Mumps

Disease Plan

Quick Links

Last updated: September 9, 2019, by Taylor Hoj.

Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191.

✓ CRITICAL CLINICIAN INFORMATION

Clinical Evidence

Signs/Symptoms

- Prodromal symptoms may include myalgia, anorexia, malaise, headache, and low-grade fever
- Most common manifestation is parotitis (swelling and tenderness of salivary glands)
- Complications may include:
  - Aseptic meningitis: headache, low grade fever, and mild nuchal rigidity
  - Oophoritis and mastitis in females
  - Orchitis, testicular atrophy, impaired fertility, and sterility in males
  - Deafness

Period of Communicability

- Mumps is most infectious in the several days before and after parotitis onset. Most transmission likely occurs before and within five days of parotitis onset. The recommended period for contact tracing for mumps is two days before through five days after parotitis onset. For disease investigation purposes, **consider mumps cases infectious two days prior to through five days after symptom (usually parotitis) onset** with the day of onset counted as day zero.

Incubation Period

- Range 12–25 days (average of 16–18 days)

Mode of Transmission

- Transmitted through droplet nuclei or direct contact with oral secretions.

Laboratory Testing

Collection of both a viral specimen (usually a buccal/throat swab) and a serologic specimen is recommended from all persons with clinical features compatible with mumps.

Type of Lab Test & Timing of Specimen Collection

- Serology (ideally >3 days after symptom [usually parotitis] onset, but vaccination status should be considered)
- Real-time Reverse Transcriptase Polymerase Chain Reaction (rRT-PCR) (ideally 0–3 days after symptom [usually parotitis] onset)
- Culture (ideally 0–3 days after symptom [usually parotitis] onset)
- See the tables found in the Laboratory Identification section for details regarding timing of specimen collection depending on vaccination status and interpretation of results

Type of Specimens

- Serology
  - Blood/Serum
- PCR/Culture
  - Fluid from parotid duct, other salivary gland ducts, and throat (preferred specimen, especially in cases with parotitis)
  - Urine (typically only in cases with complications such as orchitis)
  - CSF (typically only in cases with complications such as meningitis)

Testing Facilities

- Serology
  - Offered at commercial and hospital laboratories
- PCR
  - Offered at the Utah Public Health Laboratory (UPHL) free-of-charge *upon approval* by the Utah Department of Health, Bureau of Epidemiology (801-538-6191)
  - Also offered at some commercial laboratories
- Culture
  - Offered at some commercial laboratories

Treatment Recommendations

Type of Treatment

- Supportive care

Prophylaxis

- MMR or MMRV vaccine

Contact Management

Isolation of Case

- Persons diagnosed with mumps should voluntarily isolate themselves at home until five days after symptom (usually parotitis) onset

Identifying Case Contacts

- Individuals exposed to the case two days prior to five days after symptom (usually parotitis) onset should be considered case contacts. Specifically, consider:
    - Household members
    - Students in the same classroom (but not everyone in the school)
    - Children in the same daycare room
    - Children who ride the same school bus
    - Core groups of close friends, social contacts, boyfriends, girlfriends
    - Coworkers who work within six feet of the case
    - Those who have direct contact with respiratory secretions
    - Healthcare workers with face-to-face contact with a patient
    - Anyone that has had close contact for more than 10 minutes

Case Contact Management

- Assess contacts' immunity status
- Susceptible persons should be vaccinated immediately

Infection Control Procedures

- Standard Precautions
- Droplet Precautions if patient is in-patient.

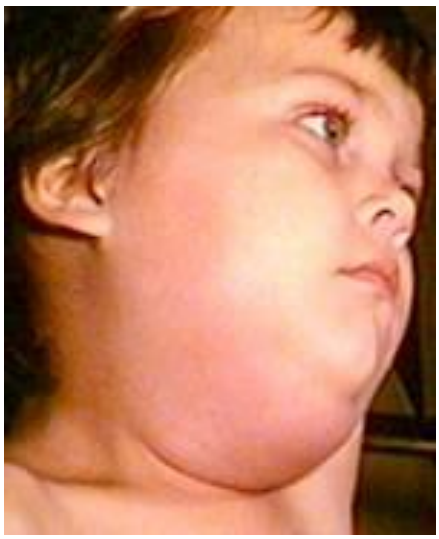
✓ WHY IS MUMPS IMPORTANT TO PUBLIC HEALTH?

Mumps is characterized by swelling of either one, or both, of the parotid glands lasting two or more days in duration. It may be accompanied by fever and swelling of the submandibular and sublingual glands. While typically self-limited and mild, complications of mumps may include aseptic meningitis, encephalitis, acute hearing loss, orchitis, oophoritis, mastitis and pancreatitis. Prior to the widespread use of an effective vaccine, mumps primarily occurred in young children attending primary grade school; mumps was also a leading cause of viral meningitis and the most common cause of unilateral acquired sensorineural deafness in children. Despite high immunization levels, the U.S. has experienced several outbreaks of mumps in recent years in populations highly vaccinated with two doses of measles-mumps-rubella (MMR) vaccine. Cases of mumps will continue to be imported into the U.S. as long as mumps continues to be endemic globally, making it an important disease for public health surveillance.

