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Unless otherwise stated the content of this guideline has been adapted from BCCDC Communicable Disease Control Management of Specific Diseases: Measles September 2018.

1.0 AUTHORITY

Yukon Public Health and Safety Act (2009). Available at www.gov.yk.ca/legislation/legislation/page_p.html

2.0 GOAL

The goal of measles control in Yukon is to maintain the elimination of local measles and prevent transmission from imported cases. This will be accomplished by:

- Achieving and maintaining the highest possible coverage for two doses of measles/mumps/rubella (MMR) vaccine in childhood;
- Conducting enhanced surveillance for measles;
- Promoting rapid reporting of all suspect, probable and confirmed measles cases;
- Providing contact follow-up for all cases of measles and immunoprophylaxis when indicated; and
- Instituting prompt outbreak control measures.

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 to 12 days with a range of 7 to 18 days, and rarely may be as long as 21 days.

Period of Communicability: from 1-2 days before the beginning of the prodromal period (usually 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. See Section 5.4.

4.0 MEASLES FLOW CHART

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

Case Identification

- Identification of suspect, probable or confirmed case of measles*
- Confirm the diagnosis and obtain history from the case.
- Contact the involved physician or community health center
- Ensure probable or suspect case has been tested by both serology (both acute and convalescent serums should be collected) and virus identification.

*To be reported as soon as suspected to YCDC or CMOH (after hours and weekends)

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Case Management

- Obtain history of the case. Determine period of communicability and places and dates of likely acquisitions and transmission.
- Exclude the case from work, school or other public settings for 4 days after rash onset.

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Contact Management

- Identify contacts- 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 has left the room/space. See Section 6.1.
- Assess susceptibility to measles. See Section 6.2.

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Immunoprophylaxis of Susceptible Contacts: (see Section 6.3.)

↙	↓	↘
within 72 hours since **first** exposure to case	73 hours-6 days since **first** exposure to case	≥ 7 days since **first** exposure to case
↓	↓	↓
Offer **MMR** to contacts that do not have a contraindication to MMR vaccine Offer Ig to contacts that have a contraindication to MMR vaccine	Offer **Ig** to contacts: • Who have never received live measles vaccine • That have a contraindication to MMR vaccine Offer **MMR** to contacts: • ≥ 12 months of age who are known or likely to have received one dose of live measles vaccine ≥ 4 weeks earlier	Offer **MMR** to contacts: • ≥ 12 months of age who have received zero or one dose of live measles vaccine ≥ 4 weeks earlier and do not have a contraindication to MMR vaccine
↓	↓	↓

Exclusion of Contacts

- Susceptible exposed HCW: CMOH 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 from 5 days after the first exposure to 21 days after the last exposure regardless of whether the HCW received measles vaccine or immune globulin after exposure. See Section 6.4.1.
- School, child care and post-secondary institutions: Susceptible contacts who refuse or cannot receive immunoprophylaxis will be excluded. Exclusions should occur for the period from 5 days after the first exposure to 21 days after the last exposure. Susceptible contacts who receive post-exposure prophylaxis may attend in these settings. See Section 6.4.2.

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Reporting

- Report as soon as suspected all clinical, probable and confirmed cases to YCDC or CMOH (after hours and weekends).
- Fax a completed copy of the Measles, Mumps, and Rubella Case Report Form to YCDC at 867-667-8349.

5.0 CASE MANAGEMENT

5.1 Confirm the Diagnosis

Investigate all confirmed, probable and suspect cases of measles within 24 hours. Public health action, including contact management, may commence at any level of the case definition, including a suspect case.

Immediately inform Yukon Communicable Disease Control (YCDC) or the Chief Medical Officer of Health (CMOH) (if after hours or weekend) of all confirmed, probable or suspect cases of measles and initiate control measures immediately**. Initiation of control measures must not await laboratory confirmation of the case.**

Measles Case Definition[1]

Surveillance case definition		Reportable to YCDC
Confirmed case	Measles compatible illness[2] and laboratory confirmation of infection in the absence of recent (i.e., within the previous 28 days) immunization with measles containing vaccine: • isolation of measles virus from an appropriate clinical specimen **or** • detection of measles virus RNA **or** • seroconversion or a significant (e.g., fourfold or greater) rise in measles IgG titre between acute and convalescent sera by any standard serologic assay **or** • detection of 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 **or** • clinical illness in a person with an epidemiologic link to a laboratory confirmed case.	Yes
Probable case	Clinical illness[2] • in the absence of appropriate laboratory tests **or** • in the absence of an epidemiological link to a laboratory-confirmed case **or** • in a person who has recently travelled to an area of known measles activity.	Yes

[1] Obtained from PHAC (2012), Guidelines for the Prevention and Control of Measles Outbreaks in Canada.

[2] Fever 38.3°C or greater, **and** cough, coryza, or conjunctivitis, **and** generalized maculopapular rash of any duration.

5.2 Laboratory Testing

Suspect and probable cases of measles should be tested ***by both serology and virus detection*** (by isolation in cell culture and RT-PCR testing on both urine and nasopharyngeal specimens). Specimens should be sent STAT to the WGH Lab for submission to BCCDC Laboratory. Notify the WGH lab of the STAT testing request.

For more information regarding testing and requisition forms, contact the WGH laboratory 867-393-8739.

