Chapter 9: *Mumps*

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I. Disease Description

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Mumps is a viral illness caused by a paramyxovirus of the genus *Rubulavirus*. The classic symptom of mumps is parotitis, most commonly bilateral, which develops an average of 16 to 18 days after exposure.[1] Nonspecific symptoms, including myalgia, anorexia, malaise, headache, and low-grade fever, may precede parotitis by several days. As many as 20% of infections are asymptomatic and nearly 50% are associated with nonspecific or primarily respiratory symptoms,[2] particularly among children less than 5 years.[3, 4] Hence, the diagnosis is easily missed.

Not all cases of parotitis—especially sporadic ones—are due to mumps infection. Parotitis can also be caused by parainfluenza virus types 1 and 3, Epstein Barr virus, influenza A virus, Coxsackie A virus, echovirus, lymphocytic choriomeningitis virus, human immunodeficiency virus, and other noninfectious causes such as drugs, tumors, immunologic diseases, and obstruction of the salivary duct. However, these agents do not produce parotitis on an epidemic scale.

The average incubation period for mumps is 16–18 days, with a range of 12–25 days.[5] Fever may persist for 3–4 days, and parotitis, when present, usually lasts 7–10 days. Persons with mumps are considered most infectious from 1–2 days before until 5 days after onset of parotitis.[6] However, mumps virus has been isolated from saliva from 7 days before symptom onset until 9 days after onset of symptoms.[2, 6]

Severe complications of mumps are rare. However, mumps can cause acquired sensorineural hearing loss in children; incidence is estimated at 5 per 100,000 cases. Mumps-associated encephalitis occurs in fewer than 2 per 100,000 cases, and approximately 1% of encephalitis cases are fatal.

Some complications of mumps are known to occur more frequently among adults than among children. Adults have a higher risk for mumps meningoencephalitis than children. In addition, orchitis occurs in up to 40% of cases in postpubertal males; although it is frequently bilateral, it rarely causes sterility. Oophoritis and mastitis have also been reported in approximately 5% and 30% of cases, respectively, in postpubertal female patients. Pancreatitis has also been reported as a rare complication of mumps.

Permanent sequelae such as paralysis, seizures, cranial nerve palsies, aqueductal stenosis, and hydrocephalus are rare, as are deaths due to mumps. Although some data suggest that mumps infection in the first trimester of pregnancy may result in fetal loss, there is no evidence that mumps during pregnancy causes congenital malformations.

II. Background

Mumps vaccine was licensed in the United States in 1967. The Advisory Committee on Immunization Practices (ACIP) made an official recommendation for one dose of mumps vaccine in 1977. In 1989, children effectively began receiving two doses of mumps vaccine because of the implementation of a two-dose measles vaccination policy using the combined measles, mumps, and rubella vaccine (MMR).

Following mumps vaccine licensure, reported mumps decreased steadily 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. The resurgence occurred mainly as a result of low vaccination levels among adolescents and young adults.[7] In the late 1980s and early 1990s, outbreaks were reported among highly vaccinated populations.[8, 9] In 1991, a mumps outbreak was sustained in a population where 98% of individuals had been vaccinated.[8] Between December 1997 and May 1998, a mumps outbreak occurred in New York City. Among the 111 case-patients with known vaccination history, 92% had received at least one dose of mumps-containing vaccine, and 62%

had received two or more doses.[10] In 2004, only 258 mumps cases were reported, the lowest annual number since reporting began. In 2006, however, another resurgence occurred, with approximately 6,500 cases reported. The incidence was highest among persons aged 18–24 years, many of whom were college students. Approximately 50% of the case-patients with known vaccination status had received two doses of MMR vaccine.[11]

Mumps continues to be endemic globally. Mumps vaccine is routinely used in 57% of countries or areas in the world.[12] Importation of mumps into the United States is now increasingly recognized.

III. Importance of Rapid Case Identification

Identification of suspected or confirmed cases of mumps is important in the initiation of control measures to prevent the spread of the disease among susceptible persons.

IV. Importance of Surveillance

Surveillance and prompt investigation of cases and contacts help to halt the spread of disease. Information obtained through surveillance is used to follow disease trends in the population, to assess progress towards disease reduction goals, and to characterize populations requiring additional disease control measures.

V. Disease Reduction Goals

The 338 reported cases of mumps in 2000 met the *Healthy People 2000* reduction goal of fewer than 500 cases. With this achievement, a goal of elimination of indigenous mumps by the year 2010 has been established.[13]

VI. Case Definition

The following case definition for mumps was approved by the Council of State and Territorial Epidemiologists (CSTE) in 2007.[14]

Clinical case definition:

- An illness with acute onset of unilateral or bilateral tender, self-limited swelling of the parotid and or other salivary gland(s), lasting at least 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

- 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 fourfold 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

Suspected: 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.

