

## Mumps Outbreak Control Guidelines

### Infectious agent

Virus: *Paramyxovirus* of the genus *Rubulavirus*

### Clinical manifestations

#### Symptoms

- ◆ Prodromal symptoms
  - Non-specific and include myalgia, anorexia, malaise, headache and low-grade fever.
- ◆ Parotitis
  - Defined as pain, tenderness and/or swelling of the parotid or salivary glands.
  - Usually occurs within the first two days of symptom onset and is unilateral or bilateral.
  - May affect other salivary glands in combination with or without the parotid glands.
  - Initial indication may be an earache or tenderness at the angle of the jaw.
  - Occurs in 30 – 40% of infected persons.
- ◆ 20% of infections are asymptomatic
- ◆ 40 – 50% may have only nonspecific or primary respiratory symptoms:
  - Low-grade fever, headache, malaise and myalgia, stiff neck, anorexia, difficulty swallowing, nasal congestion, cough, earache, sore throat, nausea and abdominal pain.
- ◆ Mumps is usually more severe in adults

### Complications

#### Aseptic meningitis

- ◆ Commonly occurs asymptotically in 50% – 60% of mumps patients.
- ◆ Symptomatic meningitis occurs in up to 15% of mumps patients and resolves without sequelae in 3 – 10 days.
- ◆ Adults are at higher risk than children and boys are more commonly affected than girls (3:1 ratio).
- ◆ Parotitis may be absent in as many as 50% of these patients.
- ◆ Encephalitis is rare.

#### Orchitis

- ◆ Occurs in 20 – 50% of post-pubertal males.
- ◆ Approximately 50% of patients with orchitis have some degree of testicular atrophy, but sterility is rare.
- ◆ Oophoritis Occurs in 5% of post-pubertal females.
- ◆ There is no relationship to impaired fertility.

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Hearing loss

- ◆ Deafness occurs in approximately 1/20,000 reported cases.
- ◆ Unilateral in 80% of those cases.
- ◆ Generally the onset is sudden and hearing loss is permanent.

Other complications include:

- ◆ Pancreatitis, myocarditis, encephalitis, arthralgia, arthritis, and nephritis.
- ◆ Spontaneous abortion can occur during the first trimester of pregnancy but there is no evidence that mumps during pregnancy causes congenital malformations.
- ◆ Deaths due to mumps are rare.

**Incubation period**

- ◆ 16 – 18 days (range 12 – 25 days).

**Period of communicability**

- ◆ Infectious period is considered to be 2 days before to 5 days after parotitis onset.
- ◆ Virus has been isolated from saliva 7 days before to 9 days after onset of parotitis.
- ◆ Degree of contagiousness is similar to rubella and influenza, but is less than that for measles or varicella.

**Transmission**

- ◆ Humans are the only reservoir.
- ◆ Mumps disease is spread by mucus or droplets from the nose or throat of an infected person, usually when a person coughs or sneezes.
- ◆ Fomite transmission is possible through direct contact with infected droplets.

**Basic epidemiology**

- ◆ Occurs worldwide and is endemic year round, but peaks in winter-spring.
- ◆ Only 61% of countries worldwide vaccinate against mumps.
- ◆ Mumps outbreaks have occurred in congregate settings in the US, which included NYS in 2009 – 2010.

**Case definition for case classification**

Case definition approved by CSTE 2012

Case classification approved by CSTE 2012

Case classification

**Suspect case**

- ◆ 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).

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**Probable:**

- ◆ Acute parotitis or other salivary gland swelling lasting at least 2 days, or orchitis or oophoritis unexplained by another more likely diagnosis, in:
  - a person with a positive test for serum anti-mumps 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 2 days
  - Aseptic meningitis
  - Encephalitis
  - Hearing loss
  - Orchitis
  - Oophoritis
  - Mastitis
  - Pancreatitis

**Outbreak**

- ◆ Mumps is the only known cause of epidemic parotitis.
- ◆ CDC defines an outbreak as 3 or more cases occurring within an incubation period in a common setting.