5.2.1 Serology

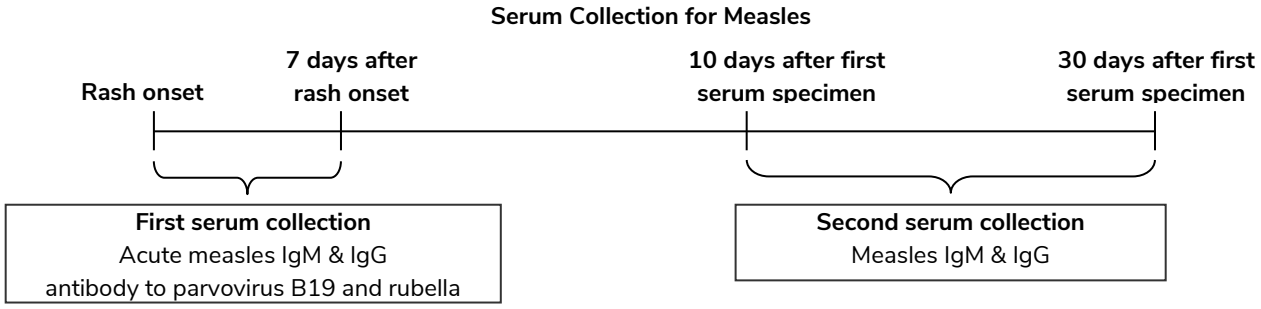
Identify the specimen as "acute measles" on the lab requisition. Acute measles serology includes testing for measles specific *IgM* and *IgG* class antibodies.

Request that sera from probable cases of measles be tested for antibody to parvovirus B19 and rubella. Request these tests on the initial ACUTE measles specimen. This is recommended as the clinical presentation of measles can resemble these other viral infections and infection with one of these other viruses can, occasionally, result in a false positive measles IgM result.

For IgM and IgG serology, obtain the first (acute) sample at time of presentation and no later than 7 days after 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 sample is indicated if the IgM serology from an early acute phase sample are inconclusive or negative for measles, rubella and parvovirus 19 and the person meets the clinical case definition for measles.

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

If the case is confirmed by RT-PCR virus identification, a convalescent specimen is not necessary.



Sporadic cases (i.e., those cases with no epidemiologic link to a laboratory-confirmed case, nor recent travel history to an area with known measles activity) must be laboratory-confirmed by measles virus isolation or have a demonstrated rise in IgG titer between acute and convalescent serum specimens.

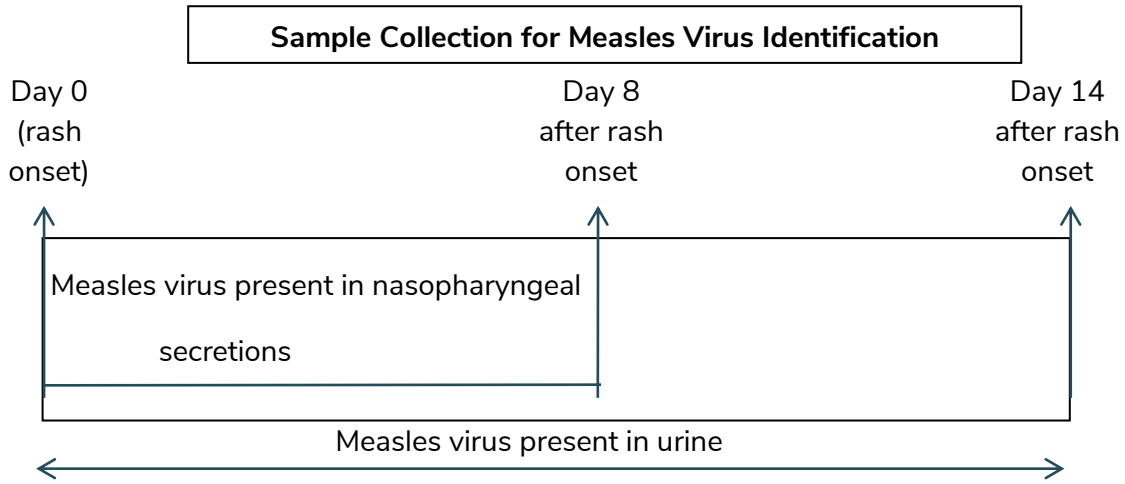
5.2.2 Virus Identification

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

Submit a nasopharyngeal swab and urine sample for measles virus isolation and RT-PCR testing. This will provide a definitive diagnosis and allows 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. These tests should be done in addition to complete measles serology.

Collect nasopharyngeal swab and urine at the time of presentation.

- Nasopharyngeal swabs may be collected up to 8 days after rash onset.
- Urine samples may be collected up to 14 days after rash onset. The yield may be lower with longer timeline for collection of these samples. Use a sterile container for urine collection



If immediate transport is not feasible, place the specimen(s) in a refrigerator and transport to the WGH laboratory as soon as possible. The specimen should be kept cool during transport. WGH lab will then ship the specimens to BCCDC Laboratory.

PCR performed on the nasopharyngeal and a urine specimen is a very sensitive assay for measles. Specimens that test positive by RT-PCR will also be set up for virus isolation in cell culture. This will allow for genotypic analysis of the isolate, which may indicate the likely sources of infection. Virus identification methods are also useful when serological results conflict the epidemiological or clinical features of the case.

