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1.0 AUTHORITY

The authority for the control of communicable diseases through case and contact management exists in British Columbia under the [Reporting Information Affecting Public Health Regulation \(B.C. Reg. 167/2018\)](#) under the Public Health Act. The direct link to the list of reportable diseases is [here](#).

2.0 GOAL

The goal of the measles control program is to maintain the elimination of indigenous measles in B.C. and prevent transmission from imported cases.

The objectives of this guideline are to support:

- Rapid reporting of all suspected and confirmed measles cases.
- Conducting enhanced surveillance for measles.
- Identification of susceptible exposed contacts and immunoprophylaxis when indicated.
- Instituting prompt outbreak control measures.

2.1 Target immunization coverage

The Pan American Health Organization (PAHO) defines measles elimination as the lack of a circulating endemic genotype for at least one year, and member nations are:

- To achieve and maintain 95% coverage of one dose of measles-containing vaccine, with an opportunity for a second dose.

The Canadian national target is:

- To achieve and maintain 95% completion of 1 dose by the 2nd birthday and 95% completion of the 2nd dose of measles containing vaccine by the 7th birthday.

3.0 DEFINITIONS

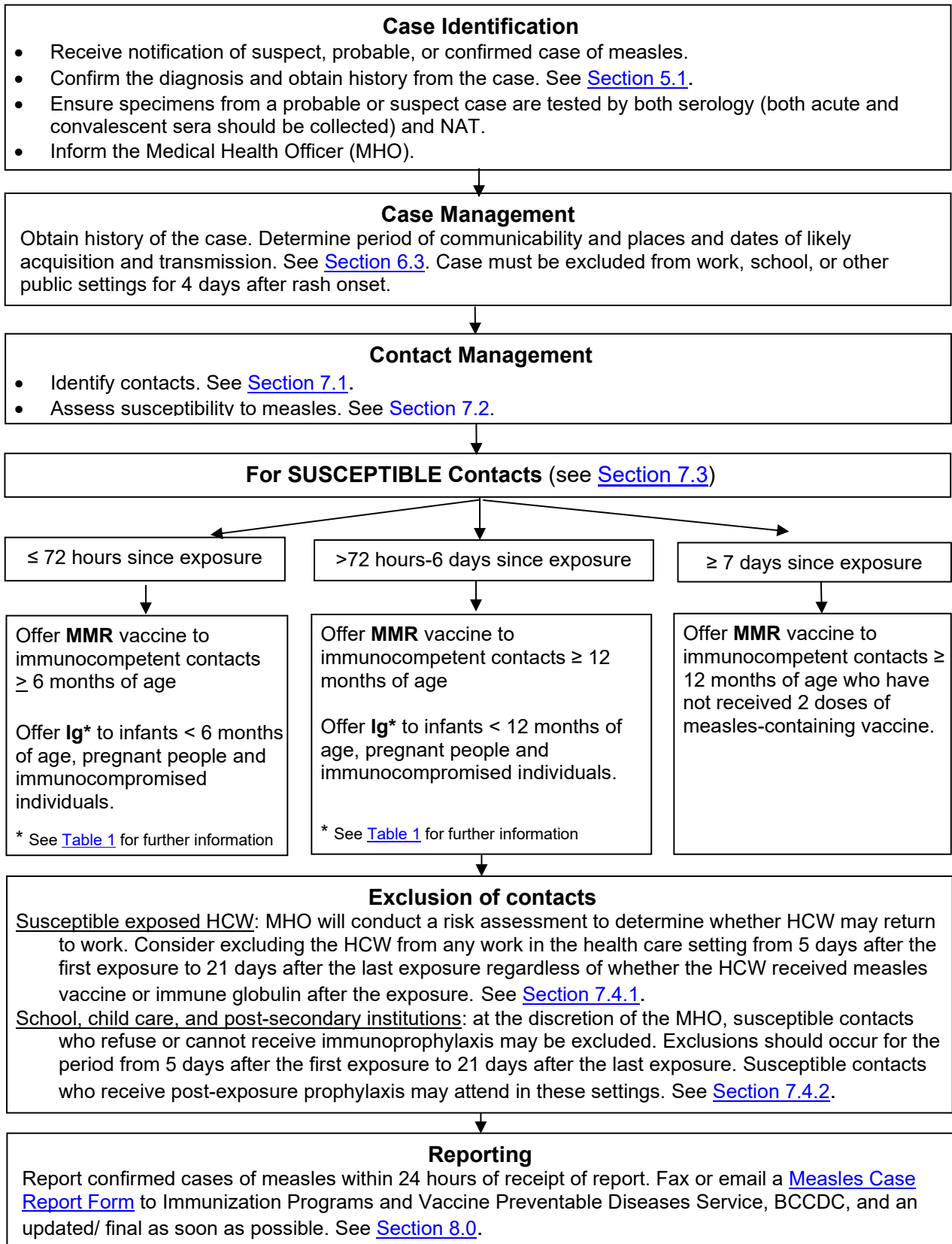
Mode of transmission: airborne by aerosol and droplet spread, direct contact with nasal or throat secretions of infected persons; less commonly by articles freshly soiled with nose and throat secretions.

Incubation period: average is 8 – 12 days with a range of 7 – 18 days, rarely may be as long as 21 days.

Period of communicability: from 1 – 2 days before the beginning of the prodromal period (usually about 4 days before rash onset) to 4 days after rash appearance in a healthy person and for the duration of measles illness in an immunocompromised person.

4.0 MEASLES FLOW CHART

The flow chart describes actions to be taken by Public Health when notified of a case of measles. A sporadic case of measles requires urgent follow-up.



5.0 CASE IDENTIFICATION

5.1 Confirm the Diagnosis

Investigate all confirmed, probable, and suspect cases of measles within 24 hours and complete the individual case report in the public health information system. Public health action, including contact management, may commence at any level of the case definition, including for a suspect case.

Inform the local Medical Health Officer and initiate control measures immediately.

All categories of the surveillance case definition below are reportable.

Case status	Criteria
Confirmed case	<p><u>Laboratory confirmed:</u> Laboratory confirmation of infection in the absence of recent immunization with measles-containing vaccine:</p> <ul style="list-style-type: none"> • isolation of measles virus from an appropriate clinical specimen¹; OR • detection of measles virus RNA; OR • seroconversion or a significant rise in measles IgG titre between acute and convalescent sera; OR • positive serologic test for measles IgM antibody using a recommended assay in a person who is either epidemiologically linked to a laboratory-confirmed case or has recently travelled to an area of known measles activity. <p><u>Epidemiologically-linked:</u></p> <ul style="list-style-type: none"> • Clinical illness* in a person who is epidemiologically linked to a laboratory-confirmed case.
Probable case	Clinical illness* in the absence of appropriate laboratory tests and not epidemiologically linked to a laboratory-confirmed case and with recent travel to an area of known measles activity.
Suspect case	For public health intervention – all of the following: <ul style="list-style-type: none"> • Fever of 38.3°C or greater • Cough, coryza, or conjunctivitis • Generalized maculopapular rash

* Clinical illness is characterized by all of the following features:

- Fever of 38.3° C or greater
- Cough, coryza or conjunctivitis
- Generalized maculopapular rash for at least 3 days

¹ This test is not performed by BCCDC Public Health Laboratories.