Laboratory criteria for diagnosis

- ◆ Clinical diagnosis of mumps may be unreliable. Cases of suspected mumps should be laboratory confirmed; however, negative laboratory results among vaccinated persons do not necessarily rule out the diagnosis of mumps, particularly if there is an outbreak of parotitis. 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.
- ◆ Criteria for laboratory diagnosis include:
  - Isolation of mumps virus from clinical specimen, OR
  - Detection of mumps nucleic acid (e. g., standard real time RT-PCR assays), OR
  - Detection of mumps IgM antibody in serum, OR
  - Demonstration of specific mumps antibody response in absence of recent vaccination; either a four-fold increase in IgG titer as measured by quantitative assays, or a seroconversion from negative to positive for both IgG and IgM using standard serologic assay of paired acute and convalescent serum specimens.

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NOTE: In both unvaccinated and vaccinated persons, false positive results can occur because assays may be affected by other diagnostic entities that cause parotitis. In addition, the laboratory confirming the diagnosis of mumps in highly vaccinated populations may be challenging, and serologic tests should be interpreted with caution because false negative results in vaccinated persons (i.e., a negative serologic test in a person with true mumps) are common. 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 the initial blood draw; and viral detection in RT-PCR or culture may have low yield if the buccal swab is collected more than three days after parotitis onset. Therefore, mumps cases should not be ruled out by negative laboratory results.

Case classification for import status

**Internationally imported case**

- ◆ Defined as a case in which mumps results from exposure to mumps virus outside the U.S., AND
  - Is evidenced by at least some of the exposure period (12 – 25 days before onset of parotitis or other mumps-associated complications) occurring outside the U.S., AND
  - The onset of parotitis or other mumps-associated complications within 25 days of entering the U.S., AND
  - No known exposure to mumps in the U.S. during that time.

**U.S. – acquired case**

- ◆ Defined as a case in which the patient has not been outside the U.S. during the 25 days before onset of parotitis or other mumps-associated complications, OR
- ◆ Is known to have been exposed to mumps within the U.S.

**U.S. – acquired cases sub-classifications**

- ◆ 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 is 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.
- ◆ 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.

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

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## Testing and diagnosis

- ◆ Buccal swabs for PCR and culture should ideally be obtained within 3 days of the onset of parotitis and should not be collected more than 8 days after parotitis onset.
- ◆ Every suspected case should have blood drawn for mumps IgM and IgG at the time of clinical diagnosis.
- ◆ If acute IgM is negative, a convalescent sample for IgM and IgG (drawn 14 – 21 days later) may be necessary for identification.

### Specimen collection

#### **Collection for PCR, culture and serology**

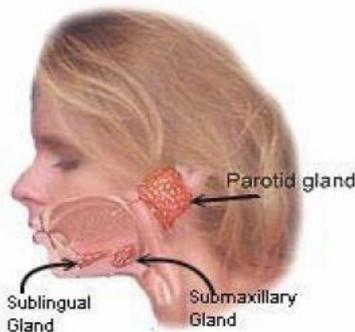
- ◆ Contact commercial laboratory regarding instructions and notification for specimen shipment.
- ◆ Use a separate kit for each specimen.
- ◆ Carefully complete the history form, including the clinical information, test results, provider name and phone number; patient name, DOB and county of residence.
- ◆ Specimen kits are not routinely available from Wadsworth Laboratory. For questions or special requests, please contact the NYSDOH Bureau of Immunization at (518) 473-4437 or Diagnostic Immunology at (518) 474-4177.

#### **Specimen source**

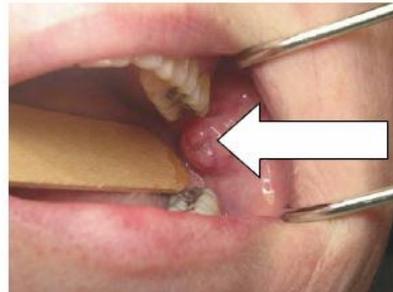
- ◆ For PCR / culture: buccal swab (urine, saliva, and cerebrospinal fluid are not currently recommended due to the low yield of virus)).
- ◆ For mumps IgM and IgG: serum/whole blood.