5.3 Interpretation of Test Results

Where serology tests are reported in international units, a fourfold increase 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 a virologist.

The timing of specimen collection must always be considered in the interpretation of a lab 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 3-28 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. False positive may occur in about 0.4%. IgM is also detectable after immunization against measles and may remain detectable in some individuals for years after immunization 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).
Protective anti-measles IgG (generally ≥ 200mIU per milliliter)	Test results will be reported as “reactive” (i.e., immune to measles).
A significant rise in IgG between the acute and convalescent sera	Acute measles infection.
Positive Culture or RT-PCR • Nasopharyngeal swab • Urine specimen	Confirms acute measles infection.

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

5.4 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 disease onset are all factors that must be considered in the interpretation of lab results for the purpose of confirming measles cases. If the dates of likely exposure are compatible with acquisition in Yukon, investigate for a source case.

Using the known incubation period for measles determine the likely source of infection. Determine the **period of communicability**: from 1 to 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.

Immunocompromised persons may have a prolonged excretion of the virus from their respiratory tract and be infectious for the duration of their illness. As such the immunocompromised person should be considered infectious for the duration of their illness. Consultation with the CMOH is required to determine of the period of communicability for these individuals.

Use the "Measles, Mumps and Rubella Case Report Form" to collect data and determine if the case report meets the case definitions for measles. See Section 11.2 Measles, Mumps and Rubella Case Report Form.

5.5 Case Treatment

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

5.6 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 as cited in BCCDC, 2014).

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.

5.7 Case Isolation

Isolation in health care facility: In health care facilities, respiratory isolation including an airborne infection isolation room should be in place from the onset of the catarrhal stage of the prodromal period through the fourth day of rash for otherwise healthy individuals and for the duration of illness for immunocompromised individuals to reduce the exposure of other patients at high risk.

Isolation in the community: Public health advice to suspect, probable and confirmed cases should include the following: maintain strict limitation of their exposure to others during the period of communicability (see Section 3.0), practice good hand hygiene, avoid sharing drinking glasses or utensils, and cover coughs and sneezes with a tissue or forearm. If home isolation cannot be maintained during the period of communicability, and travel into the community is required, the case should be advised to wear a mask to avoid infecting others.

5.8 Exclusion of Cases

Suspect and probable cases should be managed as confirmed cases until laboratory evidence suggests otherwise.

5.8.1 Exclusion of Health Care Workers

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

Advise the case to immediately notify their respective occupational health, infection control and/or manager for the facility in which the case works.

If the case is a HCW, they will be excluded from the work setting for at least 4 days after the appearance of the rash.

5.8.2 Exclusion from Workplace, School or Child Care

Cases of measles will be excluded from work at day cares, schools and other public settings for at least four days after the appearance of the rash.

When the case is in the school setting, YCDC will notify the appropriate school administrator and superintendent at the Department of Education.

5.9 Case Travel

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

6.0 CONTACT MANAGEMENT

6.1 Contact Identification

Identify all contacts and review their immunization records within 24 hours of the receipt of a report of a suspect case of measles.

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 two 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.

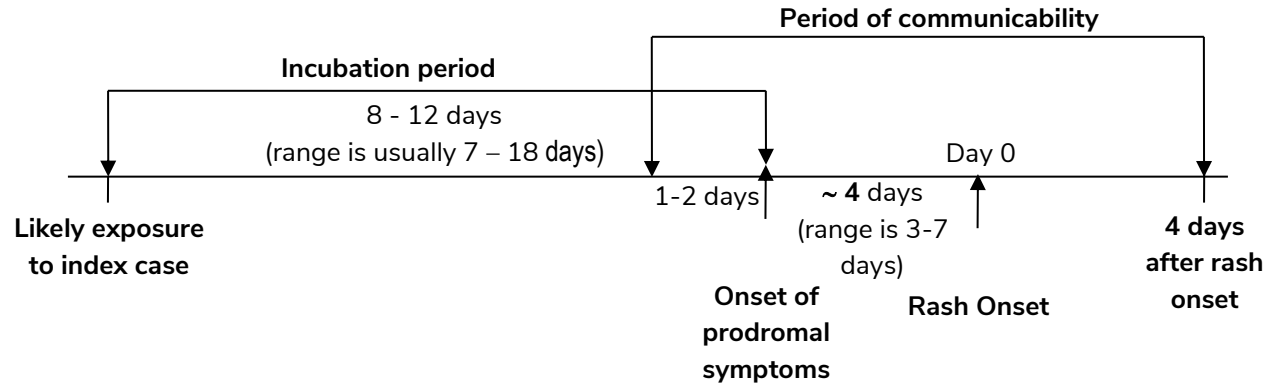
The two hour timing recommendation is consistent with Canadian and US infection control guidelines. It is based on documented transmission events related to such exposures in medical waiting rooms after the index case has left the room. It is recognized that transmission of this type may be a relatively 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 contact's susceptibility.

Prioritization of contacts should take into account the transmission risk, 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,
- household-type contacts, and
- health care workers

In Yukon, health care facilities will work collaboratively with YCDC for the purpose of information sharing, identification of case contacts, and follow-up of exposed staff and in-patients exposed in their health facility. Follow-up of patients discharged from emergency rooms and community health centers occurs in collaboration with each facility's infection control department or designate.