✓ DISEASE AND EPIDEMIOLOGY

Clinical Description

Mumps is a moderately contagious viral illness. Mumps usually begins with prodromal symptoms that include myalgia, anorexia, malaise, headache, and a low-grade fever. The most common manifestation of mumps is parotitis. Parotitis consists of swelling and tenderness in the salivary glands (parotid, sublingual, or submaxillary glands), and may be unilateral or bilateral. Parotitis usually develops two days after prodromal symptoms, and usually resolves within 10 days of onset. In the pre-vaccine era, rates of classical parotitis among all age groups typically ranged from 31%–65%, but in specific age groups could be as low as 9%, or as high as 94%, depending on the age and immunity of the group.



In the pre-vaccine era, 15%–27% of infections were asymptomatic. In the post-vaccine era, it is difficult to estimate the number of asymptomatic infections, because it is unclear how vaccine modifies clinical presentation. Complications from mumps can include orchitis, oophoritis, aseptic meningitis, mumps encephalitis, pancreatitis, and unilateral deafness. Orchitis (testicular inflammation) is the most common complication in males. With mumps-associated orchitis, there is usually abrupt onset of testicular swelling, tenderness, nausea, vomiting, and fever. Pain and swelling may subside in one week, but tenderness may last for weeks. In recent outbreaks, rates of orchitis have ranged from 3.3%–10%. Orchitis usually occurs after parotitis, but it may precede it, begin simultaneously, or occur alone. In recent mumps outbreaks, oophoritis (ovarian inflammation) rates were 1% or lower among females. It may mimic

appendicitis. Aseptic meningitis is the most common neurologic complication of mumps virus infection; it occurs in 1–10% of patients and is three times more common in males than in females. Meningitis can occur before, during, or after mumps parotitis. In some series, up to half of patients presented with meningitis in the absence of parotitis. Clinical manifestations typically include headache, low-grade fever, and mild nuchal rigidity. In the post-vaccine era, among all persons infected with mumps, reported rates of meningitis, encephalitis, pancreatitis, and deafness have all been less than 1%. Permanent sequelae such as paralysis, seizures, cranial nerve palsies, and hydrocephalus occurred very rarely.

Causative Agent

Mumps is caused by a paramyxovirus (an RNA virus). Other paramyxoviruses include parainfluenza, measles, respiratory syncytial virus (RSV), metapneumovirus, Hendra and Nipah viruses. There is only one known serotype of mumps. This virus has a lipid envelope and is subject to disruption by typical cleaning agents (this means that it is easily inactivated and easy to disinfect).

Differential Diagnosis

Not all cases of parotitis (swollen lymph nodes) are mumps, but mumps is the only known cause of outbreaks of parotitis. Parotid swelling can last up to 10 days. Other causes of parotitis include cytomegalovirus (CMV), parainfluenza, influenza A, coxsackievirus, lymphocytic choriomeningitis virus (LCM), enterovirus, HIV, *Staphylococcus aureus*, MOTT (mycobacteria other than TB), drug reactions, and certain metabolic disorders (e.g., diabetes mellitus, cirrhosis, and malnutrition). Because clinical diagnosis of this disease may be unreliable, physicians should confirm all cases through serology, PCR, or viral culture. Increased serum amylase supports the clinical diagnosis.

Laboratory Identification

Because clinical diagnosis of mumps may be unreliable, cases of mumps should be laboratory confirmed. Laboratory testing, in conjunction with case investigations, can result in many suspected mumps cases being ruled out. Collection of both a viral specimen (usually a buccal/throat swab) and a serologic specimen is recommended from all persons with clinical features compatible with mumps.

Laboratory confirmation of the diagnosis of mumps in highly vaccinated populations may be challenging; serologic tests should be interpreted with caution because false negative results in vaccinated persons are common.

IgM Serology

IgM is often the simplest and quickest method for diagnosing mumps and is available through most commercial and large hospital laboratories. Therefore, IgM serology should be ordered on all acute cases. Serum IgM antibody to mumps typically remains positive for up to four weeks, but may be negative in up to 50–60% of specimens from individuals with acute disease who were previously immunized. While a positive IgM supports the diagnosis of mumps, a negative IgM does not rule out the disease, and culture or PCR testing is recommended when proper timing of specimen collection is possible. Additionally, in both unvaccinated and previously

vaccinated persons, false-positive serologic results can occur because assays may be affected by other diagnostic entities that cause parotitis. Parainfluenza viruses 1, 2, and 3, Epstein-Barr virus (EBV), adenovirus, and human herpesvirus 6 (HHV-6) have all been noted to interfere with mumps serologic assays.

Vaccination status and timing of specimen collection affect the ability to detect IgM in persons infected with mumps. In general, IgM detection is highest in unvaccinated persons, intermediate in one-dose vaccine recipients, and lowest in two-dose vaccine recipients. Specimens collected >3 days post-symptom (usually parotitis) onset are more likely to have a positive IgM result.

Among **unvaccinated** persons, serum samples drawn too early in the course of illness may produce false-negative results. For this reason, serum samples should ideally be collected >3 days after symptom (usually parotitis) onset. If the IgM is negative from serum samples collected within the first three days of onset of parotitis, a second serum sample (collected 5–7 days after onset) is recommended, as the IgM response may require more time to develop.