#### **Procedure**

- ◆ PCR and Culture
  - Collect specimen ideally within 3 – 5 days of onset of symptoms.
  - Massage the parotid gland area for 30 seconds prior to collection.
  - Rub the two dry synthetic swabs on the buccal cavity near the upper rear molars between the cheek and the teeth on the affected side.
  - Oropharyngeal or nasopharyngeal swabs can also be collected and added together with the buccal swab.
  - Immerse swab tips in 2 – 3 ml of viral transport medium or cell culture medium (MEM or Hanks Balanced Salt Solution) or other sterile isotonic solution (phosphate buffered saline).
  - Break the swab so the tips are left in the buffer. Seal tightly.
  - Label the transport medium tube with the patient's name and/or identification number.



Swab the buccal cavity (photo on right), which is the space near the upper rear molars between the cheek and the teeth. Swab the area between the cheek and gum by sweeping the swab near the upper molar to the lower molar area.



Source: <http://www.cdc.gov/mumps/lab/detection-mumps.html>

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**Procedure – Continued**

- ◆ Mumps IgM and IgG
  - Collect 7 – 10 ml blood using tube provided in the kit.
  - If kit tube is damaged or not available, then use a serum separator tube (red top with gray stripe, sometimes referred to as “mottled-top” or “tiger-top”).
  - Spin down specimen if possible and place in the collection kit.
- ◆ Paired serum specimens
  - Collect at least two weeks apart.
  - Obtain acute-phase specimen within 5 days of onset of symptoms.
  - Obtain convalescent-phase specimen within 2 – 3 weeks after onset of symptoms.

**Transport**

- ◆ Serum
  - Do NOT freeze.
  - Refrigerate at 4°C until shipping.
  - Ship with cold packs.
  - Samples must have an outer packaging to prevent freezing.
- ◆ Viral culture sample
  - If unable to ship within 24 hours, preserve at -70°C.
  - Avoid freeze-thaw cycles.
  - Can ship with dry or wet ice or cold packs.

**Mailing instructions for Wadsworth Laboratories**

- ◆ Please consult with the NYSDOH Bureau of Immunization prior to specimen shipment.
- ◆ Ship mumps IgG and IgM serology submission by overnight mail.
  - Put specimen kit into styrofoam mailing box.
  - Include 1 – 2 cold packs to keep specimen refrigerated.
  - If specimen will be delivered on a weekend or holiday, call Diagnostic Immunology in advance: (518) 474 – 4177.

Overnight delivery should be mailed to:

*Diagnostic Immunology  
David Axelrod Institute  
Wadsworth Center, NYSDOH  
120 New Scotland Ave  
Albany, NY 12208*

Questions: Call Wadsworth Center at (518) 474 – 4177.

- ◆ Mumps viral specimen, submission by overnight mail.
  - Specimens must be delivered Monday - Friday (no weekends, no holidays).
  - Put specimen kit into styrofoam mailing box.
  - Include 1 – 2 cold packs to keep specimen refrigerated.

Overnight delivery should be mailed to:

*Virus Isolation Laboratory  
David Axelrod Institute  
Wadsworth Center, NYSDOH  
120 New Scotland Avenue  
Albany, NY 12208*

Questions: Call Wadsworth Center at (518) 474 – 4177.

## **Case investigation**

### Demographics

- ◆ Name
- ◆ DOB
- ◆ Gender
- ◆ Home address
- ◆ Race or ethnicity
- ◆ Occupation
- ◆ Country of birth
- ◆ Length of time in the U.S.

