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1.0 AUTHORITY

The authority for the control of communicable diseases through case and contact management exists under the BC Public Health Act (2008). This is further detailed in Section 1.0 Preamble to BC Communicable Disease Control Manual, Introduction, Communicable Disease Control Manual.

2.0 GOAL

Mumps goals for Canada were established at a consensus conference in 1994. B.C. has adopted the national goal to maintain an active prevention program for mumps to minimize serious sequelae from the disease.

The objectives of this guideline are:

- Promoting rapid reporting of all suspected and confirmed mumps cases
- Management of contacts of mumps cases
- Recognition and control of outbreaks of mumps

2.1 Target immunization coverage

- Coverage targets for childhood immunization are 95% for recommended vaccines, with annual improvements of 5% over the prior year; these are currently measured at the 2nd birthday for the 1st dose of mumps-containing vaccine and at the 7th birthday for the 2nd dose of mumps containing vaccine

3.0 DEFINITIONS

Mode of transmission: airborne transmission droplet contact and direct contact with saliva or respiratory droplets from the nose or throat, spread through coughing, sneezing, sharing drinks, or kissing, or from contact with any surface that has been contaminated with the mumps virus.

Incubation period: usually 16 – 18 days to onset; ranges from 12 – 25 days after exposure.

Period of communicability: maximum infectiousness occurs between 2 days before to 5 days following the onset of parotid swelling. In most circumstances, for the purpose of communicable disease control, this is considered the period of communicability. However, mumps virus has been isolated from saliva from 7 days before through 9 days after onset of swelling and may be detected in urine for up to 14 days after onset of swelling. Inapparent infections can be communicable.

4.0 MUMPS FLOW CHART

The flow chart describes actions to be taken by Public Health when notified of a case of mumps.

Case Identification

Receive notification of suspect, clinical/probable, or confirmed case of mumps.
Confirm the diagnosis and obtain history of the case. See Section 5.1.
Virus detection from buccal swab is the diagnostic test of choice; urine should also be collected.
Serology can be done to supplement the diagnosis (both acute and convalescent sera should be collected)
Inform the medical health officer (MHO).

Case Management

Determine period of communicability and places and dates of likely acquisition and transmission. See Section 6.3.
Assess whether case works in a health care setting.

Yes, case works in a health care setting.

Exclusion: Inform case to immediately notify Occupational Health or Infection Control at their workplace. MHO will conduct a risk assessment to determine whether HCW may return to work. Consider excluding the HCW from any work in the health care setting for at least 5 days after onset of salivary gland swelling. Extend exclusion up to 9 days if the case remains sick or works with immunocompromised or vulnerable patients.

No, case does not work in a health care setting.

Self-isolation/ Exclusion: Ask case to self isolate for at least 5 days after the onset of salivary gland swelling.
At MHO's discretion, cases may be excluded from school, daycare, postsecondary institution, and workplace for 5 – 9 days if susceptible individuals are present.

Contact Management: Identify contacts (household, shared sleeping arrangements, direct contact with oral/nasal secretions, children and staff in child care and school facilities). See Section 7.1.
Assess whether each identified contact is susceptible or immune to mumps. See Section 7.2.
Offer MMR vaccine to susceptible contacts who do not have a contraindication to the vaccine.
If contact is a health care worker (HCW) refer to Figure 1: Management of health-care workers who are close contacts of a case of mumps

Reporting

- Report suspect, clinical/probable, and confirmed cases of mumps in iPHIS/ Panorama or PARIS within 7 days of receipt of report.
- Fax a completed copy of the Measles, Mumps, and Rubella Enhanced Surveillance Case Report Form to Immunization Programs and Vaccine Preventable Diseases Service. BCCDC. See Section 8.0.

5.0 CASE IDENTIFICATION

5.1 Confirm the Diagnosis

Investigate all clinically identified and laboratory reported cases of mumps as soon as possible and complete the individual case report form in iPHIS (Integrated Public Health Information System) or PARIS within 7 days.

Inform the local Medical Health Officer.

All categories of the surveillance case definition below are reportable.

Case status	Criteria
Confirmed case	Laboratory confirmed: Mumps-compatible illness❶❷ and laboratory confirmation of infection in the absence of recent immunization with mumps-containing vaccine (i.e., within the previous 28 days) by: • isolation of mumps virus from an appropriate clinical specimen, **or** • detection of mumps virus RNA, **or** • seroconversion or a significant rise (e.g., fourfold or greater) in mumps IgG titre by any standard serologic assay between acute and convalescent sera, **or** • Detection of mumps IgM antibody❸ in a person who is either epidemiologically linked to a laboratory-confirmed case or has recently travelled to an area of known mumps activity, **or** Epidemiologically-linked: Mumps-compatible illness❷ in a person with an epidemiologic link to a laboratory-confirmed case
Clinical / Probable case	Mumps-compatible illness❷ in the absence of laboratory confirmation of infection and not epidemiologically linked to a laboratory-confirmed case.
Suspect case	Illness that could be mumps❹ but without parotitis or orchitis, in a person who is a contact of a confirmed or clinical mumps case.