Among **vaccinated** persons, IgM positive serology may be missing, delayed, or transient (meaning it could be falsely negative), regardless of the timing of collection. Collecting specimens >3 days after symptom (usually parotitis) onset improves the ability to detect IgM among persons that were previously vaccinated. Of serum samples collected from outbreaks less than 3 days after symptom onset, 13–46% were positive compared to 71% of serum samples collected >3 days.

IgG Serology

Mumps needs to be diagnosed in a timely manner; for this reason, IgG serology testing for acutely ill patients is not recommended for diagnosing persons who have not been previously vaccinated. A single IgG serology from an acutely ill patient is not diagnostic and must be followed up with a second serology 2–4 weeks later; a 4-fold rise in titer is diagnostic. In persons who have received one or two doses of MMR vaccine, a 4-fold rise in IgG titer is rarely demonstrated between paired serum samples. At the time of symptom onset and collection of the acute-phase serum sample, IgG may already be elevated to such high levels that detection of a 4-fold rise in titer expected when comparing acute- and convalescent-phase serum samples is not possible. For these reasons, mumps diagnosis by IgG serology is not recommended.

A positive mumps IgG result, however, does indicate a remote or prior exposure to mumps virus or mumps vaccine. However, the level of neutralizing IgG antibody that is needed for protection against mumps is not known, meaning that a positive mumps IgG result does not guarantee immunity to mumps and does not rule out an active mumps infection. On the other hand, a negative mumps IgG result indicates susceptibility to mumps infection and would be expected in unvaccinated individuals who have not had mumps previously.

Virus Detection (rRT-PCR and Culture)

Specimens for RT-PCR and culture are collected using the same methods. Because few laboratories perform mumps virus isolation, it is rarely used for clinical diagnosis in uncomplicated cases and RT-PCR is generally the preferred method of virus detection. Mumps virus can be detected from fluid collected from the parotid duct (Stensen’s duct), other affected

salivary gland ducts, the throat, from urine, and from cerebrospinal fluid (CSF). Parotid duct swabs yield the best viral sample, when parotitis is present. This is particularly true when the salivary gland area is massaged approximately 30 seconds prior to swabbing the buccal mucosa/parotid duct, so that the specimen contains the secretions from the parotid or other salivary duct glands.

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 as specimens from cases with parotitis. However, in patients presenting with mumps complications, such as orchitis or meningitis, specimens such as urine or CSF may be useful for diagnosis in addition to oral specimens.

Timing of Specimen Collection: Ideally, clinical specimens should be collected within 3 days of symptom (usually parotitis) onset and not more than 8 days after parotitis onset. In **unvaccinated** persons, virus may be isolated from the parotid duct/buccal mucosa until 11–14 days after salivary enlargement; however, viral isolation is most likely to be successful just prior to and within the first three days of parotitis onset. In **vaccinated** persons, in order to optimize virus yield, emphasis should be placed on obtaining mumps clinical specimens from buccal mucosa within one to three days after onset of symptoms (usually parotitis).

PCR Testing through UPHL: Although some commercial labs offer PCR testing, the Utah Public Health Laboratory (UPHL) offers mumps PCR testing free-of-charge upon approval by the Utah Department of Health (UDOH), Bureau of Epidemiology (BOE) (801-538-6191). A completed Infectious Disease Test Request Form must accompany the specimen to UPHL. This form can be found here: https://uphl.utah.gov/wp-content/uploads/UPHL_TEST_REQUEST_FILLABLE.pdf. Results can typically be anticipated within two business days after specimen receipt and approval. Specimens which test positive for mumps virus by PCR will be forwarded to the California Department of Health's Viral and Rickettsial Disease Laboratory for genotyping.

Proper collection, storage, and shipment of specimens are critical for successful testing. Specimens should be collected, stored, and shipped according to the following guidelines:

Collection: The buccal or oral swab specimens are obtained by massaging the parotid gland area for 30 seconds prior to swabbing the area around Stensen's duct. A commercial product designed for the collection of throat specimens or a flocked polyester fiber swab can be used. Synthetic swabs are preferred over cotton swabs, which may contain substances that are inhibitory to enzymes used in RT-PCR. Flocked synthetic swabs appear to be more absorbent and elute samples more efficiently. Swabs should be placed in 2 ml of standard viral transport medium (VTM). Allow the swab to remain in VTM for at least one hour (4°C). Ream the swab around the rim of the tube to retain cells and fluid in the tube. The swab can be broken off and left in the tube or discarded. CDC has provided a detailed instructional video for health care providers to aid in the proper collection of this sample: https://www.youtube.com/watch?v=ThvoJBjsUvQ.

Storage and Shipment: Following collection, samples should be maintained at 4°C and shipped on cold packs (4°C) within 24 hours. If there is a delay in shipment, the sample is best preserved by freezing at −70°C. Frozen samples should be shipped on dry ice.

The UPHL Virology Lab can be reached at 801-965-2584 with any questions regarding specimen collection, storage, and transport.