### Reporting source

- ◆ County
- ◆ Earliest date reported

### Clinical information

- ◆ Dates of onset and duration of symptoms (especially parotitis)
- ◆ Hospitalizations (dates, duration, relation to mumps)
- ◆ Complications (meningitis, orchitis, oophoritis, hearing loss, abortion)

### Complications

- ◆ Meningitis, deafness (transient or permanent), encephalitis, orchitis, and others

### Laboratory results

- ◆ Laboratory name
- ◆ Date of specimen
- ◆ Type of test

### Treatment

- ◆ Medications given
- ◆ Duration of treatment

### Vaccine history

- ◆ Type
- ◆ Manufacturer
- ◆ Number of doses
- ◆ Vaccination dates
- ◆ Lot numbers
- ◆ Reason if not vaccinated

### Outcome

- ◆ Recovered or died
- ◆ Date of death
- ◆ Postmortem examination results
- ◆ Death certificate diagnosis

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Epidemiology

- ◆ Transmission settings (employment, home, school, extra-curricular activities, travel history)
- ◆ Epidemiologic linkage
- ◆ Importation status
- ◆ Source of exposure and transmission
- ◆ Outbreak association

Line listing

- ◆ Create if linked to at least three confirmed or probable cases

**Control measures**

- ◆ The main strategy for controlling a mumps outbreak is to define the at-risk population and a transmission setting, 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.
- ◆ The measles/mumps/rubella (MMR) vaccine should be administered to susceptible persons.
  - 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 are vaccinated early in the course of an outbreak.
  - Cases are expected to continue to occur among newly vaccinated persons who are already infected for at least 3 weeks following vaccination because of the long incubation period for mumps.

Control measures for school and day care settings

- ◆ Students and staff with mumps should be excluded from school for five days from the onset of parotid swelling.
- ◆ Conduct a record review of all students/staff born on or after 1/1/57 listing those who are susceptible. Susceptibles include those without one of the following:
  - Documentation of physician diagnosed mumps.
  - Documentation of 1 dose of a live mumps virus vaccine for preschool-aged children and adults not at high risk and 2 doses for school-aged children (grades K-12) and for students at post-high school educational institutions.
  - Laboratory evidence of immunity.
- ◆ Notify susceptibles or their parents or guardians of a possible exposure to mumps.
- ◆ Exclude susceptibles born on or after 1/1/57 for 26 days after the onset of parotitis in the last person with mumps in the school.
- ◆ Vaccinate susceptibles if indicated. Persons with a history of one dose of mumps containing vaccine should receive their second vaccine dose and be allowed to remain in school. Vaccine does not prevent disease after exposure, but can provide future protection against mumps disease for suspect cases.
- ◆ Excluded students/staff may be readmitted immediately after vaccination.
- ◆ Increase surveillance for additional cases.

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Control of outbreaks in summer camps:

- ◆ Review immunization records of all contacts born on or after 1/1/57.
- ◆ List those who have not had 2 appropriately timed doses of mumps vaccine or proof of immunity to mumps.
- ◆ Persons who cannot readily provide documentation of mumps immunity must be vaccinated, excluded or appropriately isolated in the camp setting. The LHD or NYSDOH can provide guidance for isolation recommendations.
- ◆ Persons vaccinated with mumps containing vaccine may be immediately readmitted to the camp setting.
- ◆ For extracurricular activities, all participating individuals must be in compliance with the standards of mumps immunity, be properly vaccinated or excluded.
  - The LHD should be notified of the planned event to review the activity plans and the mumps immunity status of the participating persons. The LHD, in consultation with the NYSDOH, may advise cancellation of travel events based on the nature of the outbreak.
  - Also, based on the nature of the mumps outbreak, camp activities may be confined to the camp grounds with no other groups attending until 26 days after the last case onset.

Control measures for healthcare settings

**Preventing transmission of mumps in health care settings consists of four major components:**

- ◆ Assessment of evidence of immunity of HCP including: a documentation of physician-diagnosed mumps, laboratory evidence of immunity, birth before 1957 or appropriate vaccination history.
- ◆ Vaccination of those without evidence of immunity.
- ◆ Exclusion of HCP with active mumps illness as well as non-immune HCP who are exposed to persons with mumps.
- ◆ Isolation of patients in whom mumps is suspected.