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, if the risk assessment is suggestive of measles. Initiation of control measures need not await laboratory confirmation of the case.

6.1 Laboratory Testing

Diagnostic work-up of probable and suspect cases should include both **virus detection** (by nucleic acid testing (NAT)) **and serology**. Specimens should be sent to the British Columbia Centre for Disease Control (BCCDC) Public Health Laboratory for testing (BCCDC PHL). The medical health officer may request priority testing from the medical microbiologist at BCCDC if required at tel: 604-661-7033 (24 hours, 7 days per week). For laboratory test results, contact the BCCDC PHL Results Line (1-877-747-2522) or access the information through CareConnect.

Specimen receiving hours at BCCDC PHL for Central Processing & Receiving Pre-Analytical are 0700 - 2300 Monday to Sunday.

For more information regarding laboratory programs and services including the [eLab Handbook](#), refer to the [Laboratory Services](#) page on the BCCDC website.

6.1.1 Virus Detection

Virus detection should be attempted for all sporadic cases of suspect or probable measles. In an outbreak, specimens should be collected from several cases to increase the success of virus detection and subsequent genotyping.

Samples for measles NAT detection include either nasopharyngeal swab (preferred) or throat swab; urine and other sample types are also accepted (please consult the [eLab Handbook](#)). Viral detection methods (e.g., NAT followed by sequencing) enable a definitive diagnosis, allow the laboratory to distinguish vaccine virus type from wild virus type, and can determine if there are single or multiple genotypes of virus circulating in a community. Genotyping of the measles virus is helpful in understanding transmission patterns and is especially useful if there are no epidemiological links between cases because such results can indicate whether the origin of the virus is the same or different.

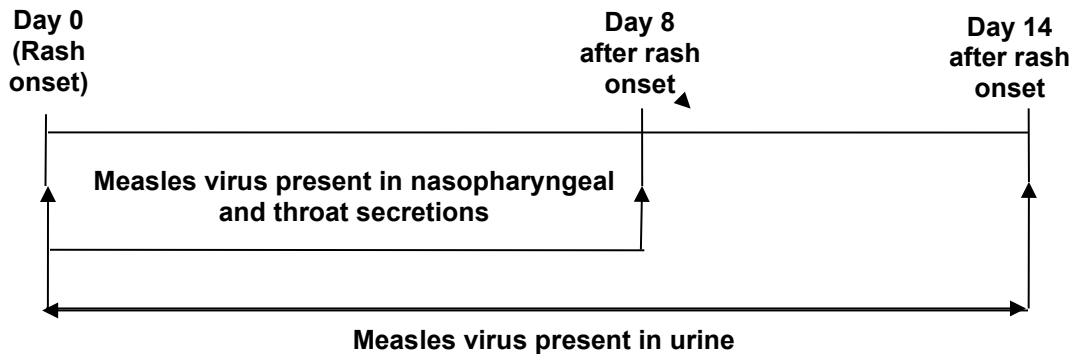
Collect a **nasopharyngeal (NP) or throat swab** and a **urine sample** at the time of presentation.

NP and throat swabs may be collected up to 8 days after rash onset. For both NP swabs and throat swabs, use a BCCDC PHL flocked swab (COPAN, red top with universal transport media is preferred).

To collect the nasopharyngeal swab, insert the flexible wire shaft swab through the nares parallel to the palate (not upwards) until resistance is encountered or the distance is equivalent to that from the ear to the nostril of the patient indicating contact with the nasopharynx. Gently, rub and roll the swab. Leave the swab in place for several seconds to absorb secretions before removing. To collect a throat swab, swab the back of the throat near the tonsils (if present).

Urine samples may be collected up to 14 days after rash onset. The yield may be lower with the longer timelines for collection of these samples. For urine collection, use a sterile container.

Sample Collection for Measles Virus Detection



Place specimens on ice pack(s), and ship immediately to the BCCDC PHL. If immediate transport is not feasible, place the specimen(s) in a refrigerator (not a freezer) and transport to the laboratory on ice pack(s) within 24 hours.

NAT performed on nasopharyngeal, throat and urine specimens is a very sensitive assay for measles. Specimens that test positive by NAT will be forwarded to the National Microbiology Laboratory for genotypic analysis. Virus detection methods are also useful when serological results conflict with the epidemiological or clinical features of the case.

6.1.2 Serology

Acute measles serology includes testing for measles specific IgM and IgG class antibodies.

As the clinical presentation of measles can resemble other viral infections, request that sera from suspect or probable cases of measles be tested for antibody to parvovirus B19 and rubella. Request these tests on the initial ACUTE measles specimen.

Use a BCCDC PHL SST (serum separator tube) gold top blood collection tube. Identify



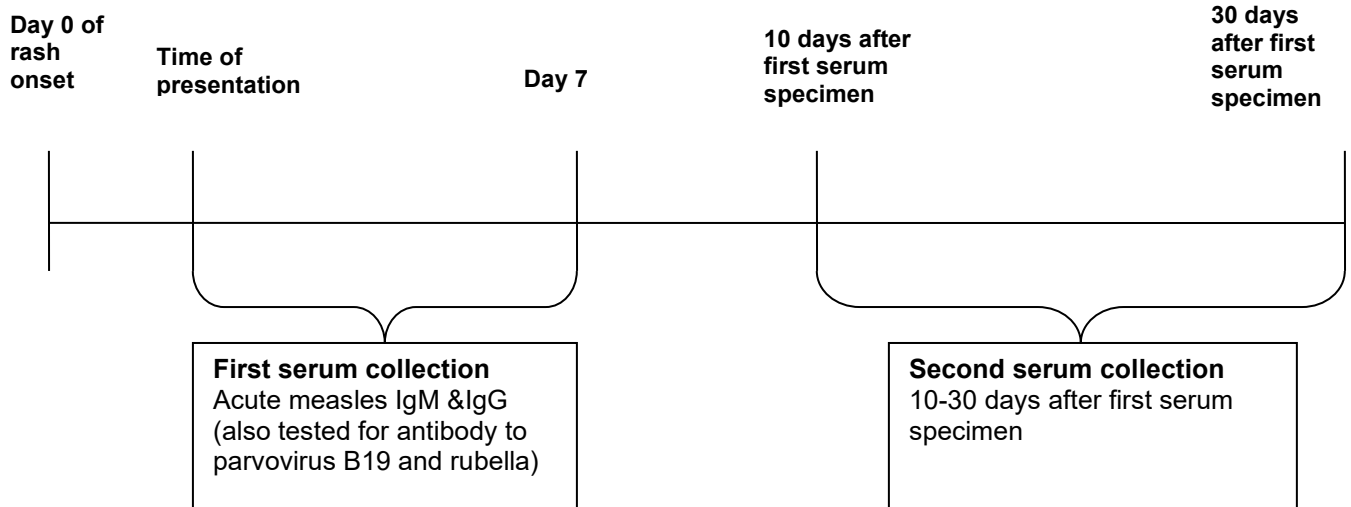
the specimen as “acute measles” on the lab requisition.

For IgM and IgG serology, obtain the first (acute) sample at the time of presentation and no later than day 7 following rash onset. Note that 20% of measles cases will not have a reactive IgM when blood is drawn within the first 3 days of rash. For this reason, a second blood sample is indicated if the IgM serology results from an early acute phase sample are inconclusive or negative for measles, rubella, and parvovirus B19, and the person meets the probable case definition for measles.