❶ A laboratory-confirmed case may be subclinical and not meet the clinical illness description.
❷ Mumps-compatible illness is characterized by acute onset of unilateral or bilateral tender, self-limited swelling of the parotid or other salivary gland, or orchitis, lasting $\geq$ 2 days, and without other evident cause.
❸ IgM serology has the potential for false positive and false negative findings. If the clinical presentation is inconsistent with a diagnosis of mumps or in the absence of recent travel/exposure history, IgM results must be confirmed by the other listed confirmatory methods. In a mumps case that had been previously immunized, the IgM class antibody response may not be detectable.
❹ Illness that could be mumps may include myalgia, anorexia, malaise, headache, low-grade fever, or non-specific respiratory symptoms.

6.0 CASE MANAGEMENT

Consult with the MHO and initiate control measures immediately upon the identification of a case, including a clinical or suspect case. Initiation of control measures need not await laboratory confirmation of the case.

6.1 Laboratory Testing

Diagnostic work-up of clinical and suspect cases should include both ***serology and virus detection*** (by RT- PCR testing and/or isolation in cell culture). Specimens should be sent to the BCCDC Public Health Microbiology & Reference Laboratory (BCPHMRL) for testing. Notify the medical microbiologist at BCCDC if priority testing is required: tel: 604-707-2627 from 8:30 – 4:30; 604-661-7033 (24 hours, 7 days per week). For laboratory test results, contact the BCCDC Public Health Microbiology & Reference Laboratory PHSA Lab Results Line (1-877-747-2522) or access the information through PLIS (Provincial Laboratory Information System).

Specimen receiving hours at BCPHMRL for Central Processing & Receiving Pre-Analytical 0730 - 2100 Monday to Friday and 0900 - 1700 Saturday. See the Guide to Programs and Services.

For more information regarding testing and requisition forms, refer to PHSA Laboratories.

6.1.1 Virus Identification

The reverse transcriptase polymerase chain reaction (RT-PCR) assay is the test of choice for the definitive diagnosis of an acute mumps infection, but its sensitivity can be influenced by the following:

- timing of the specimen collection in relation to onset of illness;
- specimen integrity (rapid specimen processing).

Collect oral specimen within 5 days of onset of symptoms. Buccal swab or saliva from the buccal cavity collected within the first 3 to 5 days of parotitis or symptom onset is the preferred specimen.

If client presents at > 5 days after symptom onset, collect urine specimen.

Oral (buccal) specimen: These specimens are optimal for mumps virus detection and isolation purposes; in particular, buccal swabs or swabs of the area around Stensen's duct. If possible the parotid gland should be milked (stroke from angle of the jaw forward and down) and the specimen collected at the exit of the parotid duct (also known as Stensen's duct) which opens into the vestibule of the mouth opposite the

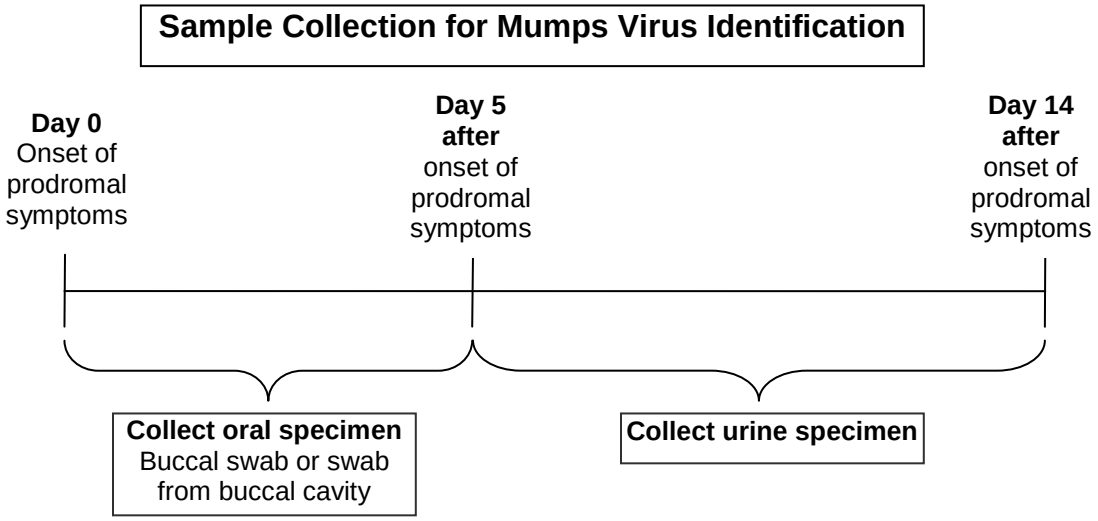
upper 2nd molar tooth. Use a BCPHMRL virus isolation swab (Starplex, S160V, blue top).

In those who have not been previously immunized, the virus can be isolated from the saliva for up to 5 days after onset of symptoms, and from the urine for up to 2 weeks.