	Lab Test	Specimen Collection Timing
Vaccinated	**IgM**	Patients that mount a secondary immune response to mumps, as seen in most previously vaccinated persons, may not have an IgM response or it may be transient and not detected regardless of the timing of specimen collection. Collecting serum specimens **>3 days after symptom (usually parotitis)** onset improves the ability to detect IgM among persons that were previously vaccinated. There is some evidence that specimens collected ≥10 days after parotitis onset may further improve the ability to detect IgM among persons who have received one or two doses of MMR vaccine.
	IgG	A serum specimen for IgG testing should be collected in conjunction with IgM serum specimen collection. IgG testing is expected to be positive in vaccinated individuals (see Interpretation of Results table on next page). At the time of symptom onset, IgG is often already elevated to such high levels that detection of a 4-fold rise in titer is not possible. Because of this, mumps IgG testing is not recommended for mumps diagnosis, particularly in vaccinated individuals. Additionally, no level of neutralizing antibody can guarantee immunity to mumps and a positive mumps IgG cannot be used to rule out an active mumps infection.
	PCR/Culture	Ideally, buccal swab specimens should be collected **0–3 days after symptom (usually parotitis) onset**. Swabs yield the best viral sample when the salivary gland area is massaged approximately 30 seconds prior to swabbing the buccal mucosa/parotid duct, so that the specimen contains the secretions from the parotid or other salivary duct glands.
Unvaccinated	**Lab Test**	**Specimen Collection Timing**
	IgM	Among unvaccinated persons, IgM antibody is typically 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. Serum samples drawn too early in the course of illness may produce false-negative results. For this reason, serum samples should ideally be collected >3 days after symptom (usually parotitis) onset. If the IgM is negative from serum samples collected within the first three days of onset of parotitis, a second serum sample (collected 5–7 days after onset) is recommended, as the IgM response may require more time to develop.
	IgG	A serum specimen for IgG testing should be collected in conjunction with IgM serum specimen collection. IgG testing is expected to be negative in unvaccinated individuals who have not had mumps previously. Because diagnosis of mumps by IgG testing requires a convalescent-phase IgG test 2–4 weeks after the initial acute-phase test, mumps IgG testing is not recommended for mumps diagnosis. Additionally, no level of neutralizing antibody can guarantee immunity to mumps and a positive mumps IgG cannot be used to rule out an active mumps infection.
	PCR/Culture	Ideally, buccal swab specimens should be collected **0–3 days after symptom (usually parotitis) onset.** Swabs yield the best viral sample when the salivary gland area is massaged approximately 30 seconds prior to swabbing the buccal mucosa/parotid duct, so that the specimen contains the secretions from the parotid or other salivary duct glands. In unvaccinated persons, virus may be isolated from the parotid duct/buccal mucosa until 11–14 days after salivary enlargement; however, viral isolation is most likely to be successful just prior to and within the first 3 days of symptom (usually parotitis) onset.

Serology Interpretation		
IgM +	**IgG +**	A positive IgM test result provides laboratory evidence of current or very recent mumps infection or vaccination with mumps-containing vaccine. A positive IgG test result indicates a remote or prior exposure to mumps virus or mumps vaccine. No level of neutralizing IgG antibody can guarantee immunity to mumps and a positive mumps IgG cannot be used to rule out an active mumps infection.
IgM +	**IgG -**	A positive IgM test result provides laboratory evidence of current or very recent mumps infection or vaccination with mumps-containing vaccine. A negative IgG test result indicates susceptibility to mumps infection.
IgM -	**IgG +**	A negative IgM test result does not rule out mumps infection in a person with clinically compatible mumps symptoms. The specimen may have been drawn before the appearance of detectable antibodies. In unvaccinated individuals, if the IgM is negative from serum samples collected within the first three days of onset of parotitis, a second serum sample (collected 5–7 days after onset) is recommended, as the IgM response may require more time to develop. In vaccinated individuals, collecting serum specimens >3 days after symptom (usually parotitis) onset improves the ability to detect IgM among persons that were previously vaccinated. There is some evidence that specimens collected ≥10 days after parotitis onset may improve the ability to detect IgM. A positive mumps IgG test result indicates a remote or prior exposure to mumps virus or mumps vaccine. IgG testing for laboratory confirmation of mumps requires a four-fold rise in the antibody titer, but is generally not recommended, especially in previously vaccinated individuals.
IgM -	**IgG -**	A negative IgG result coupled with a negative IgM result indicates the absence of prior exposure to mumps virus and susceptibility to mumps infection. However, a negative IgM result does not rule out mumps infection in a person with clinically compatible mumps symptoms. The specimen may have been drawn before the appearance of detectable antibodies. In unvaccinated individuals, if the IgM is negative from serum samples collected within the first three days of onset of parotitis, a second serum sample (collected 5–7 days after onset) is recommended, as the IgM response may require more time to develop. In vaccinated individuals, collecting serum specimens >3 days after symptom (usually parotitis) onset improves the ability to detect IgM among persons that were previously vaccinated. There is some evidence that specimens collected ≥10 days after parotitis onset may improve the ability to detect IgM.
PCR/Viral Culture Interpretation		
PCR/Viral Culture +		A positive PCR or viral culture result provides laboratory confirmation of mumps infection in persons with symptoms consistent with mumps.
PCR/Viral Culture -		Failure to detect mumps virus RNA by PCR or viral culture in samples from a person with clinically compatible mumps symptoms does not rule out mumps as a diagnosis. Successful detection of mumps virus using PCR depends primarily on the timing of collection and quality of the clinical sample.