The Measles, Mumps and Rubella Case Report Form may be used for data collection. See Section 11.2 Measles, Mumps and Rubella Case Report Form.



6.2 Assess Susceptibility of Contacts

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

Investigate the possibility of additional clinical cases among the contacts. Refer all identified clinical and probable cases to a health care provider. See Section 6.5 Contact Education for more information.

The following contacts are considered immune to measles (i.e., not susceptible):

- have had clinical diagnosis of acute measles and laboratory confirmation of same; **or**
- laboratory evidence of immunity (i.e. "reactive" or "positive" anti-measles IgG antibody or previous measles antibody >200 mIU per ml); **or**
- born on or after January 1, 1970 with documented evidence of two doses of a live measles- containing vaccine on or after the first birthday and given at least four weeks apart; **or**
- non-health care workers born before January 1, 1970*; **or**
- health care workers:
  - born before January 1, 1957*
  - born on or after January 1, 1957-Dec 31, 1969 with documented evidence of two doses of a live measles-containing vaccine on or after the first birthday and given four weeks apart.

*These persons are generally assumed to have acquired immunity to measles from natural infection. There may be susceptible individuals in this age group, however, and those without a history of measles may be considered susceptible and offered MMR vaccine per the routine schedule.

Consider as susceptible all those contacts with HIV infection, regardless of their measles immunization status. The exception is an HIV+ contact that is receiving IGIV at regular intervals and their last dose was received within three weeks of exposure.

Consider as potentially susceptible those contacts with certain immune-suppressive conditions (e.g., HSCT). Refer to Yukon Immunization Program Manual, Section 5 - Immunization of Special Populations, 1.0 Immunocompromised Individuals available at www.hss.gov.yk.ca/yipm.php.

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

The only exposed contacts recommended to receive passive protection (immunoglobulin) 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; infants under 6 months old; infants aged 6 to 12 months whose exposure was 3 to 6 days previously.*

Passive immunization (immunoglobulin) 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 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 will 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.

Passive immunizing agents (IMIg and IVIg) should only be provided within six 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 (see table below) and weigh 30 kg or more. Intramuscular immunoglobulin (IMIg), which is given in a dose of 0.5mL/kg in a maximal volume of 15 ml administered by multiple injections, does not contain sufficient anti-measles antibody to provide complete protection. IVIg is not approved for use by Health Canada for this indication; however, this use if recommended by the National Advisory Committee on Immunization.

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.

Summary of measles PEP recommendations for contacts:

Immune/ susceptible status by age, pregnancy, and immunocompetency	Time since exposure to measles	
	<72 hours	73 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 1st birthday, and born in/ after 1970, administer a 2nd dose of measles regardless of the time elapsed since the measles exposure	
Susceptible immunocompetent individuals ≥12 months old	MMR vaccine series[1] While MMR vaccine will **not** provide post-exposure protection if given >72 hours after exposure, it should still be offered and a 2-dose series completed in those without a contraindication	
Susceptible infants <6 months old[2]	IMIg (0.5mL/kg)[3,4]	
Susceptible immunocompetent infants aged between 6 and 12 months	MMR vaccine[1,5]	IMIg (0.5mL/kg)[3,4]
Susceptible pregnant women[2,3,6] Immunocompromised individuals 6 months and older[6,7]	IVIg (400mg/kg) or IMIg (0.5mL/kg), limited protection for those weighing 30 kg or more	

LEGEND:
IMIg: intramuscular immunoglobulin, GamaSTAN™ S/D
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, Privigen® and Panzyga®.

[1] For every MMR note: 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.

[2] For infants under 6 months and pregnant women: 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. For infants 0-3 months of age when exposure occurred in a household setting, maternal immunity is likely protective. In infants 3-6 months of age, maternal immunity derived from immunization is unlikely protective as a significant drop in protective maternal antibodies has been noted following 3 months of age (WHO, 2018). Maternal immunity to measles can be verified usually the same day on banked prenatal specimens, if antenatal care was provided. 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 women 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.

[3] For immunocompetent susceptibles given Ig: When clinical measles does not develop in a contact given one dose of Ig, MMR vaccine should be given 5 or 6 months later, and for pregnant women, post-partum with these time intervals in mind, depending on the Ig dose used, provided the individual is > 12 months of age and there are no contraindications to the vaccine. See BC Communicable Disease Control Manual, Chapter 2: Immunization, Part 4 – Biological Products, Immune Globulin Preparations or Blood: Timing Intervals for Vaccines Containing Live Measles, Mumps, Rubella, or Varicella Virus.

[4] For every IMIg note: If injection volume is a major concern, IVIg can be provided at a concentration of 400mg/kg, and is expected to provide effective protection. For those weighing 30 kg or more, IMIg will not provide complete protection but may provide partial protection.

[5] For infants who get MMR 6-12 months: Infants who receive a dose of MMR vaccine at less than 12 months of age should receive two additional doses of MMR vaccine according to the routine schedule.

[6] For immunocompromised and 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 women (as prenatal sera may be stored at the BCCDC Public Health Laboratory for two years).

[7] For immunocompromised: See Yukon Immunization Program manual, Chapter 5, Immunization of Special Populations (www.hss.gov.yk.ca/yipm.php).