**Evidence of immunity of health care personnel includes:**

- ◆ Documentation of physician-diagnosed mumps.
- ◆ Documentation of mumps vaccination, as recommended by ACIP, OR
  - Adequate mumps vaccination for HCP born during or after 1957 consists of 2 doses of a live mumps virus vaccine. HCP with no history of mumps vaccination and no other evidence of immunity should receive 2 doses (at a minimum interval of 28 days between doses). HCP who have received only 1 dose previously should receive a second dose. Because birth before 1957 is only presumptive evidence of immunity, health care facilities should consider recommending 1 dose of a live mumps virus vaccine for unvaccinated workers born before 1957 who do not have a history of physician-diagnosed mumps or laboratory evidence of mumps immunity.

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- ◆ Serologic evidence of immunity (i.e., positive mumps IgG)
  - Though there are no data that correlate levels of serum antibody with protection from disease, presence of mumps specific IgG antibodies can be considered evidence of mumps immunity.
  - Documentation of physician diagnosed mumps is considered reliable proof of immunity and antibody testing of such individuals is not recommended.
  - Routine serologic testing is not recommended for HCP but may be useful for evaluating personnel who have had unprotected exposure to mumps who do not have other proof of immunity.
  - If serology is to be used to assess the immune status of a HCP after an unprotected exposure, the test should be done as soon after the exposure as possible.
  - Results of serum antibody tests in vaccinated persons are difficult to interpret. In vaccinated persons, antibody levels are often lower than following natural infection, and commercially available tests may not detect such low levels of antibody. As a result, post-vaccination serologic testing to verify an immune response to MMR or its component vaccines is not recommended. There are no data on the effect of additional (greater than two) doses.

**Management of HCP with illness due to mumps:**

- ◆ A diagnosis of mumps should be considered in exposed HCP who develop non-specific respiratory infection symptoms during the incubation period after unprotected exposures to mumps, even in the absence of parotitis.
- ◆ HCP with suspect mumps illness should be excluded until 5 days after the onset of parotitis.

**Management of HCP who are exposed to persons with mumps:**

- ◆ Unprotected exposures are defined as being within 3 feet of a patient with a diagnosis of mumps without the use of droplet and standard precautions.
- ◆ Irrespective of their immune status, all exposed HCP should report any signs or symptoms of illness during the incubation period, from 12 until 25 days after exposure.
- ◆ For HCP who do not have acceptable presumptive evidence of immunity:
  - Non-immune personnel should be excluded from the 12th day after the first unprotected exposure to mumps through the 25th day after the last exposure.
  - The mumps vaccine cannot be used to prevent the development of mumps after exposure. Previously unvaccinated HCP who receive a first dose of vaccine after an exposure are considered non-immune and must be excluded from the 12th day after the first exposure to mumps through the 25th day after the last exposure.
- ◆ For HCP with partial vaccination:
  - Those personnel who had been previously vaccinated for mumps but received only one dose of mumps vaccine may continue working following an unprotected exposure to mumps.
  - Such personnel should receive a second dose as soon as possible, but no sooner than 28 days after the first.
  - They should be educated about symptoms of mumps, including non-specific presentations.
  - Should notify occupational health if they develop these symptoms.

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- ◆ For HCP who are immune:
  - HCP who are immune do not need to be excluded from work following an unprotected exposure.
  - Because 1 dose of MMR vaccine is about 80% effective in preventing mumps and 2 doses is about 90% effective, some vaccinated personnel may remain at risk for infection.
  - HCP should be educated about symptoms of mumps, including non-specific presentations, and should notify occupational health if they develop these symptoms.

Isolate patients in whom mumps is suspected, maintaining droplet and standard precautions for 5 days after onset of parotitis.

- ◆ For further information, review the isolation protocol:  
[http://www.cdc.gov/ncidod/dhqp/gl\\_isolation\\_droplet.html](http://www.cdc.gov/ncidod/dhqp/gl_isolation_droplet.html)

## **Reporting**

- ◆ A Confidential Case Report Form (DOH-389) must be submitted.
- ◆ The LHD must be notified within 24 hours when a mumps case is suspected or identified.
- ◆ The LHD must notify the NYSDOH Bureau of Immunization regional office staff within 24 hours of its notification.