Treatment

There is no specific treatment for mumps. Therapy for mumps parotitis is supportive care. Topical application of warm or cold packs to the parotid glands may be soothing. Patients who have meningitis or pancreatitis with nausea and vomiting may require hospitalization for intravenous fluids. Patients with orchitis are also treated symptomatically with bed rest, nonsteroidal anti-inflammatory agents, support of the inflamed testis, and ice packs.

Case Fatality

Death due to mumps is exceedingly rare and is primarily caused by mumps-associated encephalitis. In the United States during 1966–1971, there were 2 deaths/10,000 reported mumps cases per year. No mumps-related deaths have been reported in recent U.S. outbreaks.

Reservoir

Humans are the only known hosts of mumps virus.

Transmission

Mumps is a contagious virus that is transmitted through droplet nuclei or direct contact with oral secretions. It spreads through saliva or mucus from the mouth, nose, or throat. An infected person can spread the virus by:

- coughing, sneezing, or talking,
- sharing items, such as cups or eating utensils, with others, and
- touching objects or surfaces with unwashed hands that are then touched by others.

Susceptibility

Anyone can get mumps, however, mumps occurs most commonly among school-aged children and college-aged young adults; it is rare among infants <1 year of age, who have protection via maternal antibodies. Lifelong immunity develops after clinical (symptomatic or asymptomatic) infections.

Incubation Period

The incubation period can range from 12–25 days with an average of 16–18 days.

Period of Communicability

Although mumps virus has been isolated from seven days before through 11–14 days after parotitis onset, the highest percentage of positive isolations and the highest virus loads occur closest to parotitis onset and decrease rapidly thereafter. Mumps is therefore most infectious in the several days before and after parotitis onset. Most transmission likely occurs before and within five days of parotitis onset. The recommended period for contact tracing for mumps is two days before through five days after parotitis onset. For disease investigation purposes, therefore, **consider mumps cases infectious two days prior to through five days after symptom (usually parotitis) onset** with the day of onset counted as day zero.

Epidemiology

Mumps is endemic throughout the world. Before the advent of the vaccine in 1967, the peak incidence was annually between January and May. Since then, there is no observed seasonality in case occurrence. Several sporadic mumps outbreaks have occurred among susceptible individuals in a variety of settings, including military posts, high schools, colleges, and summer camps. There have also been hospital-based, workplace, and community-based outbreaks. In recent years, there has been an increasing trend of mumps outbreaks in the U.S. Additional information about recent outbreaks can be found here: https://www.cdc.gov/mumps/outbreaks.html. Ongoing surveillance of mumps is needed to detect and control outbreaks, and to evaluate current prevention strategies.

✓ PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility

- Promote vaccination to reduce disease burden in the community.
- Investigate all new cases of disease, complete and submit appropriate disease investigations forms.
- Conduct contact tracing and management, as needed.
- Educate patients on how to limit transmission.
- Provide education to the general public (regarding disease transmission) and to clinicians (regarding disease diagnosis, reporting, and prevention).
- Monitor disease trends.

Prevention

The primary method of prevention of mumps is through vaccination.

Chemoprophylaxis

Persons exposed to mumps that are not immune should be vaccinated as soon as possible. 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.

Vaccine

Two doses of mumps-containing vaccine (MMR) separated by at least 28 days are routinely recommended for all children. The first dose is given at 12–15 months of age; the second is usually given at 4–6 years of age. If a child receives a dose of mumps vaccine before 12 months of age, this dose is not counted toward the required number of doses, and two additional doses are required beginning at 12–15 months of age, separated by at least 28 days. For prevention of mumps, two doses of MMR vaccine are also recommended for adults at high risk, including international travelers, college and other post high school students, and healthcare personnel born during or after 1957. All other adults born during or after 1957 without other evidence of mumps immunity should be vaccinated with one dose of MMR vaccine. The vaccine appears to reduce the risk of infection in 78% (one dose) to 88% (two doses) of vaccinated individuals. The expected duration of immunity is thought to be lifelong. MMR is a

live, attenuated vaccine, and therefore pregnant women and persons with an impaired immune system should not receive the vaccine. Non-pregnant women should avoid becoming pregnant within 28 days after the last dose of vaccination. Breastfeeding is not a contraindication for MMR vaccination. Outbreak considerations and recommendations for mumps vaccine are discussed in the outbreak section of this plan.

Mumps vaccine is available as a combined measles, mumps, rubella and varicella (MMRV) vaccine. MMRV can be used for children 12 months through 12 years of age. For the first dose of measles, mumps, rubella and varicella vaccines at ages 12 months through 47 months, either MMR and varicella vaccines, or MMRV vaccine can be used. MMRV can also be used for the second dose up to the age of 12 years. ACIP Vaccine Recommendations for MMR and MMRV can be found on these web pages.

For information on best practice and recommendations for vaccine storage and handling, refer to the CDC's Vaccine Storage and Handling Toolkit, https://www.cdc.gov/vaccines/hcp/admin/storage/toolkit/storage-handling-toolkit.pdf.

Isolation and Quarantine Requirements

Isolation: Persons diagnosed with mumps should voluntarily isolate themselves at home until five days after the onset of parotitis.