In previously vaccinated individuals, the virus may only be detected by RT-PCR within the first 3 days of presentation as it is cleared much more quickly than among those that are not immunized.

Urine specimen: mumps has been detected in urine by isolation in cell culture up to 14 days after the onset of prodromal symptoms. Limited data suggest that the virus may be detected in urine samples later (> 4 days post-onset) than oral specimens. Mumps outbreak experiences suggest that urine is not as sensitive as oral specimens. Nevertheless, in outbreaks of mumps, 7% of cases have been detected solely through testing the urine by RT-PCR. For urine collection, use a sterile container.

Place specimens on ice, and ship immediately to the BCCDC Public Health Microbiology & Reference Laboratory. If immediate transport is not feasible, place the specimen(s) in a refrigerator (not a freezer) and transport to the laboratory on ice within 24 hours.



6.1.2 Serology

Collect both acute and convalescent serum specimens. The first **(acute)** serum sample should be collected as soon as possible upon suspicion of mumps and within 5 days after symptom onset. If mumps IgM class antibody is not detectable in a mumps-compatible case, the blood may have been drawn too early. Collect another sample for

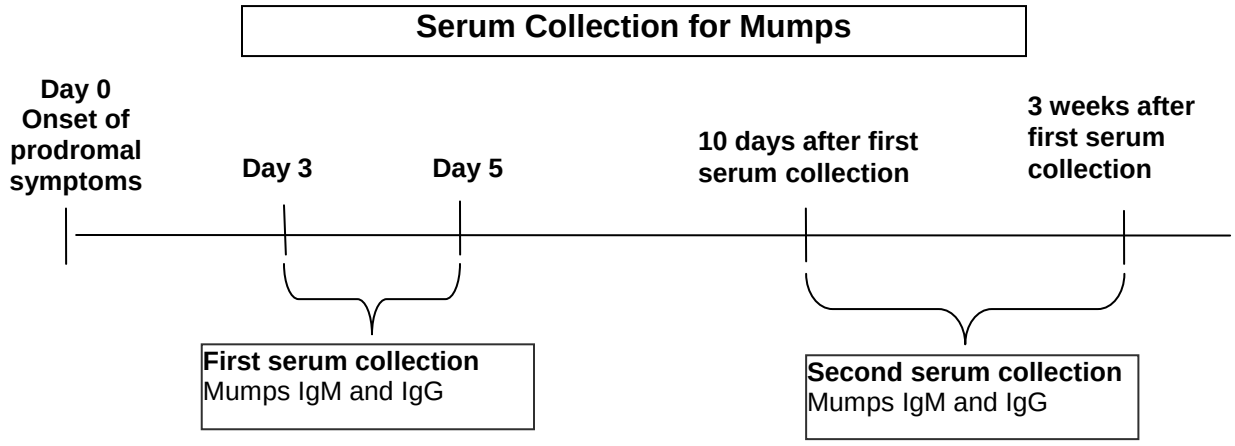
retesting. The second **(convalescent)** serum should ideally be collected at least 10 days and up to 3 weeks after the first sample. Use a BCPHMRL SST (serum separator tube) gold top blood collection tube.

In ***unvaccinated*** persons, the best time to collect serum is between 3 and 5 days from the onset of prodromal symptoms but specimens may be collected at the time of presentation. In unvaccinated cases, IgM antibody is present by day 5 post onset of prodromal symptoms and peaks after about 1 week.

If IgM class antibody is not detectable and the specimen was collected early in the illness, a second acute specimen should be obtained. IgM class antibody can be detected for at least 6 weeks.

Serology may be difficult to interpret in previously immunized people or those recently immunized against mumps. In previously ***vaccinated*** persons, the IgM antibody response to mumps infection is highly variable and may be absent. The existing IgG antibody will begin to rise soon after exposure and infection. At the time of onset of symptoms and collection of the acute serum, the IgG antibody may already be quite elevated, and may obscure the 4-fold rise typically observed between acute and convalescent serum specimens in previously unvaccinated individuals.

For persons with probable mumps, where laboratory confirmation is not available, discuss further course of action with the Medical Health Officer.



6.2 Interpretation of Test Results

An increase of approximately 25% or more from the acute to convalescent value is deemed significant and indicative of a recent infection. This magnitude of increase is consistent with a four-fold or greater rise in IgG titres.

Mumps Testing Results	
Test Result	**Interpretation**
Positive PCR (oral swab or urine), regardless of serology result	Mumps
Reactive IgM antibody	Possible acute mumps infection Note: Without additional confirmatory testing (i.e., IgG seroconversion or virus identification) this may be a false positive IgM result. Such cases should be reported as clinical/probable unless epidemiologically-linked to a laboratory confirmed case or outbreak related.
Non-reactive or equivocal IgM antibody	Not acute mumps infection (unless blood was drawn too early) in an unvaccinated person, but does not rule out mumps in a previously vaccinated person. Viral identification is required for confirmation in previously vaccinated people with this serological result.
Reactive IgG antibody	Immunity to mumps. However, unlike for measles and rubella, there is no reliable serological correlate of protection for mumps IgG. IgG The presence of mumps-specific IgG, as determined using an enzyme immunoassay (EIA), does not necessarily predict the presence of neutralizing antibodies and, thus, immunity. Mumps immunity testing by IgG is not considered as 'proof of immunity' in pre-exposure assessment of health care workers, and should not be conducted in this context.
Non-reactive or equivocal IgG antibody	Not immune to mumps.