Collect the second (convalescent) sample 10 to 30 days after the first sample and record as such on the laboratory requisition. These paired sera are tested simultaneously to determine if seroconversion has occurred.

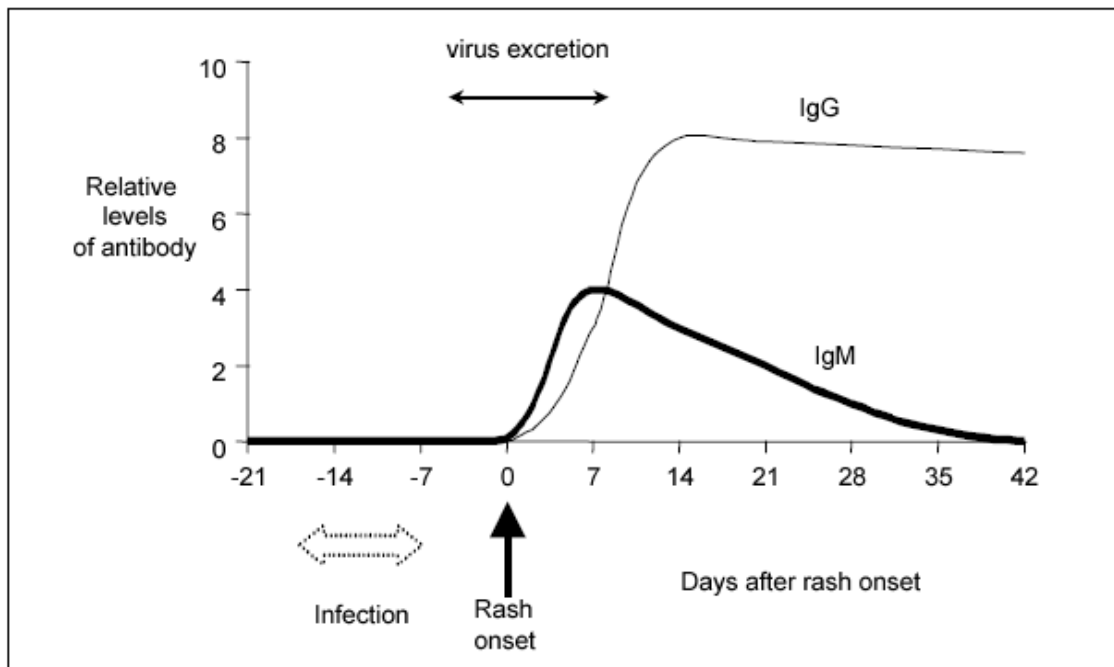
If the case is confirmed by NAT virus detection, a convalescent specimen is not necessary.

Serum Collection for Measles



The graph below depicts the antibody response to measles infection (WHO, 1999).

Figure 1: Antibody response to measles virus infection



Antibodies are first detectable when the rash appears, and life-long protection results from natural infection. IgM antibodies are produced initially, followed by IgG and IgA in serum and secretions.

Due to the very low incidence of measles in BC, an anti-measles IgM positive result in a sporadic case without links to other cases must be interpreted with caution because these may be false positives. Such sporadic cases should be confirmed by convalescent blood specimens, which will allow for demonstration of a rise in IgG titre and/or virus detection.

If the clinical and epidemiological data do not fit the picture of measles, or if results are inconclusive or inconsistent, the Medical Health Officer can consult with the medical microbiologist at BCCDC 604-661-7033 (24 hours, 7 days per week).

6.2 Interpretation of Test Results

Where serology test results are reported in international units, a significant rise between acute and convalescent serum is considered consistent with seroconversion. Where these results are not reported in international units, seroconversion may be established on consultation with the virologist/ medical microbiologist.



The timing of specimen collection must always be considered in the interpretation of a laboratory result. Samples from the early acute phase (i.e., those drawn before 3 days after rash onset) may not have detectable IgM antibody compared with those drawn 3 to 28 days after rash onset. For this reason, a second blood sample is indicated if the IgM serology results from an early acute phase sample are inconclusive or negative for measles and the person meets the probable case definition for measles.

Measles Testing Results	
Test Result	Interpretation
Reactive IgM antibody	Possible acute measles infection or recent immunization. False positive may occur in about 0.4%. IgM is also detected after immunization against measles. IgM may remain detectable in some individuals for years after vaccination or natural infection.
Non-reactive or equivocal IgM antibody	Not acute measles infection (Note: 20% of measles cases will not have a reactive IgM when blood is drawn within the first 3 days of rash).
Non-reactive anti-measles IgG	Susceptible to measles (no evidence of past infection or immunization).
Reactive anti-measles IgG	Immune to measles (evidence of past infection or immunization).
A significant rise in IgG titre between the acute and convalescent sera	Acute measles infection or recent immunization.
Positive NAT <ul style="list-style-type: none"> • Nasopharyngeal/throat swab • Urine 	Confirms acute measles infection.

Immunization against measles will result in a seroresponse of IgM and IgG measles antibodies that is indistinguishable from acute infection. Testing for virus detection should resolve such cases.

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 measles cases. If dates of likely exposure are compatible with acquisition in BC, investigate for a source case.

Using the known incubation period for measles (see Section 3.0), determine the likely source of infection. Determine the **period of communicability** - from 1 – 2 days before the beginning of the prodromal period (usually about 4 days before rash onset) to 4

days after rash appearance in a healthy person and for the duration of measles illness in an immunocompromised person.

Use the [Measles 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 public health authorities may be notified if indicated. See section [8.1 Inter-jurisdictional Notifications](#) for more information.

6.4 Case Treatment

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

6.5 Future Immunization of the Case

Defer all immunizations with live and inactivated vaccines until at least four weeks after illness onset in the case. This is because measles infection is accompanied by marked and prolonged abnormalities of cell-mediated immunity (CMI). CMI is measurably suppressed for several weeks after infection, during which time new immune responses are impaired (Karp 1996; Amanna 2007).

People who have had laboratory confirmed measles need not be immunized against measles as they are considered immune. Measles immune individuals, however, may be safely immunized with MMR vaccine for rubella and/or mumps protection.

6.6 Case Isolation

Isolation in a health care facility:

In health care facilities, initiate respiratory isolation (full airborne precautions with negative pressure isolation) from the onset of the catarrhal stage of the prodromal period through the 4th day of rash for otherwise healthy individuals and for the duration of illness for immunocompromised individuals. This will reduce the exposure of other patients at high risk and of health care workers.

Isolation in the community:

Public health advice to suspect, probable, and confirmed cases should include the following: education on how measles is transmitted, to stay home for at least 4 days after the rash first appeared, to practice good hand hygiene, avoid sharing drinking glasses or utensils, and cover coughs and sneezes with a tissue or forearm. The case should also be advised to wear a mask to avoid infecting others.

6.7 Exclusion of Cases

Probable 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 4 days after the appearance of a rash.

The Provincial Infection Control Network Guidelines for baseline assessment of health care workers, management of measles in HCWs, and management of HCW contacts of measles are available at: <https://www.picnet.ca/guidelines/>

6.7.2 Exclusion from workplace, school, or child care settings

The MHO should exclude cases from school, child care settings, post-secondary institutions and the workplace for at least 4 days after the appearance of the rash if there are susceptible individuals present in that setting.