Hospital: Hospitals should follow droplet precautions for five days following the onset of parotitis. (2007 Guideline for Isolation Precautions)

Exclusion: Quarantine is not routinely recommended for contacts to a mumps case. However, certain high-risk contacts, including college students, international travelers, and healthcare workers, should be considered for quarantine. Additional information about contact management can be found in the Case Contact Management section of this plan.

✓ CASE INVESTIGATION

Reporting

If mumps is suspected, it should be reported to public health within three working days. Report any illness to public health authorities that meets any of the following criteria:

1. Acute illness characterized by parotitis (i.e., acute onset of unilateral or bilateral tender, self-limited swelling of the parotid) or other salivary gland(s), lasting at least two days.
2. Acute illness characterized by a mumps-associated complication (i.e., aseptic meningitis, encephalitis, hearing loss, orchitis, oophoritis, mastitis, or pancreatitis) in a person with any of the following epidemiologic risk factors for mumps:
    - Contact with a confirmed mumps case
    - Member of a risk group defined by public health authorities during an outbreak

3. Laboratory tests for acute mumps infection without clinical information.
    - Isolation of mumps virus in cell culture
    - Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) test positive for mumps-specific nucleic acid
    - Positive mumps IgM antibody
    - Acute and convalescent anti-mumps IgG by quantitative assay demonstrating at least a fourfold increase
    - Standardized mumps serologic assay to determine seroconversion

Table 1. Reporting criteria for mumps

Criterion	Reporting		
Clinical Evidence			
Parotitis lasting at least 2 days	S		
Swelling of other salivary gland(s) lasting at least 2 days	S		
Aseptic meningitis		O	
Encephalitis		O	
Hearing loss		O	
Orchitis		O	
Ooophoritis		O	
Mastitis		O	
Pancreatitis		O	
Laboratory Evidence			
Isolation of Mumps virus in cell culture			O
Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) test positive for mumps-specific nucleic acid			O
Mumps IgM antibody			O
Acute and convalescent anti-mumps IgG by quantitative assay			O
Standardized mumps serologic assay to determine seroconversion			O
Epidemiologic Risk Evidence			
Contact of a confirmed mumps case		O	
Member of a risk group defined by public health authorities during an outbreak		O	

Notes:
S = This criterion alone is sufficient to report a case
O = At least one of these "O" criteria in each category in the same column (e.g., clinical presentation evidence and laboratory evidence) is required to report a case.

CSTE Case Definition
Mumps (2011)

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 two days, 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

Table 2. Case classification criteria for mumps

Criterion	Confirmed		Probable		Suspect	
Clinical Evidence						
Acute parotitis or other salivary gland swelling lasting at least 2 days	O	O	O	O	O	
Orchitis	O	O	O	O	O	
Oophoritis	O	O	O	O	O	
Aseptic meningitis	O	O				
Encephalitis	O	O				
Hearing loss	O	O				
Mastitis	O	O				
Pancreatitis	O	O				
Laboratory Evidence						
Positive test for serum anti-mumps IgM antibody			N			O
Detection of mumps virus with RT-PCR	N					O
Isolation of mumps virus in cell culture from a clinical specimen		N				O
Epidemiologic Evidence						
Epidemiologic linkage to another probable or confirmed case				O		
Epidemiological linkage to a group/community defined by public health during an outbreak of mumps				O		

Notes:
S = This criterion alone is Sufficient to classify a case.
N = This criterion in conjunction with all other “N” and any “O” criteria in the same column is required to classify a case.
O = At least one of these “O” criteria in each category in the same column (e.g., clinical evidence and laboratory evidence)—in conjunction with all other “N” criteria in the same column—is required to classify a case.

Case Classification

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 two days, or orchitis or oophoritis unexplained by another more likely diagnosis, in:
    - a person with a positive test for serum anti-mumps 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 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 two days
    - aseptic meningitis
    - encephalitis
    - hearing loss
    - orchitis
    - oophoritis
    - mastitis
    - pancreatitis

Note: With previous contact with mumps virus, either through vaccination (particularly with two doses) or natural infection, serum mumps IgM test results may be negative; IgG test results may be positive at 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.

Epidemiologic classification

An epidemiologically linked case is one in which the patient has had contact with one or more persons who have or had the disease, and transmission of the agent by the usual modes of transmission is plausible. A case may be considered epidemiologically linked to a laboratory-confirmed case if at least one case in the chain of transmission is laboratory confirmed.

Internationally imported case

A case in which mumps results from exposure to mumps virus outside the U.S. as evidenced by:

- At least some of the exposure period (12–25 days before onset of parotitis or other mumps-associated complications) occurred outside the U.S.,
- The onset of parotitis or other mumps associated complications occurs within 25 days of entering the U.S., AND
- No known exposure to mumps occurred in the U.S. during that time.

U.S.-acquired case

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 further 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 ≥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 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.

Note: Currently, there is insufficient information to determine whether any mumps strains are endemic to the U.S., or to distinguish endemic from non-endemic strains.

Case Investigation Process

All highly suspect cases of mumps warrant urgent action. Cases of mumps should be managed as follows:

- Local and state health departments should be notified of any cases.
- Appropriate laboratory samples and preliminary clinical and epidemiologic information (including vaccine history) should be obtained.
- Recommend that case remain isolated until five days after the onset of parotitis.

