Prior to vaccine availability, mumps was widespread. Following vaccine licensure, reported mumps decreased rapidly, from an estimated 212,000 cases in the US in 1964 to approximately 3,000 cases reported in 1983–85. There was a peak resurgence of mumps in 1987, but mumps has steadily declined since 1989 in the US. Even with the decline in reported cases, there have still been large outbreaks in settings with close person to person contact including sports teams, colleges and universities, religious communities, and other close-knit communities. In 2006, a multi-state mumps outbreak in the Midwest resulted in more than 6500 reported cases, mostly among college students. During 2009–10, a mumps outbreak in the Northeast resulted in over 3,500 reported cases, mostly among members of a close, religious community. In 2014, an outbreak affected the National Hockey League. Additional outbreaks reported in 2015–17 affected university campuses and close-knit communities across the United States.

A. Agent:
Mumps is an enveloped RNA virus with 12 genotypes in the genus *Rubulavirus* in the family Paramyxoviridae. The genus also includes human parainfluenza virus types 2 and 4. Other common infectious causes of parotitis include Epstein-Barr virus, cytomegalovirus, parainfluenza virus types 1 and 3, influenza A virus, enteroviruses, lymphocytic choriomeningitis virus, human immunodeficiency virus (HIV), nontuberculous mycobacterium, and gram-positive and gram-negative bacteria.

B. Clinical Description:
Persons with mumps may be asymptomatic or have mild symptoms. Parotitis is the predominant symptom and may occur unilaterally or bilaterally, and may involve single or multiple salivary glands. Parotitis may be preceded by a nonspecific prodrome of low-grade fever, malaise, myalgia and headache. Mumps is the only known cause of epidemic parotitis. Mumps should be considered in the differential diagnosis of patients presenting with parotitis or swelling of the salivary glands, regardless of vaccination history.

C. Reservoirs:
The virus is only spread by humans.

D. Mode of Transmission:
Mumps is transmitted through direct or droplet contact with respiratory secretions of an infected person.

E. Incubation Period:
The incubation period is usually 16–18 days, but can range from 12–25 days.

F. Period of Communicability:
Individuals with mumps are considered infectious from 2 days before to 5 days after onset of parotitis. Virus has been isolated 7 days before the onset of parotitis up to 14 days after.

G. Susceptibility and Resistance:
Immunity is lifelong and occurs after both subclinical and clinical infections. Mumps vaccine effectiveness for one dose is estimated to be a median of 78% (range: 49–91%) and for two doses
estimated to be a median of 88% (range: 66–95%)\textsuperscript{1}. Persons born before 1957 can be considered immune to mumps\textsuperscript{1}. Two doses of MMR are recommended at 12–15 months and 4–6 years\textsuperscript{1}.

MMR efficacy\textsuperscript{1}:

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<tr>
<td>78% immune after 1 dose</td>
<td>88% immune after 2 doses</td>
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</table>

H. Treatment:
Treatment is supportive\textsuperscript{4}.

I. Clinical Case Definition\textsuperscript{5}:
The clinical case definition requirements vary for each of the case classification categories. See the case classifications below.

J. Laboratory Criteria for Diagnosis\textsuperscript{5}:

**Confirmatory Testing**
- Isolation of mumps virus from clinical specimen, OR
- Detection of mumps nucleic acid via reverse transcriptase polymerase chain reaction (RT-PCR)