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

7.0 CONTACT MANAGEMENT

7.1 Contact Identification

Definition: Contacts are individuals who have spent any length of time in a room or enclosed space while the infectious measles case was present or for up to 2 hours after the case left the room/space.

The highest attack rates are among susceptible household contacts with secondary household cases experiencing more serious disease. Therefore, these should be prioritized for contact identification and management.

The 2-hour timing recommendation is consistent with Canadian and US infection control guidelines. It is based on documented transmission events related to such exposures in medical waiting rooms after the index case has left the room (Bloch AB, 1985; Remington,

PL, 1985). It is recognized that transmission of this type may be a relatively uncommon event; however, a risk assessment should be undertaken that considers the respiratory symptoms, speed of isolation of the case after arrival in that setting, and the contacts' susceptibility.

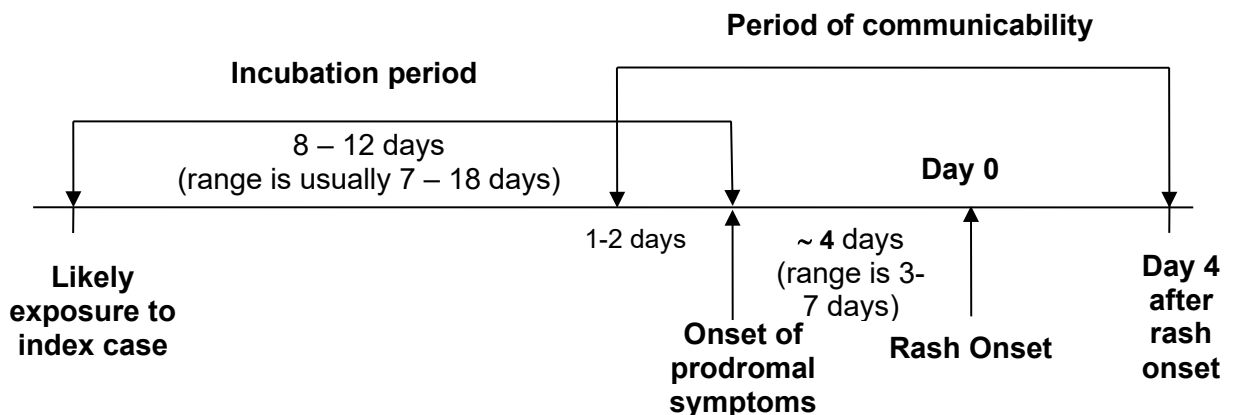
Priorization of contacts should take into account the transmission risk and the risk of susceptibility and serious complications among exposed individuals. The following should receive priority for contact identification and management:

- immunocompromised individuals
- children under one year of age
- pregnant women and pregnant people
- household-type contacts
- health care workers

Health care workers (HCWs) include students, employees, and physicians who were in a shared airspace with the case. All of these individuals should be assessed with respect to their exposure.

The [Measles Case Report Form](#) may be used for data collection.

Occupational Health and Infection Control are responsible for follow-up of exposed staff and inpatients exposed in the health care facility. Follow up of patients discharged from emergency rooms occurs in collaboration with institutional infection control staff.



7.2 Assess Susceptibility of Contacts and Risk Factors for Measles Complications

Conduct a risk assessment for each identified contact with respect to susceptibility to measles and likelihood of measles complications using the principles outlined below.

Investigate the possibility of additional suspect cases among the contacts. Refer all identified suspect and probable cases to a physician for assessment and diagnosis. Refer to [Section 7.5 Contact Education](#) for more information.

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

- birth date before January 1, 1970 (1957 for health care workers).¹
- documented evidence of vaccination with 2 valid doses² of live measles-containing vaccine after their 1st birthday and given at least one month apart.
- laboratory evidence of immunity (i.e., “reactive” or “positive” anti-measles IgG antibody or a previous measles antibody level of ≥ 200 mIU per mL). While serological testing (anti-measles IgG antibody) can be applied on a case-by-case basis to determine susceptibility, it is not appropriate for mass testing in the follow-up of potential exposures of large numbers of people e.g., a high school. If an immunization record is not readily available, such individuals should be managed as susceptible. For management of exposed healthcare workers, see [section 7.4.1](#).
- laboratory evidence of prior measles infection. Physician diagnosis of measles without laboratory confirmation is not considered proof of immunity in the current Canadian epidemiologic context.

Consider as potentially **susceptible** contacts ≥ 6 months of age born on or after January 1, 1970 (1957 for health care workers)^{3, 4} who:

- **do not have** at least one of the following:

¹ These persons are assumed to have acquired immunity to measles from natural infection. Those without a history of measles disease should be considered susceptible and offered vaccine.

² Primary vaccine failure occurs in 5-10% of infants following a single dose of measles vaccine; for the purpose of contact management, those who have received a valid single dose of measles-containing vaccine should be considered immune, and offered measles immunity testing following exposure and/or a 2nd dose of measles-containing vaccine if born in/ after 1970.

³ There are exceptions to this and infants less than 6 months of age may be susceptible. See [Section 7.3 Immunoprophylaxis of susceptible contacts](#), footnote 5.

⁴ This change to BC policy was made in 2014 from use of birth years prior to 1957 for assumption of immunity for those who are not health care workers, and is reflective of recommendations made by the National Advisory Committee on Immunization in the [Canadian Immunization Guide](#) and the Canadian Guidelines for the Prevention and Control of Measles in Canada (2012). This age criterion is supported by results of a BC pre-natal blood specimen survey conducted in 2010 which demonstrated that 95% of people born prior to 1970 and 88% born 1970-79, respectively, were immune to measles (data on file at BCCDC).

- documented evidence of vaccination with 2 valid doses² of live measles-containing vaccine after their 1st birthday and given at least one month apart;
OR
- laboratory evidence of immunity (i.e., “reactive” or “positive” anti-measles IgG antibody or a previous measles antibody level of ≥ 200 mIU per mL);
OR
- laboratory evidence of prior measles infection. Physician diagnosis of measles without laboratory confirmation is no longer considered proof of immunity in the current Canadian epidemiologic context.
- **have** certain immunosuppressive conditions (see [Table 1](#), footnote 8 for more information).

7.3 Immunoprophylaxis of Susceptible Contacts at High Risk of Measles Related Complications

In September 2018, the National Advisory Committee on Immunization updated its recommendations for measles post-exposure prophylaxis (Tunis MC, 2018). The BC guidelines have been updated accordingly.

Passive immunization (immunoglobulin [Ig]) is not recommended for immunocompetent non-pregnant individuals aged 12 months and older, even those suspected or known to be susceptible to measles (e.g., those who have not been previously immunized). Such individuals should be offered MMR vaccine regardless of the time elapsed since exposure, and should complete a series of two doses, given 4 weeks apart, in order to provide protection against future measles exposures. Post exposure MMR vaccine is effective if given within 3 days of the exposure. There are no known adverse effects of vaccine given to people incubating measles. However, when given later than 3 days following exposure, immunoprophylaxis may not prevent or modify disease. Infants aged 6 to <12 months whose exposure was ≤ 3 days previously should be given 1 dose of MMR vaccine; such infants will require 2 more doses of MMR vaccine after the first birthday, given on the routine schedule.