If results are inconclusive or inconsistent, the medical health officer may call the medical microbiologist at BCCDC for a consultation tel: 604-707-2627 from 8:30 – 4:30; 604-661-7033 (24 hours, 7 days per week).

Immunization against mumps will result in a seroresponse of IgM and IgG mumps antibodies that is indistinguishable from acute infection. Testing for virus identification will resolve such cases, if required (e.g., if an immunized person develops a mumps illness post-vaccination.

6.3 Case History

In order to properly interpret laboratory results, consider both clinical and epidemiologic information along with the laboratory information. Prior vaccination history, travel and

exposure history, and timing of sample collection relative to symptom onset are all factors that must be considered in the interpretation of lab results for the purpose of confirming mumps cases. If dates of likely exposure are compatible with acquisition in BC, investigate for a source case.

Determine **period of communicability** - maximum infectiousness occurs between 2 days before to 5 days following the onset of parotid swelling. However, virus has been isolated from saliva from 7 days before through 9 days after onset of swelling and may be detected in urine for up to 14 days after onset of swelling. Inapparent infections can be communicable.

Use the "Measles, Mumps, and Rubella Enhanced Surveillance Case Report Form" to collect data and determine if the case report meets the case definitions for measles.

If the case travelled outside of BC during their infectious period, or may have acquired their infection elsewhere in Canada, inform BCCDC and provide the case's itinerary so that the appropriate Canadian public health authorities may be notified if indicated.

6.4 Case Treatment

Clinical management of cases is outside the scope of this guideline. There is no specific treatment for mumps and clinical management is largely supportive.

6.5 Future Immunization of the Case

It is preferable to defer all immunizations with live and inactivated vaccines until at least four weeks after illness onset in the case. People who have had laboratory confirmed mumps need not be immunized against mumps as they are considered immune. Mumps immune individuals, however, may be safely immunized with MMR vaccine for rubella and/ or measles protection.

6.6 Case Isolation

Isolation in the health care facility:
Cases in health care facilities should be managed with droplet precautions (in addition to routine practices) until at least 5 days after symptom onset and up to 9 days if symptomatic.

Isolation in the community:
Public health advice to confirmed and clinical cases of mumps should include the following: to practice good hand hygiene, avoid sharing drinking glasses or utensils, and cover coughs and sneezes with a tissue or forearm.

6.7 Exclusion of Cases

Clinical and suspect cases should be managed as confirmed cases until laboratory evidence suggests otherwise.

6.7.1 Exclusion of health care workers

Health care workers (HCWs) include and are not limited to: nurses; physicians; physiotherapists, laboratory technicians, HCW students; volunteers; medical office assistants; home care workers; emergency responders; and support staff in acute care, long-term care, home care, and community health settings.

Notify Occupational Health and/or Infection Control for the facility in which the case works. The case is also obligated to inform Occupational Health of their illness.

If the case is a HCW, the MHO should exclude them from work for at least 5 days after the onset of salivary gland swelling. This exclusion may be extended up to 9 days if the HCW remains symptomatic at the discretion of occupational health in consultation with the MHO.

6.7.2 Exclusion from workplace, school, or child care settings

The MHO should consider excluding cases from school, daycare, post-secondary institution and the workplace for at least 5 days and up to 9 days (if symptomatic) after the onset of salivary gland swelling if there are susceptible individuals present in that setting. The period of maximum communicability is from 2 days before to 5 days after onset of parotid swelling.

When the case is in a school setting, notify the appropriate school administrator.

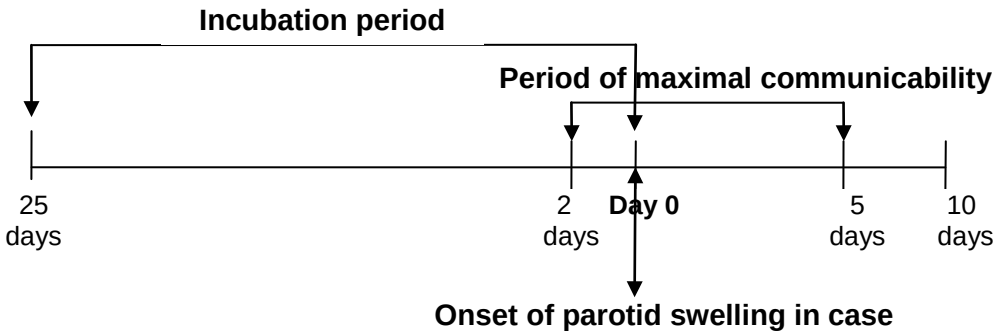
7.0 CONTACT MANAGEMENT

7.1 Contact Identification

Identify contacts. Contacts include those who have had the following types of contact with the case during the period of maximum communicability (see Section 3.0 period of communicability).