Practice Point

Note that MMR vaccine is used as both PEP and as a prevention measure. This overlap depends on when the MMR vaccine is administered (within 72 hours post exposure versus 73 hours to 6 days) and whether it is the first or second dose.

Both measles vaccine, given as MMR vaccine and human serum immunoglobulin (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 immunoglobulin will interfere with the live attenuated vaccine. Immunoglobulin should not be used for the control of measles outbreaks, although susceptible individuals with contraindications to measles vaccine should be considered for Ig prophylaxis.

There are no known adverse effects of vaccine given to people incubating measles.

Ig dosing is based on patient's weight. Check product monograph for dosing details.

Ensure that all clients who receive immune globulin are informed of the potential risks associated with the receipt of a blood-derived 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 back as far as the 1940's, indicating levels of efficacy around 70-80% (Endo 2001; Janeway 1945; Ordman 1944 sited in BCCDC 2014). 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 identification to confirm the diagnosis of measles as serology will not distinguish between wild type virus and measles vaccine seroresponse with IgM and IgG. Virus isolation and typing will distinguish wild from vaccine strain virus.

6.3.1 Accessing Ig

Immune globulin (Ig) is prepared from donated human blood and is used for short-term immediate protection against some illnesses. It is given when individuals do not have known or adequate protection against various illnesses and are at high risk of acquiring the infection. Ig can be administered intramuscularly (IM) and intravenously (IV) however, different products and preparations are used for IM versus IV.

For a complete list of those individuals considered immunocompetent, refer to the Yukon Immunization Program (www.hss.gov.yk.ca/pdf/im_manual_section5.pdf)

IMIg and IVIg can be only accessed for PEP with the authorization of the CMOH/YCDC. Whitehorse General Hospital Laboratory is the sole location storing both IMIg and IVIg for Yukon.

Accessing IMIg

Whitehorse: Monday-Friday 0830-1630, if IMIg is indicated, YCDC will notify blood services in the WGH Laboratory and arrange for administration to occur in the WGH ER. If an individual meets criteria for IMIg after hours, please call the CMOH on call.

Communities: Monday-Friday 0830-1630, if IMIg is indicated, YCDC will notify blood services in the WGH Laboratory and makes arrangements for administration on a case-by-case basis. This may include having the product shipped to the requesting health center or clinic. If after hours, please call the CMOH on call.

Accessing IVIg

IVIg requires administration in hospital and active patient monitoring during the infusion, performed by appropriately trained staff. For these reasons, IVIg will only be administered at WGH. This may or may not involve transport of the susceptible individual from a rural community to Whitehorse General Hospital. Such arrangements

will be made on a case-by-case basis in consultation with YCDC and the CMOH.

6 .4 Exclusion of Susceptible Contacts

6.4.1 Health Care Settings

Assess the measles susceptibility status of all health care workers (HCWs) who are exposed to a case of measles, see Section 6.2. When a clinical case of measles is identified within a health care setting attempt to have only staff considered immune to measles entering the patient's room. Employees will follow facility or organizational infection control policies and procedures in the event of the need to enter the room of a patient for whom airborne precautions are in place for suspected measles. If no policy or procedures exist refer to the following document for recommendations Public Health Agency of Canada. (2002). Prevention and Control of Occupational Infections in Health Care. Canada Communicable Disease Report, Volume 28S1 March 2002 (publications.gc.ca/collections/Collection/H12-21-3-28-1E.pdf)

When a susceptible HCW is exposed to the case of measles, conduct a risk assessment to determine whether the HCW may return to work. After such risk assessment, the CMOH may exclude 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. These time intervals reflect the incubation period and the potential 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 in infectiousness can precede symptom onset

HCWs who develop a measles-like illness following exposure should be tested (by serology and culture/ RT-PCR) 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).

6.4.2 Workplace, School, Child Care or Post-Secondary Educational Settings

Susceptible contacts from the above settings who refuse or cannot receive MMR vaccine or immune globulin (due to ≥ seven days since exposure) may be excluded from that setting. If exclusions occur, the period of exclusion should extend from 5-21 days after the last exposure. Consideration should be given to the number of susceptible individuals 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 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 (> 90%).

Generally susceptible contacts that have received post-exposure prophylaxis within the

appropriate time lines can attend in these settings. YCDC will notify the appropriate school administrator and superintendent at the Department of Education.

6.5 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.

For more information about measles refer individuals to Yukon Health Line (811) or Healthlink BC at www.healthlinkbc.ca/healthfiles/hfile14b.stm.

6.6 Contacts Aboard Commercial Flights and at Other Public Venues

If the case travelled outside of Yukon during the infectious period, inform YCDC 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, YCDC will consider requesting flight manifest information 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. An alternative to notification of potentially exposed passengers is a public advisory which can be posted in the public domain as determined by YCDC and the CMOH.

In a large social and/or public event (i.e. repeated aggregate settings and/or one-time events), where the case was known to have been, YCDC/CMOH will 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, consideration will be given to providing 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.

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. Any necessary communications will be prepared by YCDC and the CMOH.

7.0 REPORTING

Immediately report clinical, probable, or confirmed cases of measles by telephone to YCDC or CMOH (if after hours and on weekends).