The only exposed contacts recommended to receive passive protection (Ig) are those known to be susceptible to measles and at high risk of measles-related complications and within 6 days of measles exposure. These are: immunocompromised people; pregnant women and pregnant people; infants under 6 months old; infants aged 6 to <12 months whose exposure was >72 hours to 6 days previously.

Passive immunizing agents (IMIg and IVIg) should only be provided within 6 days of measles exposure. Those already receiving replacement IVIg (400 mg/kg of body weight or higher) to treat other conditions do not require Ig if the last dose of IVIg was received within three weeks prior to measles exposure.

Intravenous immunoglobulin (IVIg) is the product of choice for those who cannot receive MMR vaccine (see table below) and weigh 30 kg or more. Intramuscular



immunoglobulin (IMlg), which is given in a dose of 0.5 mL/kg (to a maximal volume of 15 mL), administered by multiple injections, does not contain sufficient anti-measles antibody to provide complete protection. In cases where IVlg cannot be accessed because of logistical issues such as distance to a health care facility able to administer IVlg by infusion, IMlg can be offered but is not expected to provide sufficient protection. IVlg can also be offered to those weighing less than 30 kg if the number of injections required for its administration is unacceptable.

All exposed individuals should be informed about signs and symptoms of measles and to seek medical attention should symptoms arise. They should be told to inform the health care provider in advance prior to travel to the clinic to be assessed, in order that appropriate infection control measures can be put into place to avoid infecting others in the clinical setting.

Table 1. Summary of updated measles PEP recommendations for contacts

Immune/susceptible status by age, pregnancy, and immunocompetency	Time since exposure to measles	
	≤ 72 hours (3 days)	>72 hours – 6 days
Individuals with measles immunity	No post-exposure prophylaxis required. If only a single dose of measles-containing vaccine has been received on or after the 1 st birthday, and born in/after 1970 (1957 for healthcare workers), administer a 2 nd dose of measles regardless of the time elapsed since the measles exposure	
Susceptible infants 0-6 months old ¹	IMlg (0.5 mL/kg) ^{2,3,4}	
Susceptible immunocompetent infants aged between 6 and <12 months	MMR vaccine ^{5,6}	IMlg (0.5 mL/kg) ^{2,3,4}
Susceptible immunocompetent individuals 12 months of age and older ⁷	MMR vaccine ⁵ (To protect against current exposure)	MMR vaccine ⁵ (To protect against future exposures)
Immunocompromised individuals 6 months of age and older ^{8,9} Susceptible pregnant women and pregnant people ^{1,8}	IVlg (400 mg/kg) or IMlg (0.5 mL/kg) ⁴ , limited protection for those weighing 30 kg or more	



LEGEND:

IMlg: Intramuscular immunoglobulin, GamaSTAN®

IVIg: Intravenous immunoglobulin. There are five IVIg products available in Canada through Canadian Blood Services. One or more of these will be available at the hospital blood bank. These are: Gammagard®, Gamunex, IGIVnex and Privigen®

- ¹ For infants under 6 months of age and pregnant women and pregnant people: Ig may be offered to infants younger than 6 months of age if maternal immunity to measles is lacking, uncertain, or measles-vaccine acquired and the exposure occurred in a household-like setting. Maternal immunity to measles can be verified usually the same day on banked prenatal specimens, if antenatal care was provided in BC. The MHO can call the medical microbiologist at BCCDC to request immediate testing at tel: 604-661-7033 (24 hours, 7 days per week). Pregnant susceptible people managed for measles exposure during pregnancy should receive 2 doses of MMR vaccine post-partum, with due attention to the interval following immunoglobulin receipt. See [Part 4 – Biological Products, Immune Globulin Preparations or Blood: Timing Intervals for Vaccines Containing Live Measles, Mumps, Rubella or Varicella Virus](#).
- ² For immunocompetent susceptibles given Ig, and without contraindications to MMR vaccine: When clinical measles does not develop in a contact given one dose of Ig, MMR vaccine should be provided at the recommended interval outlined in [Part 4 – Biological Products, Immune Globulin Preparations or Blood: Timing Intervals for Vaccines Containing Live Measles, Mumps, Rubella or Varicella Virus](#). If Ig was given in infancy, MMR vaccine should be postponed until ≥ 12 months of age. See [Part 4 – Biological Products, Immune Globulin Preparations or Blood: Timing Intervals for Vaccines Containing Live Measles, Mumps, Rubella or Varicella Virus](#).
- ³ If injection volume exceeds the recommended volume for all the available injection sites combined, IVIg can be provided at a concentration of 400 mg/kg, and is expected to provide effective protection. For those weighing 30 kg or more, IMlg will not provide complete protection but may prevent some symptoms.
- ⁴ See [Immune Globulin Preparations \(HBIg, Ig, TIg, VarIg, RabIg\)](#) for administration information and maximum volume to be administered per site according to age.
- ⁵ Two doses of measles-containing vaccine are required after the first birthday for high levels of long-term protection. While MMR vaccine will not provide post-exposure protection if given >3 days after exposure, it should still be offered and a 2-dose series completed in those without a contraindication.
- ⁶ For infants who receive MMR at age 6-12 months: such infants should receive two additional doses of MMR vaccine according to the routine schedule.
- ⁷ Susceptible immunocompetent individuals 12 months of age and older are not a priority to receive Ig following measles exposure due to low risk of disease complications and the practical challenges of administration contact management.
- ⁸ For immunocompromised or pregnant: On a case-by-case basis, consider serological testing for immunity for immunocompromised individuals who are likely to have pre-existing immunity from prior vaccination or measles disease as well as for pregnant people (as prenatal sera may be stored at the BCCDC Public Health Laboratory for two years and readily available for retrieval for testing).
- ⁹ Individuals with immunosuppressive conditions that significantly alter immune status, including HSCT or CART therapy recipients within the past 24 months and severe primary immunodeficiency, should be offered immunoglobulin. Special consideration should be given to individuals with prior immunity, but with immunosuppressive conditions that may result in a loss of/or reduced protective antibody level. Such individuals should be managed on the basis of IgG obtained at the time of exposure (or since the diagnosis or treatment completion):
 - chemotherapy for acute lymphoblastic leukaemia (ALL)
 - lymphoproliferative disorders (e.g., haematological malignancies)
 - solid organ transplant recipients
 - HSCT or CART therapy recipients
 - individuals receiving, or within six months of completing, biological therapies (i.e., monoclonal



antibodies and cytokine inhibitors)

- advanced HIV infection

See [Appendix A - Classification for Immunosuppression](#) for further information.

Both measles vaccine, given as MMR vaccine, and human serum immune globulin (Ig) have a role in measles post-exposure prophylaxis for susceptible individuals. One or the other of these should be considered for this circumstance; both products are not to be used concurrently as immune globulin will interfere with the response to the live attenuated vaccine.

Ensure that all clients who receive immunoglobulin are informed of the potential risks associated with receipt of a blood-derived product and provided with a written record. This is a requirement of the Canadian Standards Association for Blood and Blood Products.

