Preventive Interventions

- 1) All healthcare workers should be immune to mumps.
- 2) If a healthcare worker is exposed to a case of mumps (exposure is defined as any exposure within 3 feet of a patient with mumps):
 - a) For all Exposed healthcare workers (regardless of immune status):
 - i) Monitor for symptoms (parotitis) during the 12 to 25 days after exposure.
 - ii) If symptoms develop, exclude from work until 5 days after development of parotitis.
 - b) For Exposed SUSCEPTIBLE healthcare workers, evaluate the following:
 - i) One dose of MMR prior to exposure: May continue to work, but should receive a second dose as soon as possible and at least 28 days after the first dose.
 - ii) No documentation of MMR vaccine prior to exposure: Furlough from the 12th day after the first exposure through the 25th day after the last exposure or, if symptoms develop, until 5 days after the onset of parotitis. These workers may subsequently return to work after one dose of MMR but should receive a second dose 28 days after the first dose.
 - iii) Consider the diagnosis of mumps if non-specific respiratory symptoms develop during 12 to 25 days after exposure.
- 3) Infection Control
 - a) Mumps is spread by airborne, droplet spread and direct contact with saliva. Persons with suspect or confirmed mumps should be placed in droplet precautions through 5 days after onset of parotid swelling.
- 4) Management of contacts in congregate setting (see public health responsibility no. 9)
- 5) Immunization Recommendations (See public health responsibility no. 10)

Surveillance Indicators

1. Proportion of cases with complete demographic data.
2. Proportion of mumps cases with complete vaccination history.
3. Proportion of mumps cases for which appropriate clinical specimens were obtained and submitted to the laboratory.
4. Proportion of cases with complete clinical information
5. Proportion of cases with complete information on transmission setting.

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6. Proportion of cases with complete epidemiologic information, including whether case is epi-linked to another case, whether the case is part of an outbreak, and whether contact tracing has been completed.
7. The interval between date of symptom onset and date of public health notification.
8. Proportions of reports with timely initiation of control measures.

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References

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Websites <http://www.cdc.gov/vaccines/vpd-vac/mumps/default.htm>
<http://www.cdc.gov/mumps/lab/specimen-collect.html>

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