Complete and fax the "Measles, Mumps and Rubella Case Report Form" to YCDC at: 867-667-8349. See Section 11.2 Measles, Mumps and Rubella Case Report Form.

YCDC will notify other Canadian jurisdictions about the occurrence of measles via the Canadian Network for Public Health (CNPHI).

Yukon participates in the Canadian Measles and Rubella Surveillance Systems (CMRSS) which includes real time reporting of epidemiological and laboratory parameters to the Public Health Agency of Canada (PHAC) including National Microbiology Laboratory.

8.0 OUTBREAK MANAGEMENT

Measles is considered under elimination in Canada and a single case warrants attention therefore, a single confirmed case of measles in Yukon is deemed sufficient to manage as an outbreak. In outbreak situations, at least one case must be laboratory confirmed. Outbreak management is coordinated by YCDC and the CMOH.

The main strategies in managing a measles outbreak 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 all susceptible individuals in the identified population who do not have a contraindication to MMR vaccine. Any decisions regarding interim changes to the Yukon Vaccine Program schedule for measles vaccination will be made by the CMOH in

consultation with the Yukon Immunization Program

- Increase awareness about measles in the population and in the medical community

8.1 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. Document common exposure settings.

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 two-week period prior to the identified case. This is to help identify earlier unreported cases. Continue active surveillance until four weeks after the last case occurs.

8.2 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 and where appropriate event organizers will be advised by the CMOH/YCDC to inform participants:

- of the potential for exposure and measures to take to reduce the risk of spreading the disease
  (e.g., check that immunization is up-to-date, use good hand hygiene, avoid sharing food/drinks/utensils, cough and sneeze into the 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.

For more information on measles refer individuals to Yukon Health Line (811) or Healthlink BC at www.healthlinkbc.ca/healthfiles/hfile14b.stm.

8.3 Immunization during an Outbreak

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.

Identify and vaccinate all susceptible individuals in the identified population who do not have a contraindication to MMR vaccine.

Yukon Immunization Program will be notified of the outbreak by YCDC/CMOH to coordinate services and vaccine supply if expanded immunization clinics are being planned.

8.4 Communication during an Outbreak

Communication during an outbreak is the responsibility of YCDC and CMOH. During an outbreak the following measures will be undertaken:

- Ensure the medical community and the public are aware
- Notify local health care providers and facilities about the outbreak, diagnostic testing requirements and reporting responsibilities. This is to ensure prompt diagnosis and reporting of cases as well as to ensure health care worker immunization and infection control policies are fully implemented
- Inform the public of the signs and symptoms and mode of transmission of rubella
- Consider notifying other settings of the outbreak (e.g., child care centres)

8.5 Analyze the Outbreak

Following an outbreak, a descriptive analysis of the cases (time, place and person) provides a useful local reference of the outbreak.

Review the effectiveness of control procedures and revise as necessary.

9.0 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- to 4-day prodrome of fever, coryza, cough, conjunctivitis and Koplik spots (i.e., small spots with white or bluish centres 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 to 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 five 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.

10.0 EPIDEMIOLOGY

Since 1998, Canada has maintained its measles elimination status as set forth by the Pan American Health Organization (PAHO). From 2012 to 2016 (a five-year period), the rate of measles among all ages and sexes in Canada was 0.4 per 100,000. In contrast, between 1991 and 1995 (a five-year period), the rate was 8.5 in 100,000 (PHAC, 2018). This significant drop in reported cases can be attributed to significant public health efforts aimed at immunization strategy as well as ongoing surveillance measures (CCDR, 2016).

The unvaccinated and those not up-to-date for age with measles-containing vaccine account for the vast majority of cases reported in Canada. Of the cases reported, infants who are too young to be immunized and children are often disproportionately affected and account for a large percentage of hospitalizations.

During 2015, four outbreaks were reported in Canada. Of these outbreaks, three were identified as being linked to travel outside of Canada, with the largest resulting from a single importation from the United States (CCDR, 2016). Similarly, during 2016, it was noted that 91% of measles cases were linked to importations via travel (PHAC, 2016).

Although no cases of measles have been reported in Yukon over the past 10 years, ongoing cases and outbreaks within other jurisdictions both within Canada and internationally emphasize the importance of ongoing vigilance of measles prevention strategies and surveillance in Yukon (YCDC, 2014).

10.1 Measles Immunization in Yukon

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. Yukon introduced its second dose of MMR vaccine at age 18 months as part of the routine schedule and in the same year a second dose of measles vaccine was provided through a mass vaccination campaign in schools in 1996. These interventions achieved vaccine coverage for the second dose in excess of 85%, reducing the proportion of vulnerable children to such a low level where viral transmission was unlikely to 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.

In 2012, the second dose of MMR was moved to school entry and is given at 4-6 years of age and 2015 MMRV was introduced for this cohort (Yukon Immunization Program Manual, Section 1 Introduction, June, 2017).

The Yukon Immunization Program Manual Section 8: Biological Products provides

current recommendations for measles, mumps and rubella immunization. See www.hss.gov.yk.ca/yipm.php.

11.0 MEASLES, MUMPS, RUBELLA CASE REPORT FORM

Complete and fax the "Measles, Mumps and Rubella Case Report Form" to YCDC, within one working day (fax: 867-667-8349). See Section 11.2 Measles Mumps and Rubella Case Report Form.