Available efficacy data on the use of Ig for post exposure measles prophylaxis is from studies dating as far back as the 1940s, indicating levels of efficacy around 70-80% (Endo 2001; Janeway 1945; Ordman 1944). The efficacy of measles vaccine post exposure is less well studied, with estimates ranging from as low as 4% and as high as 100%.

In contacts who have received measles vaccine post-exposure and develop symptoms of measles including fever and rash (occurring within 7-12 days of immunization), specimens must be collected for virus detection to confirm the diagnosis of measles as serology will not distinguish between wild type infection and measles vaccine seroresponse with IgM and IgG. Virus isolation and typing will distinguish wild from vaccine strain virus.

7.4 Exclusion of Susceptible Contacts

7.4.1 Health care settings

Assess the measles susceptibility status of all health care workers (HCWs) who are exposed to a case of measles. When a suspect case of measles is identified within a health care setting, attempt to have only staff known to be immune to measles entering the patient's room. Ensure all patients suspected or confirmed to have measles are placed on airborne precautions, for more information refer to the following resource from the [Provincial Infection Control Network of British Columbia](#).

When a susceptible HCW is exposed to a case of measles, 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 5th day after the first exposure until 21 days after the last exposure to the case of measles.¹

¹ The rationale for the 5 to 21 day time period is as follows: if the individual became infected with measles



These time intervals reflect the incubation period and the potential period of communicability before the possible onset of symptoms.

Administer one dose of MMR vaccine to the susceptible HCW immediately and a second dose 4 weeks later. Measles vaccine or immune globulin given after the exposure does not guarantee protection and infectiousness can precede symptom onset. In circumstances where patient care would be compromised by exclusion of a health care worker, conditions for return to work can be determined in consultation with a Medical Health Officer.

HCWs who develop a measles-like illness following exposure should be tested (by serology and nucleic acid testing) to confirm the diagnosis, and be excluded from work until no longer infectious (i.e., on or after 5th day after rash onset and clinically recovered).

The Provincial Infection Control Network Guidelines for baseline assessment of health care workers, management of measles in HCWs, and management of HCW contacts of measles are available at: <https://www.picnet.ca/guidelines/>.

7.4.2 Workplace, school, or child care settings

Susceptible contacts from the above settings who refuse or cannot receive MMR vaccine or immune globulin may be excluded from that setting at the discretion of the Medical Health Officer. If exclusions occur, the period of exclusion should extend from 5 days after the first exposure to 21 days after the last exposure. Consideration should be given to: the number of susceptibles in that setting; the presence of high risk individuals, susceptible infants, or immunocompromised individuals; and the reliability of the incubating individual to comply with early recognition and self-isolation. Exposed individuals who are age eligible to receive 2 doses of MMR vaccine and who have not received their 2nd dose would typically be offered the 2nd dose immediately post exposure but not be excluded, as the likelihood of immunity after 1st dose is high ($\geq 90\%$).

Susceptible contacts who have received post-exposure prophylaxis within the appropriate time lines may attend in these types of settings at the discretion of the Medical Health Officer. See [7.3 Immunoprophylaxis of Susceptible Contacts at High Risk of Measles Related Complications](#).

Notify the appropriate school administrator of the respective school board.

as a result of the exposure, shedding of the measles virus can occur as early as 5 days following the exposure; 21 days is the longest possible incubation period. The incubation period ends with the onset of prodromal symptoms (e.g., fever, cough, coryza, conjunctivitis, Koplik spots). The person is infectious 1 to 2 days before the onset of prodromal symptoms.

7.5 Contact Education

Advise susceptible contacts:

- about the signs and symptoms of measles, how it is transmitted, and to isolate themselves at home immediately if any symptoms of measles develop and for four days after the onset of rash.
- to observe for signs and symptoms of measles beginning 7 to 21 days after the first contact with a case or longer if the contact received immune globulin.
- to avoid other measles susceptible people and immunocompromised persons 5 to 21 days after exposure to a case.
- to rapidly report any symptoms compatible with measles 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 measles 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 symptoms of measles.

7.6 Contacts Aboard Commercial Flights and at Other Public Venues

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.

The recognition of a case of measles that was infectious while aboard a commercial flight warrants an assessment to consider the likelihood of exposure of flight crew and passengers. While most passengers on airplanes should be immune to measles through either vaccination or prior infection, measles transmissions to flight crew and airport contacts has been documented in recent years in Canada. While it may not be practical to notify all flight passengers directly, public health officials should consider requesting flight manifest information through the BCCDC (Immunization Programs and Vaccine Preventable Diseases during working hours, and BCCDC on call physician after hours), who in turn will request this information from the Health Portfolio Operations Centre of Health Canada for flight passengers younger than 2 years old (maintained specifically by airlines as such passengers are documented but need not purchase a fare if seated on a parent's lap), some of whom will be susceptible to measles. In addition, a public advisory should be posted in the public domain (e.g., BCCDC website or the regional health authority [RHA] website).

In large social and/or public events (i.e., repeated aggregate settings and one-time events), where the case was known to be, assess the degree of exposure in order to determine those who can reasonably be considered susceptible contacts and thus eligible and accessible for further assessment and intervention, including potential immunization. For those who cannot be individually identified but who may have been present in the general area, consider the need to provide notices, a letter, or a media

release informing them of their possible exposure.

Individual follow-up may not be possible in these settings and broad community notification through a media release to newspapers, radio and television outlets may be considered, as outlined for commercial flights above (e.g., BCCDC website or the RHA website).

The occurrence of additional cases, particularly among individuals who were not initially identified as contacts, may indicate the need for reassessment of control measures and the need to issue additional communications to health care providers, hospitals, and the public.

8.0 REPORTING

Complete the [Measles Case Report Form](#) and send by fax 604-707-2515 or email: VPD.epi@bccdc.ca to the Immunization Programs and Vaccine Preventable Diseases Service, BCCDC within 24 hours of the case report.

In addition, complete the individual case report in the electronic public health information system within 7 days following identification of a suspect, probable, or confirmed case of measles. Update the information if more or new information becomes available. Update the case status item if the case changes from confirmed, probable or suspect status.

The BCCDC will notify other Canadian/Pacific Northwest public health jurisdictions about the occurrence of measles via the Canadian Network for Public Health Intelligence (CNPHI), if this information has not been posted on CNPHI by the RHA.

BC participates in the [Canadian Measles & Rubella Surveillance System](#) (CMRSS) which includes real time reporting of epidemiologic and laboratory parameters to the Public Health Agency of Canada (PHAC) including National Microbiology Laboratory.

8.1 Inter-jurisdictional Notification

Inter-jurisdictional notification (IJN) to other provinces, territories, or countries may be required in some situations, including but not limited to:

- Investigating a case with a home address in another jurisdiction; or
- Identifying a contact from another jurisdiction; or
- Flight notification if case investigation and contact tracing determine that a significant exposure has occurred.

BC RHAs are responsible for notifying other RHAs of cases or contacts identified in their area. BCCDC will facilitate IJN communication between provinces/territories



and other countries about measles cases and contacts. If an out of province case or contact is identified, an IJN should be provided (with timing in keeping with any required public health management) to the BCCDC Immunization Programs and Vaccine Preventable Diseases Service (during working hours, fax 604-707-2515 and call 604-707-2519; after hours, call the switchboard at 604-875-2161 or 1-888-300-3088 and ask for public health physician).