Probable: A case that meets the clinical case definition without laboratory confirmation and is epidemiologically linked to a clinically compatible case.

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.

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; 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.

Case classification for import status

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 subclassified 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.*

Comment: *Currently, there is insufficient information to determine whether any mumps strains are endemic to the United States or to distinguish endemic from non-endemic strains...*

Note: *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.*

VII. Laboratory Testing

Acute mumps infection can be laboratory confirmed by the presence of serum mumps IgM, a significant rise in IgG antibody titer in acute- and convalescent-phase serum specimens, positive mumps virus culture, or detection of virus by reverse transcriptase polymerase chain reaction (RT-PCR).

In 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.[16, 17] The timing of the IgM response to mumps infection in vaccinated persons is highly variable,[18] .

In unvaccinated persons, IgG antibody increases rapidly after onset of symptoms and is long-lasting. Among vaccinated persons, the IgG may already be quite elevated in the acute-phase blood sample, which may obviate the fourfold rise in IgG titer in the convalescent serum specimen.

Virus may be isolated from the buccal mucosa from 6 days before until 10 days after salivary enlargement. Maximal viral shedding, however, seems to occur during the first 5 days after onset of symptoms. Among vaccinated persons who become infected, isolation of virus from the buccal mucosa seems to be more likely within the first few days after the onset of symptoms.

Serologic testing

The serologic tests available for laboratory confirmation of mumps acute infection and immunity vary among laboratories. The state health department can provide guidance regarding available laboratory services.

- At the initial visit, a serum specimen should be obtained to test for mumps IgM antibodies.
- If the acute-phase specimen is positive for IgM, a second specimen is not necessary. If the acute-phase IgM result is negative, a second (convalescent) serum specimen could be collected 2–3 weeks after the onset of symptoms.
- The paired serum specimens may also be used to demonstrate a fourfold increase in IgG titer or a seroconversion from negative to positive from acute to convalescent, which is considered a positive diagnostic result for mumps. Prior immunologic experience with mumps, either from childhood disease or from vaccination, may be documented by the presence of serum IgG mumps-specific antibodies.

Tests for IgM antibody

Enzyme immunoassay (EIA) is a highly specific test for diagnosing acute mumps infection. At the direction of the state health department, healthcare providers and state and local health departments may send serum specimens from suspected mumps cases to the CDC Measles, Mumps, Rubella, and Herpes Laboratory Branch for IgM detection by EIA.

Immunofluorescence assay (IFA) assays have the advantage of being relatively inexpensive and simple. The reading of IFA-IgM tests requires considerable skill and experience since nonspecific staining may cause false-positive readings.

Note: *Commercially available IFA antibody assays and EIA kits for detection of mumps IgM are not currently FDA-approved. Therefore, each laboratory must validate these tests independently.*

Tests for IgG antibody

IgG tests can be performed in the state laboratory or at CDC. A variety of tests for IgG antibodies to mumps are available and include EIA, IFA, and plaque reduction neutralization. The specific criteria for documenting an increase in titer depend on the test.

IgG testing for laboratory confirmation of mumps requires the demonstration of seroconversion from negative to positive by EIA or a fourfold rise in the titer of antibody against mumps as measured in plaque-reduction neutralization assays or similar quantitative assays. The tests for

IgG antibody should be conducted on both acute- and convalescent-phase specimens at the same time. The same type of test should be used on both specimens. EIA values are not titers, and increases in EIA values do not directly correspond to titer rises.

Virus detection (RT-PCR and culture)

Mumps virus can be detected from fluid collected from the parotid duct, other affected salivary gland ducts, throat, urine, and cerebrospinal fluid (CSF). Parotid duct swabs yield the best viral sample. This is particularly true when the salivary gland area is massaged approximately 30 seconds prior to swabbing the buccal/parotid duct, so that the specimen contains the secretions from the parotid or other salivary duct glands. Efforts should be made to obtain the specimen as soon as possible after onset of parotitis or meningitis. Clinical specimens should ideally be obtained within 3 days of parotitis and should not be collected more than 10 days after parotitis onset.

Successful isolation should always be confirmed by immunofluorescence with a mumps-specific monoclonal antibody or by molecular techniques. Molecular techniques such as RT-PCR can also be used to detect mumps RNA directly for mumps confirmation in appropriately collected specimens.