11.1 Instructions for Completing the Report Form

A. PERSON REPORTING

Record name and phone number of person completing the form.

B. CASE INFORMATION

Complete identifying information about the case. Include name of the case's regular physician. If the case doesn't have a physician but did see a physician regarding the current illness, record that physician's name. Record whether the case is a health care worker or attends child care, school, or university.

C. CLINICAL AND LABORATORY INFORMATION

Laboratory tests: refer to individual disease guidelines for information regarding appropriate lab testing to confirm the case.

Symptoms/Signs/Complications: check all experienced in the course of this illness.

D. CASE HISTORY

MMR Immunization History: ascertain immunization history of every case.

Incubation period: the incubation period is the time interval from contact with an infectious person until first symptoms appear.

By using the average incubation period time intervals, it is possible to determine the period of time when the case was exposed to an infectious person who was their source of infection. Determine the likely exposure period by referring back from date of symptom onset in case. Calculate the likely dates of the exposure period by counting back from the date of onset using the range (min and max) of specified incubation periods.

Determining the likely exposure period is important in assessing where the case was infected and whether there may be other unidentified cases developing from the same exposure.

Prodrome: The prodrome is an early non-specific sign or symptom that indicates the start of the illness before disease-specific symptoms (such as cough, coryza or conjunctivitis for measles) occur. Infectiousness can begin prior to onset of prodromal illness (e.g., for measles the period of communicability usually starts one to two days before the onset of prodromal symptoms).

Period of communicability: The period of communicability is the time interval when the case can transmit the infection to others. Determining the case's period of communicability is essential to contact management. Determine the dates during which the case was communicable by referring back to dates of prodrome or illness onset, and reviewing the specified period of communicability before/after onset of symptoms.

E. CONTACT MANAGEMENT

The contact tracing worksheet is intended to facilitate follow up of contacts. Its completion is optional.

Refer to the guidelines for each disease (i.e., measles, mumps, and rubella) for the definition of a "contact" before conducting contact tracing and follow up.

11.2 Measles, Mumps, Rubella Case Report Form

Submit the completed MMR Case Report Form by fax to YCDC at 867-667-8349

Disease: ☐ **Measles** ☐ **Mumps** ☐ **Rubella**

Report cases of Measles, Mumps and/or Rubella to YCDC or CMOH (after hours and weekends) that meet suspect, probable or confirmed case definitions. **Fax this form to YCDC at 867-667-8349**. Information is collected under the authority of the *Health Act* and the *Public Health Act* for purposes of providing health services and public health services. Queries should be directed to the Manager of Yukon Communicable Disease Control, at (867) 667-8323 or toll free, at 1-800-661-0408, ext. 8323.

A. PERSON REPORTING

Panorama Investigation ID# _____ Location: Health Centre/Clinic/ER _____

Date of report: _____ /_____/_____
YYYY / MM / DD

Name of HCW reporting: _____ _____ Phone number: (____)_____
First name Last name

Fax: (____) _____

B. CASE INFORMATION

YHIS #: _____Name: _____ _____ Sex: _____
First name Last name

Date of birth: _____ /_____/_____ Country of birth: ☐ Canada ☐ Other (Specify) _____
YYYY / MM / DD

Address: _____

Phone numbers: _____

Attending Physician: _____

☐ Health Care Worker ☐ Attends child care, school or university; If yes, specify where: _____

Is the case pregnant? ☐ Yes ☐ No ☐ Unknown

Self-Identified Ethnicity (Select One):

- □ White (e.g. Caucasian, etc.)
- □ Indigenous (e.g. First Nations, Metis, Inuit)
- □ Black (e.g. African, Haitian, Jamaican, etc.)
- □ Latin American (e.g. Mexican, Central/South American, etc.)
- □ South Asian (e.g. East Indian, Pakistani, Sri Lankan, etc.)
- □ South-East Asian (e.g. Chinese, Japanese, Korean, Filipino, etc.)
- □ Arab/West Asian (e.g.Armenian, Egyptian, Iranian, etc.)
- □ Other: _____
- □ Refused/Declined
- □ Unknown

C. CLINICAL INFORMATION

Case status: ☐ Confirmed ☐ Probable ☐ Clinical

Did the case visit a HCP? ☐ Yes ☐ No ☐ Unknown Did the case visit an ER? ☐ Yes ☐ No ☐ Unknown

Was the Case Hospitalized (>24 hours)? ☐ Yes (_____ days) ☐ No ☐ Unknown

Name of Hospital: _____ Reason for hospitalization: _____

If yes, was case admitted to an Intensive Care Unit?: ☐ Yes ☐ No ☐ Unknown

Outcome at the time of reporting: ☐ Recovered ☐ Sick ☐ Died ☐ Unknown If died, date of death: _____ /_____/_____
YYYY / MM / DD

SIGNS/SYMPTOMS:

☐ Conjunctivitis	☐ Maculopapular rash	☐ Post-auricular, occipital and posterior cervical lymphadenopathy	☐ Encephalitis
☐ Coryza (runny nose)	☐ Arthralgia (painful joints)	☐ Bilateral parotitis (Sublingual/ submaxillary glands)	☐ Hearing loss
☐ Cough	☐ Fever	☐ Unilateral parotitis (Sublingual/ submaxillary glands)	☐ Koplik spots
☐ Pharyngitis/sore throat	☐ Myalgia	☐ Orchitis/oophoritis	☐ Meningitis