9.0 OUTBREAK MANAGEMENT

Measles is considered under elimination in Canada and a single case warrants attention.

The main components of measles 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. Depending on the epidemiology of the outbreak, administration of the 2nd dose of MMR earlier than at age 4 years may be considered for children.
- Increase awareness about measles in the population and in the medical community.

9.1 Intensify Surveillance

When a case occurs, attempt to identify the source of infection and all related cases. Institute surveillance measures to identify cases prospectively and retrospectively. Where possible, identify the source of all cases, particularly the index case. Consult BCCDC Immunization Programs and Vaccine Preventable Diseases about assistance with an outbreak investigation or other control strategies.

If the index case is a student, ascertain the reason for absenteeism of other students from the schools attended or in the area of the confirmed case for the 2 week period prior to the identified case. This is to help identify earlier unreported cases. Continue active surveillance until 4 weeks after the last case occurs.

9.2 Mass Gatherings

Cancelling or restricting athletic events and other school programs or community events has not been shown to be effective for controlling measles outbreaks.

In the context of a measles 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, use good hand hygiene, avoid sharing food/drink/utensils, cough or sneeze into crook of elbow, stay home if ill);
- about measles symptoms and prevention; and
- that if they become ill with a fever and rash, to call ahead about possible measles before visiting their health-care provider.

Refer individuals to [HealthLink BC](#) for more information:

- Phone 8-1-1.

9.3 Immunization

Remind the public about the recommendations for measles immunization.

Consider the scheduling of extra immunization clinics for those at risk without up-to-date measles immunization status.

Notify the Immunization Programs and Vaccine Preventable Diseases Service at the BCCDC of the outbreak and provide an estimate of the number of extra 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.

9.4 Communication

Contact physicians, laboratories, hospitals and urgent and primary care centres 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.

9.5 Analyze the Outbreak

A descriptive analysis in the course of and at the conclusion of the outbreak (person, place and time) provides a useful local reference of the outbreak.

Review the effectiveness of control procedures, and revise as necessary.

10.0 CLINICAL DESCRIPTION

Measles (rubeola) is one of the most contagious of all infectious diseases, with >90% attack rates among susceptible close contacts. The infection is characterized by a 2 - 4 day prodrome of fever, coryza, cough, conjunctivitis and Koplik spots (i.e., small spots with white or bluish centers on an erythematous base on the buccal mucosa). The



prodrome is followed by a characteristic maculopapular rash appearing on the 3rd to 7th day. The rash begins on the face, then becomes generalized, lasts 4 – 7 days, and sometimes ends in brawny desquamation.

Complications such as otitis media and bronchopneumonia occur in about 10% of reported cases, even more commonly in those who are poorly nourished, chronically ill, and in infants < 1 year of age. Measles encephalitis occurs in approximately 1 of every 1,000 cases and may result in permanent brain damage. Very rarely (~1/100,000 cases), subacute sclerosing panencephalitis (SSPE) develops several years after measles infection. In developed countries, such as Canada, death (predominantly resulting from respiratory and neurologic complications) is estimated to occur once in 3,000 cases.

Case fatality rates are increased in children younger than 5 years of age and in immunocompromised children, including children with leukaemia, HIV infection, and severe malnutrition. Measles during pregnancy results in a higher risk of premature labour, spontaneous abortion, and low birth weight infants.

11.0 EPIDEMIOLOGY

Measles is now uncommon in British Columbia and the incidence has declined dramatically since the measles elimination campaign in 1996. Sustained transmission has not been observed since 1997. Sporadic cases occur typically in under or unvaccinated persons with a travel compatible with acquisition of measles out of country. Most clusters and outbreaks are in association with imported cases, although not all index cases are recognized or reported, with occasional cases reported among individuals without history of travel and without known exposure to cases of febrile rash illness. BC has experienced a few small outbreaks and three larger outbreaks (2010, 2014 and 2019) in recent years, typically lasting not more than two to three months. For details please refer to the BCCDC [Reportable Diseases Data Dashboard](#), the [Annual Summary of Reportable Diseases](#) and for periodic updates about measles activity at Data & Reports - [Vaccine Preventable Diseases](#).

12.0 IMMUNIZATION AGAINST MEASLES IN B.C.

In 1969, measles (rubeola) live vaccine was recommended for infants at 12 months of age, preschool and susceptible school children. MMR vaccine began to be used in the publicly funded immunization program in 1981 for children aged 12 months, preschoolers, and susceptible school children. In 1985, an MMR campaign was conducted over a 1 to 2 year period for school children in grades K to 12, with immunizations given by public health nurses in the schools.

In 1996 as part of the national and Pan American Health Organization measles elimination strategy, 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 in addition to the first dose given at 12 months of age.

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; public funding for these groups was effected in 2006 and 2007, respectively.

In 1996 and 1997 every province and territory in Canada added a second dose of measles-containing vaccine to its routine schedule and most conducted catch-up programs in school-aged children. These interventions achieved vaccine coverage for the second dose in excess of 85%, reducing the proportion of vulnerable children to such a negligible level that measles virus transmission could not be sustained.

The efficacy of a single dose of live measles vaccine given at 12 or 15 months of age is estimated to be 85% to 95%. With a second dose, almost 100% of children are protected.



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	Mumps ^②	Rubella ^①	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	Mumps ^②	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

① One 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.

② One 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.

13.0 REFERENCES

Advisory Committee on Immunization Practices. 2013. Prevention of Measles, Rubella, Congenital Rubella Syndrome, and Mumps, 2013: Summary Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recommendations and Reports. June 14, 2013 / 62(RR04);1-34.

Amanna IJ, Carlson NE, Slifka MK. (2007). Duration of humoral immunity to common viral and vaccine antigens. N Engl J Med. 2007; 357(19):1903-15.

American Academy of Pediatrics. Red Book: Report of the Committee on Infectious Diseases. 2021-24. (32nd ed.). Elk Grove Village, Illinois. 2021

BC Centre for Disease Control. British Columbia Annual Summary of Reportable Diseases. <http://www.bccdc.ca/health-professionals/data-reports/annual-summaries-of-reportable-diseases>

Bloch AB, Orenstein WA, Ewing WM, Spain WH, Mallison GF, Herrmann KL, Hinman AR. Measles outbreak in a pediatric practice: airborne transmission in an office setting. Pediatrics. 1985; 75 (4), 676-83.

Centers for Disease Control and Prevention. Epidemiology and prevention of vaccine-preventable diseases. Editors: Atkinson W, Wolfe C, Hamborsky J. Washington, DC: Public Health Foundation. 13th edition. 2015. Retrieved from <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>

Chen RT, Goldbaum GM, Wassilak SG, Markowitz LE, Orenstein WA. An explosive point-source measles outbreak in a highly vaccinated population. Am J Epidemiol. 1989; 129 (1):173-82.

Department of Vaccines and Biologicals. Manual for the laboratory diagnosis of measles virus infection. WHO. 1999. Retrieved from <http://www.measlesrubellainitiative.org/wp-content/uploads/2013/06/Manual-Laboratory-Diagnosis-Measles-Virus-Infection.pdf>

Endo A, Izumi H, Miyashita M, *et al.* Current efficacy of postexposure prophylaxis against measles with immunoglobulin. J Pediatrics. 2001; 138:926.