Urine samples are less likely than oral specimens to contain sufficient virus copies or virus-infected cells for culture or detection by molecular methods, and therefore are not preferred.

Molecular typing provides important epidemiologic information and is now recommended.

Molecular typing provides important epidemiologic information and is now recommended. Molecular epidemiologic surveillance, (i.e., genotyping of virus) allows the building of a sequence database that will help track transmission pathways of mumps strains circulating in the United States. In addition, genotyping methods are available to distinguish wild-type mumps virus from vaccine virus.

Specific instructions for specimen collection and shipping may be obtained from the CDC mumps website [http://www.cdc.gov/nip/diseases/mumps/faqs-lab-spec-collect.htm#5034] or by contacting the CDC MMR and Herpes Virus Laboratory Branch at 404-639-1156 or 404-639-3512. Specimens for virus isolation and genotyping should be sent to CDC as directed by the state health department.

For additional information on use of laboratory testing for surveillance of vaccine-preventable diseases, see Chapter 22, "Laboratory Support for the Surveillance of Vaccine-Preventable Diseases."

VIII. Reporting

Each state and U.S. territory has regulations or laws governing the reporting of diseases and conditions of public health importance.[19] These regulations and laws list the diseases that are to be reported and describe those persons or groups responsible for reporting, such as healthcare providers, hospitals, schools, laboratories, daycare and childcare facilities, and other institutions. Persons reporting these conditions should contact their state health department for state-specific reporting requirements.

Reporting to CDC

A provisional report of probable and confirmed cases should be sent by the state health department to CDC via the National Notifiable Diseases Surveillance System (NNDSS). Electronic reporting of case records should not be delayed because of incomplete information or lack of confirmation. Following completion of case investigations, case records should be updated with any new information and resubmitted to CDC.

Information to collect

Basic demographic information (age, race, ethnicity, sex, county, and country of birth), date of onset of symptoms, and mumps vaccination history allow cases to be characterized and also allow identification of groups at increased risk of disease. In most states, resource limitations have prevented routinely conducting detailed case investigations or obtaining laboratory

confirmation of reported mumps cases. However, laboratory confirmation is important, particularly for sporadic cases, since not all cases with parotitis are due to mumps infection.[20] In cases for which laboratory testing is done, final laboratory results may not be available for the initial report but should be submitted via NNDSS when available.

The following data are epidemiologically important and should be collected in the course of case investigation. Additional information may be collected at the direction of the state health department.

- Demographic information
  - Name
  - Address
  - Date of birth
  - Age
  - Sex
  - Ethnicity
  - Race
  - Country of birth
  - Length of time in United States
- Reporting source
  - County
  - Earliest date reported
- Clinical
  - Date of illness onset, especially parotitis
  - Duration of parotitis
  - Symptoms
  - Parotitis or other salivary gland involvement (pain, tenderness, swelling)
  - Other symptoms (e.g., headache, anorexia, fatigue, fever, body aches, stiff neck, difficulty in swallowing, nasal congestion, cough, earache, sore throat, nausea, abdominal pain)
  - Complications
    - Meningitis
    - Deafness (transient or permanent)
    - Encephalitis
    - Orchitis
    - Oophoritis
    - Mastitis
    - Pancreatitis
  - Other
  - Hospitalization, reason/association to mumps, duration of stay
  - Outcome (patient survived or died)
  - Date of death
  - Postmortem examination results
  - Death certificate diagnoses
- Treatment
  - Medications given
  - Duration

- Laboratory
  - Serology (IgM, IgG)
  - Virus detection (PCR, culture)
  - Specimen collection date
- Vaccine information
  - Dates of mumps vaccination
  - Number of doses of vaccine given
  - Manufacturer of vaccine
  - Vaccine lot number
  - If not vaccinated, reason
- Epidemiologic
  - Epidemiologic linkages
  - Transmission setting (e.g., college, daycare, doctor's office)
  - Import status*
  - Source of exposure (country, if international import; state, if out-of-state import)
  - Travel history

** 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 symptoms) occurring outside the United States and symptom onset occurring within 25 days of entering the United States and there is no known exposure to mumps in the United States during that time.*

IX. Vaccination

Live attenuated mumps virus vaccine is incorporated with measles and rubella vaccine as a combined vaccine (MMR). With the use of MMR for measles vaccination under the currently recommended two-dose schedule, most children and adolescents receive two doses of mumps vaccine. The current ACIP recommendations for routine vaccination for children indicate a first dose of MMR at 12–15 months of age with a second dose at school entry (4–6 years).[21] Studies have shown a trend toward a lower attack rate among children who have received two doses of mumps-containing vaccine as opposed to those who have received one dose.[9, 22]

Two doses of MMR vaccine are also recommended for adults at high risk, such as international travelers, college students, or healthcare workers born during or after 1957.[21, 23] For healthcare workers born before 1957 without other evidence of immunity, one dose of a live mumps virus vaccine should be considered.[23] Vaccination recommendations for an outbreak setting are discussed in Section XIII, Outbreak Control.