☐ Other(specify): _____

Date of onset of prodromal symptoms[1] _____ /_____ /_____ (YYYY / MM / DD)

Did the case visit a diagnostic laboratory? Y / N
If yes, name of institution: _____

Date of onset of parotid swelling/orchitis/rash: _____ /_____ /_____ (YYYY / MM / DD)

Duration of parotid swelling/orchitis/rash (days): _____

D. CASE IMMUNIZATION HISTORY

Is MMR immunization history in panorama? ☐ Yes ☐ No

If incomplete MMR immunization details in Panorama, but patient recall indicates vaccine history, specify:

Vaccine Name	Date Received (YYYY/MM/DD)	Age (years)	Province/Territory or Country of receipt (if known)

E. EXPOSURES

INCUBATION PERIOD: time interval from contact with infectious person until first symptoms appear

Measles – average time from exposure to onset is 8-12 days (range: 7-18 days)
Mumps – average time from exposure to onset is 16-18 days (range: 12-25 days)
Rubella – average time from exposure to onset is 14-17 days (range: 14-21 days)

Exposure period: Earliest possible exposure _____ /_____ /_____ (YYYY / MM / DD)

Latest possible exposure _____ /_____ /_____ (YYYY / MM / DD)

Did the exposure occur in a health care setting? ☐ Yes ☐ No ☐ Unknown

During exposure period:

Travel[2] ☐ Yes ☐ No ☐ Unknown

If yes, travel within Canada: ☐ Yes ☐ No ☐ Unknown If yes, specify where _____ when _____

travel outside Canada: ☐ Yes ☐ No ☐ Unknown If yes, specify where _____ when _____

Contact with a known case: ☐ Yes ☐ No ☐ Unknown

If yes, specify whom _____ where _____ when _____

Notes: _____

Contact with a visitor from outside of Yukon? ☐ Yes ☐ No ☐ Unknown

If yes, specify when: _____ Visitor's residence: _____

Contact in a known outbreak location ☐ Yes ☐ No ☐ Unknown

If yes, specify where _____ when _____

[1] Prodrome: early non-specific sign(s) or symptom(s) that indicate the start of the illness before disease-specific symptoms occur
Measles: *three to four days before rash (i.e., fever, cough, coryza, conjunctivitis)*
Mumps: *three to five days before parotitis (i.e., myalgia, anorexia, malaise, sore throat, headache, low-grade fever)*
Rubella: *one to five days before rash (i.e., fever, headache, malaise, coryza)*

[2] Any travel outside the city of residence should be included

Yukon Communicable Disease Control
4 Hospital Rd., Whitehorse, YT Y1A 3H8
Phone: (867) 667-8323 Fax: (867) 667-8349
January 2019

MEASLES, MUMPS AND RUBELLA CASE-RELATED CONTACT SUMMARY FORM

Please complete this form once follow-up with contacts is complete. Complete this form for each reported case of Measles, Mumps and/or Rubella that meets the suspect, probable/clinical or confirmed case definitions.

FAX THIS FORM TO YCDC AT 867-667-8349

PERIOD OF COMMUNICABILITY: time interval when the case can transmit the infection to others

Measles: one to two days before onset of prodromal symptoms and up to four days after rash onset
Mumps: maximum infectiousness occurs between two days before to five days following the onset of parotid swelling
Rubella: seven days before to at least seven days after rash onset

Period of communicability: From _____/_____/_____ To _____/_____/_____
YYYY / MM / DD YYYY / MM / DD

Manage case contacts based on this date range. Include contact summary in Section E Contact Management.

Note: If travel occurred during the period of communicability notify YCDC of travel itinerary

G. CONTACT TRACING

Case Health Care #: _____ Case name: _____ _____
First name Last name

Date of birth: _____/_____/_____ Sex: ☐ Male ☐ Female
YYYY / MM / DD

Total number of contacts: _____

Number of susceptible contacts: _____ Number of immune contacts: _____

Number of contacts that received MMR: _____ _____ within 3 days _____ within 4 to 6 days

Number of contacts that received Ig: _____

Number of contacts by setting type:

_____ Household _____ School, day care

_____ Workplace (not including doctor's office, Emergency Room or hospital)

_____ Health care setting (doctor's office, ER, hospital)

_____ Other, please specify: _____

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13.0 CONTACT INFORMATION

Yukon Communicable Disease Control
Hours: Monday- Friday (08:30 to 16:30)
#4 Hospital Road
Whitehorse, YT Y1A 3H8
Telephone:
Local (867) 667-8323
Within Yukon 1-800-661-0408, ext. 8323
Fax: (867) 667-8349

Dr. Brendan E. Hanley MD CCFP (EM) MPH
Chief Medical Officer of Health, Yukon
204 Lambert Street, 4th Floor
Box 2703 (H-2)
Whitehorse, YT Y1A 1Z4
Telephone:
Office: (867) 456-6136
Cell: (867) 332-1160

Whitehorse General Hospital
(Ambulatory Care)
#5 Hospital Road
Whitehorse, YT Y1A 3H7
Telephone: (867) 393-8700
Fax: (867) 393-8772
WGH Laboratory telephone: (867) 393-8739