Health Canada. Measles surveillance: Guidelines for laboratory support. Can Commun Dis Rep. 1999; 25 (24). Retrieved from https://publications.gc.ca/collections/collection_2016/aspc-phac/HP3-1-25-24.pdf

Heymann DL. Control of communicable diseases in man. (21st ed.). Washington, DC: American Public Health Association. 2022.



Janeway CA. Use of concentrated human serum γ -globulin in the prevention and attenuation of measles. *Bulletin NY Acad Med.* 1945; 21:202.

Karp CL *et al.* Mechanism of suppression of cell-mediated immunity by measles virus. *Science.* 1996; 273: 228-31.

National Advisory Committee on Immunization. Canadian Immunization Guide. Evergreen Edition. Part 4, Active Vaccines, Measles. Public Health Agency of Canada. Ottawa, Ontario. Last complete chapter update April 2015; last partial update September 2020. Retrieved from <https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-12-measles-vaccine.html>

Ordman CW, Jennings CG Jr, Janeway CA. Chemical, clinical and immunological studies on the products of human plasma fractionation. XII. The use of concentrated normal human serum gamma-globulin (human immune serum globulin) in the prevention and attenuation of measles. *J. Clin. Investigation.* 1944; 23:531.

Provincial Infection Control Network of BC (PICNet). Management of Health Care Providers Pre and Post Exposure to Measles, Mumps or Rubella (MMR). May 2011. Retrieved from https://picnet.ca/wp-content/uploads/PICNet_MMR_recommendations_May2011.pdf

Plotkin SA, Orenstein WA, Offit PA. *Vaccines.* 7th ed. Philadelphia, PA. Elsevier Saunders. 2018.

Public Health Agency of Canada. Measles and Rubella Elimination Working Group. Guidelines for the Prevention and Control of Measles Outbreaks in Canada. An Advisory Committee Statement. *Can Commun Dis Rep.* 2013;39(ACS-3):1-52. Retrieved from <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/13vol39/acs-dcc-3/assets/pdf/meas-roug-eng.pdf>

Public Health Agency of Canada. Canadian national report on immunization, 1996. *Can Commun Dis Rep.* 1997; 23 (Suppl. 4). Retrieved from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/97vol23/23s4/23s4d_e.html

Public Health Agency of Canada. Case definitions for communicable diseases under national surveillance. *Can Commun Dis Rep.* 2009;35 (Suppl. 2). Retrieved from <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/index-eng.php>

Public Health Agency of Canada. Prevention and control of occupational infections in health care. *Can Commun Dis Rep.* 2002; 28 (Suppl. 1). Retrieved from https://publications.gc.ca/collections/collection_2016/aspc-phac/HP3-1-28-S1-eng.pdf



Public Health Agency of Canada. Vaccination Coverage Goals and Vaccine Preventable Disease Reduction Targets by 2025. <https://www.canada.ca/en/public-health/services/immunization-vaccine-priorities/national-immunization-strategy/vaccination-coverage-goals-vaccine-preventable-diseases-reduction-targets-2025.html>

Remington PL, Hall WN, Davis IH, Herald A, Gunn RA. Airborne transmission of measles in a physician's office. JAMA. 1985; 253 (11), 1574-77.

Tunis MC, Salvadori MI, Dubey V, Baclic O, on behalf of the National Advisory Committee on Immunization (NACI). Updated NACI recommendation for measles post-exposure prophylaxis. Can Commun Dis Rep. 2018; 44(9): 226-230. <https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2018-44/issue-9-september-6-2018/article-7-naci-recommendation-pep.html>



Appendix A - Classification for Immunosuppression

Group A - individuals who should develop and maintain adequate antibody from past infection or vaccination	
Manage on basis of evidence of protection at any time (prior to or since the diagnosis or treatment end)	<ul style="list-style-type: none"> • Patients receiving or within 6 months of completing immunosuppressive chemotherapy or radiotherapy for malignant disease, (other than those with acute lymphoblastic leukemia ALL, a lymphoproliferative disorder or who have had Hematopoietic Stem Cell Transplantation (HSCT) or Chimeric Antigen Receptor T-cell (CART) Therapy) • Patients with human immunodeficiency virus (HIV) infection: <ul style="list-style-type: none"> ○ i) >5 years of age and with a CD4 count <200 cells/µl (but without a diagnosis of AIDS) or ○ ii) aged 5 years or less, with a CD4 count <500 cells/µl • Patients with chronic immune mediated inflammatory disease who are receiving or have received immunosuppressive therapy: <ul style="list-style-type: none"> ○ moderate to high dose corticosteroids (equivalent ≥20 mg prednisone per day; children one mg/kg/day) for more than 10 days in the previous month ○ long term moderate dose corticosteroids (equivalent to ≥10 mg prednisone per day or children 0.5 mg/kg/day for more than 4 weeks) in the previous 3 months ○ adults on non-biological oral immune modulating drugs, for example, methotrexate >20 mg per week (oral and subcutaneous), azathioprine >3 mg/kg/day; 6-mercaptopurine >1.5 mg/kg/day, mycophenolate >1 g/day, in the previous 3 months ○ children on any dose of non-biological oral immune modulating drugs ○ certain combination therapies at individual doses lower than stated above, including those on ≥7.5 mg prednisone per day in combination with other immunosuppressants (other than hydroxychloroquine or sulfasalazine) and those receiving methotrexate (any dose) with leflunomide in the previous 3 months • Individuals who have received a short course of high dose steroids (equivalent >40 mg prednisone per day or children 2 mg/kg/day for more than a week) for any reason in the previous month. <p>Individuals who had received brief immunosuppression (≤40 mg prednisone per day) for an acute episode (for example, asthma, COPD or COVID-19) and individuals on replacement corticosteroids for adrenal insufficiency are not considered severely immunosuppressed and can be treated with the standard post exposure treatment.</p>



Group B – individuals who lose or may not maintain adequate antibody levels from past infection or vaccination	
B (i): Manage on basis of measles IgG test obtained at the time of exposure (or since the diagnosis or treatment end)	<ul style="list-style-type: none"> • Patients on or after completion of immunosuppressive chemotherapy for ALL • Patients with lymphoproliferative disorders (including haematological malignancies such as indolent lymphoma, leukaemia and plasma cell lymphoma). • Patients who have received a solid organ transplant • Patients more than 12 months after receiving HSCT or CART therapy • Patients receiving or within 6 months of completing biological therapies (alone or in combination with steroids). These include: <ul style="list-style-type: none"> ○ monoclonal antibodies, for example alemtuzumab, ofatumumab ○ rituximab cytokine inhibitors, for example etanercept • Patients with a diagnosis of acquired immunodeficiency syndrome (AIDS)
B (ii): Offer PEP regardless of status	<ul style="list-style-type: none"> • Patients who have received HSCT or CART therapy within the past 12 months • Patients with persistent agammaglobulinaemia (IgG less than 3 g/L) due to primary immunodeficiency (for example, common variable immunodeficiency) or secondary to disease or therapy (this group may already be on long term IVIG replacement, which should provide equivalent protection to post exposure immunoglobulin)

Appendix A is adapted from Public Health England's [National measles guidelines](#) (February 2024)