Mumps vaccine is also now available incorporated with measles, rubella and varicella vaccines as a combined vaccine (MMRV). MMRV vaccine can be used for children aged 12 months through 12 years who need a first dose of MMR and varicella vaccine, or who need a second dose of MMR and either a first or second dose (as indicated) of varicella vaccine.[24]

X. Enhancing Surveillance

Rapid detection, investigation, and implementation of control measures may reduce the occurrence and magnitude of outbreaks.[25] The activities listed below can improve reporting of mumps cases and improve the comprehensiveness and quality of reporting. Additional guidelines for enhancing surveillance are given in Chapter 19, "Enhancing Surveillance."

Obtaining accurate and complete immunization histories

Mumps case investigations should include complete immunization histories that document all doses of mumps-containing vaccines. Vaccination histories may be obtained from schools, medical providers, or immunization records provided by the case-patient. Verbal history of receipt of mumps vaccine is not considered adequate proof of vaccination.

Laboratory testing

Experience suggests that careful case investigation, combined with routine use of laboratory testing for confirmation of sporadic mumps cases, will result in many suspected cases being discarded.[26, 27] Therefore, if mumps is suspected, laboratory testing should be performed to confirm or rule out sporadic cases. If a case is confirmed, a case investigation should be conducted. Mumps specimens may also be sent to CDC for testing if this resource is needed.

Investigating contacts

Determining the source or chain of disease transmission, identifying all contacts (household, child care, and other close contacts), and following up with susceptible persons may reveal previously undiagnosed and unreported cases.

Promoting awareness

Healthcare personnel should be aware that mumps outbreaks have occurred in highly vaccinated populations (e.g., college students). Therefore, mumps should not be ruled out on the assumption that individuals are already immune because of vaccination.

Active surveillance

Active surveillance for mumps should be conducted for every confirmed mumps case, if possible. In the case of an outbreak, local or state health departments should contact healthcare providers in outbreak areas to inform them of the outbreak and request reporting of any suspected cases. 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.

A number of other activities can improve the detection and reporting of cases as well as the comprehensiveness and quality of reporting. For general information on improving surveillance of vaccine-preventable diseases, see Chapter 19, "Enhancing Surveillance."

Active surveillance for mumps should be conducted for every confirmed mumps case, if possible.

Monitoring surveillance indicators

Regular monitoring of surveillance indicators can help identify specific areas of the surveillance and reporting system that need improvement. These indicators should be monitored:

- The proportion of confirmed cases reported to NNDSS with complete information (date of birth, onset date, clinical case definition, hospitalization, laboratory testing, vaccine history, date reported to health department, transmission setting, outbreak-related, and epidemiologic linkage)
- The interval between date of symptom onset and date of public health notification
- The proportion of confirmed cases that are laboratory confirmed
- The proportion of cases that have an imported source

XI. Case investigation

The Mumps Surveillance Worksheet (Appendix 10) may be used as a guideline to collect case information during a case investigation. Essential components of the case investigation are discussed below.

Establishing a diagnosis of mumps

Because clinical diagnosis of mumps may be unreliable, cases of suspected mumps should be laboratory confirmed. Not all cases of parotitis, especially sporadic ones, are due to mumps infection; however, mumps is the only known cause of epidemic parotitis. Experience indicates that case investigations combined with laboratory testing will result in many sporadic, suspected mumps cases being discarded. Because laboratory confirmation may be difficult, especially for vaccinated case-patients, negative laboratory results do not necessarily rule out the diagnosis of mumps, particularly in the event of epidemic parotitis.

Obtaining accurate, complete immunization histories

Mumps case investigations should include complete immunization histories that document all doses of mumps-containing vaccine. Recent outbreaks of mumps have occurred among older children and adults, many of whom had already received at least one dose of a mumps-containing vaccine. In a large U.S. outbreak in 2006, approximately 50% of the case-patients had received two doses of a mumps-containing vaccine (CDC, unpublished data). All vaccination histories should be 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. Usually immunization histories can be obtained from child care, school (generally available for children attending licensed childcare centers or kindergarten through high school), or healthcare provider records. Immunization registries, if available, can also readily provide vaccination histories.