- household contacts;
- persons who share sleeping arrangements with the case, including shared rooms;
- direct contact with the oral/nasal secretions of an infectious case (e.g., close contact within a distance of 2 metres; sharing cigarettes, drinking glasses, food, cosmetics like lip gloss; kissing on the mouth);
- children and staff in child care and school facilities (as deemed necessary by the epidemiology of the outbreak).

The Measles, Mumps, and Rubella Enhanced Surveillance Case Report Form may be used for data collection.



7.2 Contact notification

Contact notification should be done by public health if resources permit, but resources may not be sufficient to do this with a large number of cases. An alternative is contact notification by the case. Contacts should be informed by the case about their potential exposure and asked to do the following:

- review their immunization history for evidence of MMR vaccine receipt and get immunized if needed. Refer them to the MMR Vaccine HealthLink BC File #14a ;
- watch for signs and symptoms of mumps. Refer them to the Mumps HealthLink BC File #14c ;
- contact local public health authorities should symptoms occur;
- isolate themselves if symptomatic until a clinical assessment has been done to confirm mumps diagnosis.

Depending on the epidemiology of the outbreak, alternative follow-up mechanisms (e.g., letter, Internet, public service announcement, press release, toll-free telephone number) should be considered to reach contacts and provide information to other at-risk groups.

7.3 Case Travel

If the case travelled outside of BC during the infectious period, inform BCCDC and provide sufficient details about the case's itinerary to enable the affected public health jurisdiction to receive the notification and take appropriate action for contact identification and management.

7.4 Assess susceptibility of contacts

Assess whether each identified contact is susceptible or immune to mumps. Those not immune are considered susceptible.

Consider as **immune** those persons who have had any of the following:

- Birth date before January 1, 1970 (1957 for health care workers).[1]
- Prior clinical diagnosis of acute mumps **and** laboratory confirmation of same; **or**
- Born on or after January 1, 1970 with documented evidence of two doses of mumps-containing vaccine on or after the first birthday and given at least 4 weeks apart; **or**

There is no known serologic threshold that correlates with immunity to mumps, and therefore mumps serology is not to be used for assessment of immunity. The only exception is post-exposure serology for exposed health care workers where exclusion is being considered and no other information is available.

[1] These persons are generally assumed to have acquired immunity to mumps from natural infection. There may be susceptible individuals in this age group, however, and those without a history of mumps vaccine or mumps disease may be considered susceptible and offered MMR vaccine.

Determine whether any of the identified contacts are health care workers (HCWs). If a contact is a susceptible HCW and requires exclusion, public health will notify, Occupational Health for the facility in which the HCW works.

Assess symptomatic contacts for mumps.

7.5 Immunoprophylaxis of Susceptible Contacts

Offer MMR vaccine to susceptible contacts who do not have a contraindication to the vaccine. Although mumps immunization after exposure to mumps may not prevent the disease, it is not harmful. Should the exposure not result in an infection, the vaccine will confer protection against future exposures. Immunization during the incubation period presents no increased risk of vaccine-associated adverse events.

Pre-vaccination mumps immunity screening is not recommended as there is no serological correlate of protection.

No data are currently available correlating specific antibody titres with susceptibility to mumps, and pre-existing immunity is not a contraindication to mumps immunization.

In contacts who have received mumps vaccine post-exposure and develop symptoms of mumps including parotitis (occurring within 10-14 days of immunization), specimens must be collected for virus identification to confirm the diagnosis of mumps as serology will not distinguish between wild type infection and mumps vaccine seroresponse with IgM and IgG. Virus isolation and typing will distinguish wild from vaccine strain virus.

Immune globulin is not recommended for mumps for post exposure prophylaxis as it has not been shown to be effective.

7.6 Exclusion of Susceptible Contacts

7.6.1 Health care settings

When a susceptible HCW is exposed to a case of mumps, conduct a risk assessment to determine whether the HCW may return to work. In consultation with the MHO, consider exclusion of the HCW from any work in the health care setting from the 10th day after the first exposure until the 26th day (inclusive) after the last exposure to the case of mumps. These time intervals reflect the incubation period and the potential period of communicability before the possible onset of symptoms.

Refer to Section 13.0 Appendix A, Figure 1: Management of health-care workers who are close contacts of a case of mumps

7.6.2 Workplace, school, or child care settings

Exclusion of susceptible contacts to a mumps case is **not** indicated.