- All case contacts should be identified and appropriately managed (explained in detail below).

Outbreaks

A mumps outbreak is defined as three or more cases linked by time and place. Because patients are infectious for up to six days prior to symptoms, and because of the likelihood of asymptomatic infections, the sole use of isolation to curb an outbreak will be ineffective. Effective outbreak management will require vaccination of the susceptible population, as well as school exclusion of susceptible individuals. The main strategy for controlling a mumps outbreak is to define the population(s) at risk and transmission setting(s), and to rapidly identify and vaccinate persons without presumptive evidence of immunity; or, if a contraindication exists, to exclude persons without presumptive evidence of immunity from the setting to prevent exposure and transmission.

Mumps-containing vaccine should be administered to persons without evidence of immunity and everyone should be brought up to date with age appropriate vaccination (one or two doses). Although mumps-containing vaccination has not been shown to be effective in preventing mumps in persons already infected, it will prevent infection in those persons who are not yet exposed or infected. If persons without evidence of immunity can be vaccinated early in the course of an outbreak, they can be protected prior to exposure. However, because of the long incubation period for mumps, cases are expected to continue to occur for at least 25 days among newly vaccinated persons who may have been infected before vaccination. As with all vaccines, some individuals will not develop protective immunity after receipt of mumps vaccine. Depending on the epidemiology of the outbreak, a second dose of mumps-containing vaccine should be considered for children aged 1–4 years and adults who have received one dose previously.

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

ACIP and CDC recommend that persons previously vaccinated with two doses of a mumps 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.

In the setting of an identified mumps outbreak, public health authorities should define target groups at increased risk for mumps during the outbreak, determine whether vaccination of at-risk persons is indicated, and provide recommendations for vaccination to healthcare providers.

Persons at increased risk for acquiring mumps are those who are more likely to have prolonged or intense exposure to droplets or saliva from a person infected with mumps, such as through close contact or sharing of drinks or utensils. During an outbreak, persons identified as being at increased risk and who have received ≤2 doses of mumps virus-containing vaccine or have unknown vaccination status should receive one dose. Authorities who decide to administer a third dose as part of mumps outbreak control are encouraged to collect data to evaluate the impact of the intervention. The following data should be collected:

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

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

Identifying Case Contacts

Close contact exposure is not well defined. It is known that mumps is more communicable than pertussis, but less than measles or varicella. Consider members of the following groups that were exposed to the case during the infectious period (two days prior until five days after the onset of parotitis):

- Household members
- Students in the same classroom (but not everyone in the school)
- Children in the same childcare room
- Children who ride the same school bus
- Core groups of close friends, social contacts, boyfriends, girlfriends
- Coworkers who work within six feet of the case
- Those who have direct contact with respiratory secretions
- Healthcare workers with face-to-face contact with a patient
- Anyone that has had close exposure for more than 10 minutes

Healthcare personnel

Prevention and control strategies should be applied in all healthcare settings, including outpatient and long-term facilities. These measures include:

- Assessment of presumptive evidence of immunity of healthcare personnel with the following criteria:
    - Written documentation of vaccination with two doses of live mumps or MMR vaccine administered at least 28 days apart.
    - Laboratory evidence of immunity.
    - Laboratory confirmation of disease.
    - Birth before 1957.
- Vaccination of those without evidence of immunity.
- Exclusion of healthcare personnel with active mumps illness, as well as healthcare personnel who do not have presumptive evidence of immunity who are exposed to a person with mumps.

- Isolation of patients in whom mumps is suspected.
- Implementation of droplet precautions, in addition to standard precautions.

In the event that a nosocomial outbreak occurs, healthcare facilities should have a plan put into place for the implementation of the two-dose recommendation for all healthcare personnel, including those who were born after 1957 and lack laboratory evidence of immunity or laboratory confirmation of disease.

Case Contact Management

- Assess contacts' immunity by auditing immunization records. Contacts should have their immunization records audited for appropriate immunity. A person is considered susceptible unless they have documentation of:
    - receipt of one or more doses of a mumps-containing vaccine administered on or after the first birthday for preschool-aged children and adults not at high risk, and two doses of mumps-containing vaccine for school-aged children and adults at high risk (i.e., healthcare personnel, international travelers, and students at post high school educational institutions);
    - laboratory evidence of immunity; or
    - birth before 1957.
- Documentation of immunity is recommended as a best practice, but local health jurisdictions can decide to accept verbal reports as deemed appropriate for the situation.
- If adequate documentation of immunization cannot be provided, the person should be considered susceptible. Susceptible persons should be vaccinated immediately.
- Provide educational materials informing contacts of exposure and recommending vaccination.

Utah Administrative Code R396-100-8 addresses school exclusions as follows:

R396-100-8. Exclusions of Students Who Are Under Exemption and Conditionally Enrolled Status.

(1) A local or state health department representative may exclude a student who has claimed an exemption or who is conditionally enrolled from school attendance if there is good cause to believe that the student has a vaccine preventable disease AND:

(a) has been exposed to a vaccine-preventable disease; OR

(b) will be exposed to a vaccine-preventable disease as a result of school attendance.

(2) An excluded student may not attend school until the local health officer is satisfied that a student is no longer at risk of contracting or transmitting a vaccine-preventable disease.