**Presumptive Testing**
- Detection of serum mumps IgM antibody

### Case Classification\textsuperscript{5}

<table>
<thead>
<tr>
<th><strong>Confirmed</strong></th>
<th>A case with confirmatory laboratory results and an acute illness characterized by any of the following:</th>
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<tbody>
<tr>
<td></td>
<td>- Acute parotitis or other salivary gland swelling, lasting at least 2 days</td>
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<tr>
<td></td>
<td>- Aseptic meningitis</td>
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<tr>
<td></td>
<td>- Encephalitis</td>
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<tr>
<td></td>
<td>- Hearing loss</td>
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<tr>
<td></td>
<td>- Orchitis</td>
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<tr>
<td></td>
<td>- Oophoritis</td>
</tr>
<tr>
<td></td>
<td>- Mastitis</td>
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<tr>
<td></td>
<td>- Pancreatitis</td>
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<tr>
<th><strong>Probable</strong></th>
<th>Acute parotitis or other salivary gland swelling lasting at least 2 days, or orchitis or oophoritis unexplained by another more likely diagnosis, in:</th>
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<tr>
<td></td>
<td>- A person with positive presumptive laboratory results, OR</td>
</tr>
<tr>
<td></td>
<td>- 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.</td>
</tr>
</tbody>
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<tr>
<th><strong>Suspect</strong></th>
<th>Parotitis, acute salivary gland swelling, orchitis, or oophoritis unexplained by another more likely diagnosis, OR</th>
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<tbody>
<tr>
<td></td>
<td>A positive lab result with no mumps clinical symptoms (with or without epidemiological-linkage to a confirmed or probable case).</td>
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</table>

K. Classification of Import Status\textsuperscript{5}:

**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 U.S. during the 25 days before onset of parotitis or other mumps-associated complications or was known to have been exposed to mumps within the U.S. 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 U.S. 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 \(\geq 12\) 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 \(\geq 12\) months within the U.S.
- **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.

*Internationally imported, import-linked, and imported-virus cases are considered collectively to be import-associated cases.*

**L. Laboratory Testing**: Collect specimens for serology or PCR to be sent to the Arizona State Public Health Lab for testing based on time from symptom onset to specimen collection. Buccal swab and urine specimens should be collected at initial presentation.

<table>
<thead>
<tr>
<th>TEST</th>
<th>SPECIMEN TYPE</th>
<th>COLLECTION TIME</th>
</tr>
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</table>
| IgM  | Serum         | • In unvaccinated persons, it’s detectable within 5 days after onset of symptoms and peaks about 1 week after onset; will remain elevated for several weeks.  
|      |               | • In vaccinated persons, the timing of the IgM response to mumps infection is highly variable and may be absent, delayed, or transient and easily missed (false-negative). |
| PCR  | Urine & Buccal swab | ≤8 days after parotitis onset |

**M. Assessing Laboratory Results**: Results should be interpreted in lieu of the epidemiologic evidence available. False positive IgM results can occur when IgM tests are ordered in the absence of clinical symptoms or soon after vaccination. The IgM test has also been shown to cross-react with antibodies to other organisms. Specimens should be collected as soon as possible on all suspected mumps cases to confirm the presence of the virus. A person with previous vaccination or mumps illness may have a false negative result on IgM. Viral detection through PCR or viral culture may be negative if specimens were collected more than three days after parotitis onset. Travel history is important to consider when triaging potential cases. Positive results at a commercial lab should be sent to the Arizona State Public Health Laboratory for confirmatory testing and potential forwarding to CDC. For high
suspect cases, additional specimen collection may be necessary if the original specimen is no longer available.

N. Outbreak Definition:
An outbreak is defined as ≥ 2 cases (epi-link outside household or common exposure source/setting), occurring within a 25-day period.

O. Time Frame:

<table>
<thead>
<tr>
<th>Providers</th>
<th>Submit a report to the Local Health Department within 1 working day after a case or suspect case is diagnosed, treated, or detected.</th>
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<tbody>
<tr>
<td>Schools, Childcare establishments, Shelters</td>
<td>Submit a report to the Local Health Department within 24 hours after detecting a case or a suspect case.</td>
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</table>
| Laboratories                  | - Submit a report to ADHS within 1 working day after obtaining a positive test result.  
- Submit an isolate or specimen, for each positive culture or test result, to ASPHL within 1 working day.  
- Report results of all other tests performed for the subject as part of the disease panel or as a reflex test to ADHS, when reporting a positive result for any of the specified tests. |
| Local Health Agencies         | - Notify ADHS within 1 working day after receiving a report.  
- Submit an epidemiologic investigation report to ADHS within 30 calendar days after receiving a report.  
- Ensure that specimens from a case as specified by ADHS are submitted to ASPHL within 1 working day. |