Identifying the source of infection

Efforts should be made to identify the source of infection for every confirmed case of mumps. Case-patients should be asked about contact with other known patients. When no history of contact with a known case can be documented, opportunities for exposure to unknown cases should be sought. After determining when and where transmission likely occurred, investigative efforts should be directed to these locations.

Assessing potential transmission and identifying contacts

As part of the case investigation, the potential for further transmission should be assessed. Contacts of the case-patient during the infectious period should be identified, assessed for immunity, and educated about signs and symptoms.

Obtaining specimens for virus detection

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.

XII. Outbreak Investigation

Case investigation and control activities at the household level should not be delayed pending the return of laboratory results. Initial preparation for major control activities also may need to be started before laboratory results are known. However, it is reasonable to delay major control activities, such as vaccinating an entire school, pending the return of laboratory results, which should be obtained as quickly as possible (within 24 hours).

The following are general guidelines for outbreak investigation:

Tracking information collected

Tracking is easily accomplished by constructing a line listing of cases, allowing ready identification of known and unknown data and ensuring complete case investigation. A line listing can be maintained on a computer using database management or spreadsheet software. Such a line listing provides a current summary of the outbreak and of ongoing case investigations.

Identifying the population affected by the outbreak

In the course of the outbreak investigation, every suspected case (whether reported through active or passive surveillance or identified through contact investigation) should be investigated thoroughly, as described above. In very large outbreaks, it may not be possible to investigate each reported case thoroughly.

Based on the findings of individual case investigations, the population affected by the outbreak should be characterized in terms of person (who is getting mumps and how many case-patients

have had none, one dose, or two doses of mumps-containing vaccine), place (where are the cases), and time (when did the outbreak start, and is it still going on). These essential data elements allow public health officials to determine the population at risk of infection (e.g., unvaccinated preschool-age children, high school students who have only received one dose of mumps vaccine, persons who visited the emergency department of Hospital A on a certain day), determine where transmission is occurring (e.g., child care centers, high schools, healthcare settings), and identify individuals who are at potential risk of infection (e.g., other unvaccinated preschool-age children, students attending other schools)

Enhancing surveillance for mumps

Many of the activities outlined in Section X, "Enhancing surveillance," are applicable in the outbreak setting. Previously unreported cases may be identified by reviewing emergency department logs or laboratory records. As part of outbreak response, active surveillance for mumps should be established to ensure timely reporting of suspected cases in the population known to be affected by the outbreak. Hospital emergency departments and physicians serving affected communities are usually recruited to participate in active surveillance. Active surveillance should be maintained for two incubation periods after the last confirmed case is reported.

XIII. Outbreak Control

Mumps is the only known cause of epidemic parotitis. The main strategy for controlling a mumps outbreak is to define the at-risk population(s) and transmission setting(s), and to rapidly identify and vaccinate susceptible persons or, if a contraindication exists, to exclude susceptible persons from the setting to prevent exposure and transmission. According to ACIP recommendations published in 2006, acceptable presumptive evidence of mumps immunity includes one of the following: a) 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 (healthcare workers, international travelers, and students at post-high school educational institutions); b) laboratory evidence of immunity; c) birth before 1957; or d) documentation of physician-diagnosed mumps. Persons who do not meet the above criteria are considered susceptible.[23]

Mumps vaccine, preferably as MMR, should be administered to susceptible persons. Although mumps 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 infected. If susceptible persons can be vaccinated early in the course of an outbreak, they can be protected. However, because of the long incubation period for mumps, cases are expected to continue to occur for at least 3 weeks among newly vaccinated persons who were already infected before vaccination.[28] As with all vaccines, some individuals will not gain immunity after receipt of mumps vaccine. Depending on the epidemiology of the outbreak (e.g., the age groups and/or institutions involved), a second dose of mumps-containing vaccine should be considered for children aged 1–4 years and adults who have received one dose previously.[23]

If susceptible persons can be vaccinated early in the course of an outbreak, they can be protected.

Exclusion of susceptible students from schools/colleges affected by a mumps outbreak (and other, unaffected schools judged by local public health authorities to be at risk for transmission of disease) should be considered among the means to control mumps outbreaks.[21] Once vaccinated, students can be readmitted to school. Students who have been exempted from mumps vaccination for medical, religious, or other reasons should be excluded until at least 26 days after the onset of parotitis in the last person with mumps in the affected school.[21]

Patients should be isolated for 9 days following onset of symptoms. However, an isolation period of 5 days, which is the maximum period of communicability after onset of parotitis, is being considered.

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