7.7 Contact Education

Advise susceptible contacts:

- to observe for signs and symptoms of mumps beginning 16 to 18 days after the first contact with a case;
- about transmission, the signs and symptoms of mumps, and to isolate themselves at home if any symptoms of mumps develop until an assessment has been done to confirm a diagnosis of mumps;
- to report any symptoms compatible with mumps to their doctor/health care provider. Advise them to call ahead before going to any health care facility, including laboratories, to inform the staff of mumps symptoms so that they can be isolated on arrival to avoid exposing any susceptible persons.
- to inform their local public health unit should they develop mumps.

8.0 REPORTING

Complete the individual case report in iPHIS/ Panorama (Integrated Public Health Information System) or PARIS within 7 business days following identification of a suspect, clinical/probable, or confirmed case of mumps.

Fax the completed Measles, Mumps and Rubella Enhanced Surveillance Case Report Form to Immunization Programs and Vaccine Preventable Diseases Service, BC Centre for Disease Control (fax: 604-707-2515).

Update iPHIS/Panorama/PARIS if more or new information becomes available. Update the case status item if the case changes from confirmed, clinical or suspect status.

The BCCDC may notify other Canadian jurisdictions about the occurrence of mumps via the Canadian Network for Public Health Intelligence (CNPHI).

9.0 OUTBREAK MANAGEMENT

A mumps outbreak is defined as confirmed cases in excess of what is expected in the jurisdiction over a given period of time.

The main components of mumps outbreak management are:

- identify the population affected by the outbreak.
    - Identify the population at risk of infection.
    - Determine where transmission is occurring.
    - Identify individuals at potential risk of infection.
- identify and vaccinate susceptible individuals in the identified population who do

not have a contraindication to MMR vaccine.
- increase awareness about mumps in the population and in the medical community.

9.1 Intensify Surveillance

Conduct enhanced surveillance for additional cases of mumps including through notification of local physicians about the occurrence of mumps in the area and diagnostic testing.

9.2 Immunization

Notify Immunization Programs and Vaccine Preventable Diseases Service of the outbreak and provide an estimate of the number of excess doses of vaccine required if expanded immunization services are being planned. This will ensure that adequate supplies of vaccine can be secured for both the outbreak intervention and routine immunization programs.

Outbreaks that are limited to family or closely related groups in which the cases can be epidemiologically linked can be managed with a limited offering of vaccine.

Outbreaks that are community based with multiple generations of cases occurring in a geographic area and without epidemiologic links require broader messaging and offering of immunization.

Consult with BCCDC. There is no threshold of numbers of cases or rates above which expansion of control measures should be done (e.g., broader offering of vaccine). These measures will need to be considered on a situation specific basis. The characteristics of cases of mumps and the settings in which transmission is occurring should guide the focus of vaccination activity.

Anyone who is not up to date on their immunization and resides within the outbreak area should be offered the vaccine as this is an opportunity to update their immunization status.

Immunization is not known to prevent mumps in those already exposed, but will protect against future exposures if given sufficiently in advance of that exposure (i.e., minimum 14 days) and will eventually interrupt the outbreak if it results in sufficient herd immunity.

Provide immunization clinics in locations readily accessible by the affected community including in high schools, on campuses, and in “outreach” settings (e.g., churches, large workplaces with several cases of mumps).

9.3 Communication

Contact physicians, laboratories, and hospitals in the area to alert them of the outbreak and request reports of suspect cases. This is to ensure diagnosis and reporting of cases but also to ensure health care worker immunization and infection control policies are fully implemented.

9.4 Mass gatherings

Gatherings at which mumps can be transmitted include events of all sizes, in both private and public settings. Gatherings may include social or religious functions, sports activities, shopping events, concerts, conferences, meetings as well as public transit. During an outbreak, a risk assessment should be conducted to assess whether any public gatherings need to be cancelled or postponed. This can be considered if a gathering may pose a high-risk for transmission or involve unimmunized populations. In the context of a mumps outbreak, public health and event organizers should advise participants:

- of the potential for exposure and measures to take to reduce risk of spreading the disease (e.g., check that immunization is up-to-date, hand hygiene, avoid sharing food/drink/utensils, cough or sneeze into crook of elbow, stay home if ill);
- about mumps symptoms and prevention;
- that if they become ill, to call ahead before visiting their health-care provider.

Refer individuals to HealthLink BC for more information:

- Phone 8-1-1

9.5 Analyze the Outbreak

Review the effectiveness of the local control measures and revise local protocols as necessary.

Following an outbreak, an epidemiological analysis of events provides a useful local reference.

10.0 CLINICAL DESCRIPTION

Mumps is an acute infectious disease caused by the mumps virus. It is characterized by swelling of one or more of the salivary glands, most commonly the parotid glands (parotitis), which may be unilateral but is more commonly bilateral. Sometimes the sublingual or submaxillary glands are involved.

Parotitis may be preceded by a non-specific prodrome lasting 3 to 5 days with fever, headache, malaise, myalgia, and anorexia. About 20-30% of those infected develop acute parotitis. Non-specific or primarily respiratory symptoms occur in about half of those who acquire infection and in children under 5 years old mumps can present as a primarily lower respiratory infection. Fever lasts 1-6 days but enlargement of the parotids may persist 10 days or longer.