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✓ VERSION CONTROL

Updated August 2015: General update to document formatting.

Updated February 16, 2016: Added Importance to Public Health section.

Updated March 1, 2016: Updated Laboratory Identification and Treatment, Clinical Description, Incubation Period, Period of Communicability, and Transmission. Updated the Epidemiology section and added Healthcare Personnel to Outbreak Management. Added UT-NEDSS Minimum/Required Fields by Tab.

Updated December 2017: Updated Disease and Epidemiology, Laboratory Identification, Treatment, Case Fatality, Transmission, Susceptibility, Period of Communicability, Epidemiology, Vaccine, Isolation and Quarantine Requirements, Case Investigation Process, Outbreaks, Case Contact Management, sections to reflect changes from VPD Disease Plan workgroup. Added lab collection and interpretation information. Added Critical Clinician Information section.

Updated March 2018. Added Rules for Entering Laboratory Test Results section.

Updated September 2019. Added information to the Laboratory Identification section about sending tests to UPHL. Revised case definition to mirror CTSE case definition. Updated and expanded clinical case information section at beginning of plan. Revised laboratory/testing information and corresponding tables to better reflect CDC's Manual for the Surveillance of Vaccine-Preventable Diseases.

✓ UT-NEDSS MINIMUM/REQUIRED FIELDS BY TAB

Demographic

- First Name
- Last Name
- Street Number
- Street Name
- City
- State
- County
- Zip Code
- Date of Birth
- Area Code
- Phone Number
- Birth Gender
- Ethnicity
- Race

Clinical

- Did the patient have meningitis?
- Did the patient have encephalitis?
- Did the patient have orchitis?
- Did the patient have oophoritis?
- Did the patient have mastitis?
- Did the patient have pancreatitis?
- Date of first vaccination
- Date of second vaccination
- Is contact symptomatic?
- Has contact been vaccinated?
- Date of contact first vaccination
- Date of contact second vaccination
- Was contact vaccinated within 72 hours of exposure?
- Deafness
- Hearing impairment
- Other complications
- Specify other complications
- Parotitis
- Length of parotitis
- History of vaccination for the indicated disease?
- If vaccinated, how many doses has the patient received?
- If patient was not vaccinated, why were they not vaccinated?
- What was the IgM result?
- What is the collection date of the IgM specimen?
- What is the IgG result?
- What is the date of the acute specimen collection?
- What is the date of the convalescent specimen collection?
- Was a test done other than IgM or IgG?
- What other test method was performed?
- What was the other test method result?
- Parotitis onset date
- Was swelling unilateral/bilateral?
- Has any other possible cause of swelling been identified?
- Did the patient have swelling of the parotid or other salivary gland?
- Did swelling last at least 2 days?
- Has the patient ever received a mumps-containing vaccine?
- Number of doses:
- Reason:
- Clinician First Name
- Clinician Last Name
- Date diagnosed
- Diagnostic facility
- Died
- Disease
- Onset Date

Laboratory

- Test Type
- Test Result
- Collection Date
- Lab Test Date
- Units
- Organism
- Result value
- Has a sample been sent to CDC?
- Did CDC confirm the diagnosis?

Epidemiological

- Imported from
- Day care association
- Other data 1
- Other data 2
- Has case been excluded from childcare until 5 days after parotitis onset?
- Name and location of facility:
- Has case been excluded from the facility until 5 days after parotitis onset?
- Attends school
- Name and location of school:
- Has case been excluded from school until 5 days after parotitis onset?
- List names of contacts
- Did patient travel out of the U.S. in the 25 days before symptom onset?
- Dates and places of travel
- What is the transmission setting?
- What is the source of the infection?
- Epi-linkage to a confirmed or probable case
- Epi-linkage to a group or community as defined by public health during an outbreak

Contacts

- Date 7 days prior to onset:
- Date 5 days after onset:
- Does case have household contacts?
- Does case have workplace contacts
- Name and location of workplace
- Does case participate in any extra-curricular activities?
- Name and location of activity:

Reporting

- Date first reported to public health

Administrative

- State Case Status (Completed by UDOH)
- Outbreak Associated
- Outbreak Name
- LHD Investigation

✓ RULES FOR ENTERING LABORATORY TEST RESULTS

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS. These rules have been developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

Test-Specific Rules

Test specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS.

Test Type	Test Result	Create a New Event	Update an Existing Event
Culture	Positive	Yes	Yes
	Negative	No	Yes
IgG Antibody	Positive	No	Yes
	Negative	No	Yes
	Equivocal	No	Yes
IgM Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes
PCR/Amplification	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes
Genotype by PCR	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes

Whitelist Rules

Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.

Mumps Morbidity Whitelist Rule: Never a new case.

Mumps Contact Whitelist Rule: If the specimen collection date of the laboratory result is 30 days or less after the event date of the contact event, the laboratory result should be added to the contact event.

Graylist Rule

We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The

graylist rule describes how long an existing event can have an old laboratory result appended to it.

Mumps Graylist Rule: If the specimen collection date of the laboratory result is 30 days before to 7 days after the event date of the morbidity event, the laboratory result should be added to the morbidity event.

Other Electronic Laboratory Processing Rules

If an existing event has a state case status of “not a case,” ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.