Q. Investigation Steps:
For a local health agency:

A.A.C. R9-6-359. Mumps
A. Case control measures:
   1. A local health agency shall:
      a. Upon receiving a report under R9-6-202 or R9-6-203 of a mumps case or suspect case, notify the Department within 1 working day after receiving the report and provide to the Department the information contained in the report;
      b. Conduct an epidemiologic investigation of each reported mumps case or suspect case;
      c. For each mumps case, submit to the Department, as specified in Table 2.4, the information required under R9-6-206(D); and
      d. Ensure that one or more specimens from each mumps case or suspect case, as required by the Department, are submitted to the Arizona State Laboratory.

B. Contact control measures:
   1. A local health agency shall determine which mumps contacts will be:
      a. Quarantined or excluded, according to R9-6-303, to prevent transmission; and
      b. Advised to obtain an immunization against mumps.
Confirm Diagnosis

- Before contacting the patient or family, determine what information is available from medical records, physician, etc.
- For hospitalization, obtain medical records, including admission notes, progress notes, lab report(s), and discharge summary.
- Obtain information that supports clinical findings in the case definition and information on symptom onset (e.g., duration of parotitis).
- Obtain information on any laboratory tests performed and results or date results are expected.
- Obtain accurate and complete immunization histories on cases. Collect vaccine information, including:
  - Dates of vaccination, type, vaccine lot number, manufacturer, number of doses, and why case was not vaccinated (if applicable).

Conduct Case Investigation

- Epidemiological investigation report should be submitted in MEDSIS by filling out the full DSO.
  - Identify potential source of infection; focus on incubation period of 12–25 days prior to parotitis onset.
- Known exposure to another potential case within incubation period. Obtain:
  - Name, date of birth, contact information, dates of exposure, relationship to case, and transmission setting.
- Travel history should be captured in the travel table in MEDSIS including dates of travel.

Conduct Contact Investigation

- Consider those in contact with case 2 days before to 5 days after onset of parotitis.
- Presumptive evidence of immunity includes at least one of the following:
  - Written documentation of adequate vaccination:
    - Receipt of one or more doses of a measles-containing vaccine administered on or after the first birthday for preschool-age children and adults not at high risk; OR
    - Receipt of two doses of measles-containing vaccine for school-age children and adults at high risk for exposure transmission (i.e., health care personnel, international travelers, and students at post-high school educational institutions); OR
  - Birth before 1957*; OR
  - Laboratory evidence of immunity; OR
  - Laboratory confirmation of disease.

*Although birth before 1957 is considered as presumptive evidence of immunity, for unvaccinated HCP born before 1957 that lack laboratory evidence of measles immunity or laboratory confirmation of disease, health care facilities should consider vaccinating personnel with two doses of MMR vaccine at the appropriate interval.

- Identify high-risk susceptible contacts of the case during the infectious period:
  - Pregnant women should be referred to their obstetrician.
  - Immunosuppressed individuals – referred to their health care provider.
  - Infants <12 months of age – referred to their pediatrician.
- Follow-up on symptomatic contacts as cases.

Initiate Control and Prevention Measures

- Exclude cases from work and/or school/child care for 5 days from the onset of parotitis.
- Provide education that includes basic information about the disease, its complications and ways to prevent transmission of illness, including instructions on the necessary isolation measures for cases.
- Ensure individuals without presumptive evidence of immunity are vaccinated.
▪ If needed, work with appropriate administrative personnel to initiate work and school restrictions for cases and/or contacts without presumptive evidence of immunity.
▪ Follow-up with cases and contacts to assure compliance with work and/or school restrictions.
▪ Initiate active surveillance for a period of 25 days after the last known exposure to a case.
▪ Counsel contacts to watch for signs or symptoms of mumps occurring within 25 days of exposure. Should symptoms develop, medical care should be sought promptly and appropriate specimens collected.