While mumps virus is the major etiologic agent of parotitis, this condition can also be caused by other viruses such as Coxsackie, influenza A, parainfluenza and Epstein Barr virus, as well as bacteria such as streptococci and staphylococci.

Up to 30% of mumps infections are sub-clinical. Although complications are relatively frequent, permanent sequelae are rare. Before the widespread use of mumps vaccine, mumps was a major cause of viral meningitis. Mumps meningoencephalitis can, rarely, result in permanent neurologic sequelae, including paralysis, cranial nerve palsies, and hydrocephalus. Transient but occasionally permanent deafness may occur at an estimated rate of 0.5 to 5.0 per 100,000 reported mumps cases. Orchitis occurs in 20% to 30% of post-pubertal male cases, mastitis in up to 31% and oophoritis in 5% of post-pubertal female cases. Involvement of the reproductive organs is commonly unilateral; therefore, sterility as a result of mumps is rare. Neither wild type infection nor vaccination provides a lifelong guarantee of immunity.

Mumps infection during the first trimester of pregnancy may increase the rate of spontaneous abortion, but mumps infection in pregnancy has not been associated with congenital malformations.

11.0 EPIDEMIOLOGY

Mumps incidence in BC has declined dramatically since 1997. Mumps control has likely benefited from two changes to the MMR vaccine recommendations, implemented in 1996: the two dose MMR vaccine schedule for young children and a recommendation for a 2nd dose of MMR vaccine for college and university students and health care workers.

From 2002 through 2006, fewer than 10 cases were reported each year, mainly in adults. Subsequent to 2007, the incidence has been higher, with large outbreaks in 2008 and 2011, the first of these affecting a faith based community in Fraser East. Two patterns of outbreaks have been seen in Canada as in BC: a) among communities unimmunized due to religious reasons; these have affected mainly school age children; 2) among young adults, with the majority of cases among people in their 20s and other cases among those born after 1969 with small numbers among older individuals. In 2008 BC added a 2nd dose of mumps to its immunization schedule recommendations for people born after 1969 but the strategy for its implementation has been through opportunistic health encounters rather than mass catch-up. Therefore, the two patterns described above are likely to continue to predominate. In mumps outbreaks in recent years in BC and other Canadian provinces, the provision of vaccine to susceptible groups (as defined by the particular epidemiology of the outbreak) has resulted in low levels of vaccine uptake.

For details please refer to the Annual Summary of Reportable Diseases and to periodic updates about measles activity at Vaccine Preventable Disease Reports.

11.1 Mumps Immunization in BC

Mumps vaccine was approved in Canada in 1969, and MMR vaccine was approved in 1972. MMR vaccine began to be used in the publicly funded immunization program in 1981 in BC for children aged 12 months, preschoolers, and susceptible school children. In 1985, an MMR campaign was conducted over a 1 to 2 year period by health authorities for school children in grades K to 12, with immunizations given by public health nurses in the schools. In 1996, BC conducted a measles elimination campaign targeting children aged 19 months of age through to those attending post-secondary (college/ university) educational institutions. This campaign utilized measles-rubella (MR) vaccine, and did not deliver a second dose of mumps vaccine. In the same year, a policy of second dose of MMR vaccine at 18 months of age was recommended for measles elimination in addition to the first dose given at 12 months of age.

In 1996, BCCDC immunization guidelines also recommended a second dose of measles vaccine given as MMR vaccine to health care workers born after 1956 and to students of colleges and universities; this became publicly funded in 2006 and 2007, respectively. While intended for measles elimination, this policy has the potential to in effect deliver a second dose of mumps vaccine to a large proportion of health care workers. Data on health care worker coverage are not available at the provincial level.

Immunization coverage rates are assessed using iPHIS/ Panorama immunization registry data or aggregate reporting from health authorities. Results of mumps-containing vaccine coverage assessment at the 2nd birthday and at kindergarten/ 7th birthday are available at Immunization Coverage.

In 2014, 18 years after implementation of a measles 2-dose policy, most children and adolescents aged up to about 20 years old who have lived their lives in BC will have received two doses of mumps vaccine given as MMR vaccine, and those up to about 45 years of age will have been offered one dose of MMR vaccine. Those older than about 45 are likely to have naturally acquired immunity as mumps continued to circulate prior to and during the first several years of immunization programs in Canada.

The following tables summarize the number of doses of MMR vaccine recommended for BC residents based on its constituent components:

Health care workers

Year of birth	Measles	Mumps❷	Rubella❶	MMR vaccine
Prior to 1957	0 doses	0 doses	1 dose	1 dose
1957 – 1969	2 doses	1 dose		2 doses
1970+		2 doses		2 doses

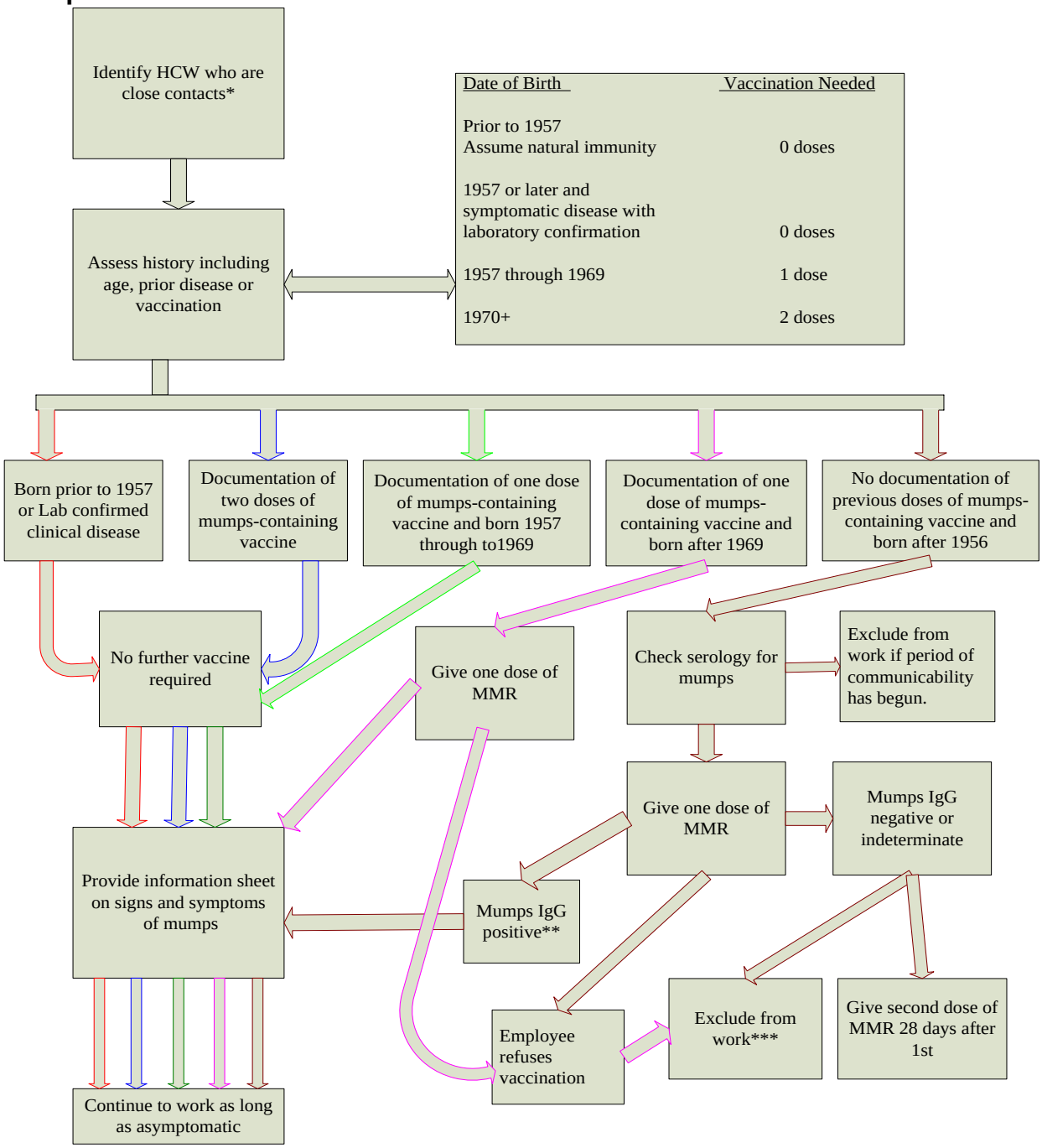
All others

Year of birth	Measles	Mumps❷	Rubella	MMR vaccine
Prior to 1957	0 doses	0 doses	0 doses	0 dose
1957 – 1969			1 dose	1 dose
1970+	2 doses	1 or 2 doses		2 doses

❶One dose of MMR for rubella protection is recommended for all health care workers regardless of age, and for adults born after 1956 who do not have documentation of receiving 1 dose of rubella containing vaccine on / after their first birthday or laboratory evidence of immunity or laboratory confirmed rubella.
❷One dose of mumps vaccine is recommended for any susceptible adult born in 1970 and later. The following should receive two doses: children as per routine schedule; students of post-secondary educational settings and travelers to outside of North America. Health care workers should receive 1 dose if born between January 1, 1957-December 31, 1969; 2 doses if born on or after 1970.

12.0 APPENDIX A.

Figure 1: Management of health-care workers who are close contacts of a case of mumps



*Close contact (exposure) for health care workers is defined as providing patient care with unprotected close contact within two meters of a confirmed case during the maximal communicable period (2 days before and 5 days after onset of classical signs and symptoms).

**Will need a second dose of MMR if born after 1969.

*** In consultation with the MHO, consider exclusion of the HCW from any work in the health care setting from the 10th day after the first exposure until the 26th day (inclusive) after the last exposure to the case of mumps.(where day of exposure is day 1).

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