Isolation, Work and Child Care Restrictions

For a school or child care establishment:

A.A.C. R9-6-359. Mumps
A. Case control measures:
   1. An administrator of a school or child care establishment, either personally or through a representative, shall:
      a. Exclude a mumps case from the school or child care establishment for five calendar days after the onset of glandular swelling; and
      b. Exclude a mumps suspect case from the school or child care establishment and from school- or child-care-establishment-sponsored events until evaluated and determined to be noninfectious by a physician, physician assistant, registered nurse practitioner, or local health agency.

B. Contact control measures:
   1. When a mumps case has been at a school or child care establishment, the administrator of the school or child care establishment, either personally or through a representative, shall:
      a. Consult with the local health agency to determine who shall be excluded and how long each individual shall be excluded from the school or child care establishment, and
      b. Comply with the local health agency’s recommendations for exclusion.

For a health care provider or an administrator of a health care institution:

A.A.C. R9-6-359. Mumps
A. Case control measures:
   1. A diagnosing health care provider or an administrator of a health care institution, either personally or through a representative, shall isolate and institute droplet precautions with a mumps case for five calendar days after the onset of glandular swelling.
   2. An administrator of a health care institution, either personally or through a representative, shall exclude a mumps:
      a. Case from working at the health care institution for five calendar days after the onset of glandular swelling; and
      b. Suspect case from working at the health care institution until evaluated and determined to be noninfectious by a physician, physician assistant, registered nurse practitioner, or local health agency.

B. Contact control measures:
   1. An administrator of a health care institution shall ensure that a paid or volunteer full-time or part-time worker at a health care institution does not participate in the direct care of a mumps case or suspect case unless the worker is able to provide evidence of immunity to mumps through one of the following:
      a. A record of immunization against mumps with two doses of live virus vaccine given on or after the first birthday and at least one month apart; or
      b. A statement signed by a physician, physician assistant, registered nurse practitioner, state health officer, or local health officer affirming serologic evidence of immunity to mumps.
### Case Management
- Case isolation inside a household is not usually feasible, but cases should still refrain from contact outside of the household for five days from the onset of parotitis.
- Follow-up to ensure compliance with control measures.

### Contact Management, including Susceptible Contacts
- Recommend immunization to all susceptible contacts immediately. Mumps vaccination has not been shown to be effective in preventing mumps in persons already infected but will prevent infection from subsequent exposures.
- Immune globulin (IG) is of no value as post-exposure prophylaxis and is not recommended.
- Follow-up of contacts that have been excluded from child care, school, or work to determine compliance of control measures.
- Monitor household and other close susceptible contacts for symptoms for 25 days after onset of the case, even if immunized after contact, as new cases might still occur.
- Symptomatic contacts meeting the clinical case definition are probable cases; investigate and report to ADHS; initiate any restrictions.

### Notifications
- ADHS and the local health department will jointly decide whether to send a health alert notice to providers, create a press release, or provide other public notifications.
- As appropriate, use the notification letter(s) and the disease fact sheet to notify the case, contacts and other individuals or groups.
- ADHS is responsible for notifying CDC upon identification of a confirmed/probable case.
- ADHS is responsible for submitting information from the investigation form to CDC.

### R. Outbreak Guidelines:
Refer to the general outbreak guidelines section for general information on conducting an outbreak investigation.

### Third Dose of MMR for Outbreak Control:
CDC has published guidance for the use of a third-dose of MMR in specifically targeted populations for outbreak control. Targeted populations should include those identified by public health to be at increased risk of infection. Targeted populations may include:
- 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).
References


