Measles

Revision Dates

Case Definition	November 2013
Reporting Requirements	June 2013
Remainder of the Guideline (i.e., Etiology to References sections inclusive)	November 2013

Case Definition

Confirmed Case

Laboratory confirmation of infection in the absence of recent immunization[1] with measles-containing vaccine:

- Detection of measles virus nucleic acid (e.g., RT-PCR) in a clinical specimen (e.g., nasopharyngeal (NP) swab, urine).

OR

- Seroconversion or a significant (i.e., fourfold or greater) rise in measles IgG titre by any standard serologic assay between acute and convalescent sera.

OR

- Positive serologic test for measles IgM antibody[2] 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

- Isolation of measles virus from a clinical specimen (e.g., NP swab, urine)[3]

OR

- Clinical illness[4] in a person who is epidemiologically linked to a laboratory-confirmed case.

Probable Case

Clinical illness[4]:

- In the absence of both appropriate laboratory tests and an epidemiologic link to a laboratory-confirmed case.

OR

- In a person who has recently travelled to an area of known measles activity.

Suspect Case (Outbreak Only[5])

Clinical illness,[4] evaluated by a health care professional including public health, even where the maculopapular rash has been present for less than three days.

[1] The most frequent reaction to Measles-Mumps-Rubella (MMR) immunization is malaise and fever (with or without rash) occurring 7 – 12 days after immunization. However, this should be determined for each case as these reactions and the timeframe can vary.(1)

[2] Testing for IgM antibody has the potential for false positive findings. If the clinical presentation is inconsistent with a diagnosis of measles or in the absence of recent travel/exposure history, positive IgM antibody results must be confirmed by either paired IgG serology or virus detection. Most acute measles cases develop IgM antibody three days after rash onset. Therefore, a suspected measles case where serum was collected $\leq$3 days post rash onset that initially tests IgM antibody negative should have a second serum collected between 5 – 10 days post onset for retesting. **Note:** In a vaccine context, you will see the same serology picture as wild-type measles. In such cases, vaccine and wild-type measles virus strains can be differentiated by virus genotyping.

[3] Measles virus culture is not currently done in Alberta but is available at the National Microbiology Laboratory (NML), Public Health Agency of Canada (PHAC).

[4] Clinical illness, evaluated by a health care professional including public health, is characterized by ALL of the following features:

- fever 38.3° C or greater
- cough, coryza, or conjunctivitis
- generalized maculopapular rash for at least three days.

[5] As measles is eliminated in Canada, a single case would be considered unusual or unexpected. However, while measles activity remains high in other WHO regions, importations are expected to continue. A working definition for a measles outbreak is: two or more confirmed cases linked, either epidemiologically or virologically or both.(2)

Reporting Requirements

1. **Physicians, Health Practitioners and others**
   Physicians, health practitioners and others listed in Sections 22(1) or 22(2) of the *Public Health Act* shall notify the Medical Officer of Health (MOH) (or designate) of all confirmed, probable and suspect cases of measles by the Fastest Means Possible (FMP) i.e., direct voice communication.

2. **Laboratories**
   All laboratories, including regional laboratories and the Provincial Laboratory of Public Health (ProvLab), shall report all positive laboratory results by FMP to the:
   - Chief Medical Officer of Health (CMOH) (or designate),
   - MOH (or designate) and
   - attending/ordering physician.

3. **Alberta Health Services and First Nations and Inuit Health Branch**
   - The MOH (or designate) shall notify the CMOH (or designate) of all confirmed, probable and suspect cases by FMP.
   - The MOH (or designate) shall forward the preliminary Notifiable Disease Report Form (NDR) of all confirmed and probable cases to the CMOH (or designate) within seven days (one week) of notification and the final NDR (amendments) within two weeks of notification.
   - For out-of-zone cases, the MOH (or designate) first notified shall notify the MOH (or designate) where the client resides by FMP and immediately fax a copy of the positive laboratory report.
   - For out-of-province and out-of-country cases, the following information shall be forwarded to the CMOH (or designate) by FMP including:
     - name,
     - date of birth,
     - out-of-province health care number,
     - out-of-province address and phone number,
     - attending physician (locally and out-of-province),
     - positive laboratory report (faxed),
     - travel history (if known) and
     - immunization history (if known).
   - For out-of-zone susceptible **contacts** requiring follow-up, the MOH (or designate) first notified shall notify the MOH (or designate) where the contact resides as soon as possible with the following information including:
     - name,
     - date of birth and
     - contact information (i.e., address and phone number).
   - For out-of-province and out-of-country susceptible **contacts**, the following information shall be forwarded to the CMOH (or designate) as soon as possible including:
     - name,
     - date of birth and
     - out-of-province/country contact information.

Etiology

Disease is caused by the measles virus, a member of the family Paramyxoviridae, genus *Morbillivirus*.(3) It has a short survival time (less than two hours) in the air or on objects and surfaces.(4)

Clinical Presentation

Measles is an acute highly communicable viral disease. Symptoms of measles usually begin with prodromal fever, conjunctivitis, coryza, cough and Koplik spots (white spots on the inner lining of the mouth-buccal mucosa).(5) A characteristic red blotchy rash appears on the third to seventh day, beginning behind the ears and on the face spreading down to the trunk and then the extremities. The fever often rises as the rash appears. The rash may last 4 – 7 days and often disappears in the same direction it appeared. It occasionally ends in brawny desquamation. Leukopenia is common.(3) Atypical presentation can occur in vaccinated persons or those with prior exposure.(6)

Disease in an immunocompromised individual can be severe and have a prolonged course. It may occur without the typical rash.(5) Shedding of the virus occasionally occurs for several weeks after the acute illness.(4)

Measles infection during pregnancy leads to an increased frequency of miscarriage, premature birth, and low birth weight. Birth defects have rarely been reported.(4)

Complications are more common among children under five years of age and individuals 20 years of age and older. Approximately 30% of cases have one or more complications. Complications include diarrhea (8%), otitis media (7%) (which can lead to permanent hearing loss), pneumonia (6%), encephalitis (0.1%), seizures (0.6–0.7%) and death (0.2%).(4) The most common causes of death are pneumonia in children and acute encephalitis in adults.(4) In developed countries, death is estimated to occur one in to two of every 1,000 cases.(1) In addition, sub-acute sclerosing panencephalitis (SSPE) a rare, but fatal, degenerative central nervous system disease may occur as a result of acquiring a measles infection most often before two years of age. It can develop anywhere from one month to 27 years (average seven years) after the original infection. SSPE develops very rarely (about 5 – 10 per 1 million reported cases).(4)

Diagnosis

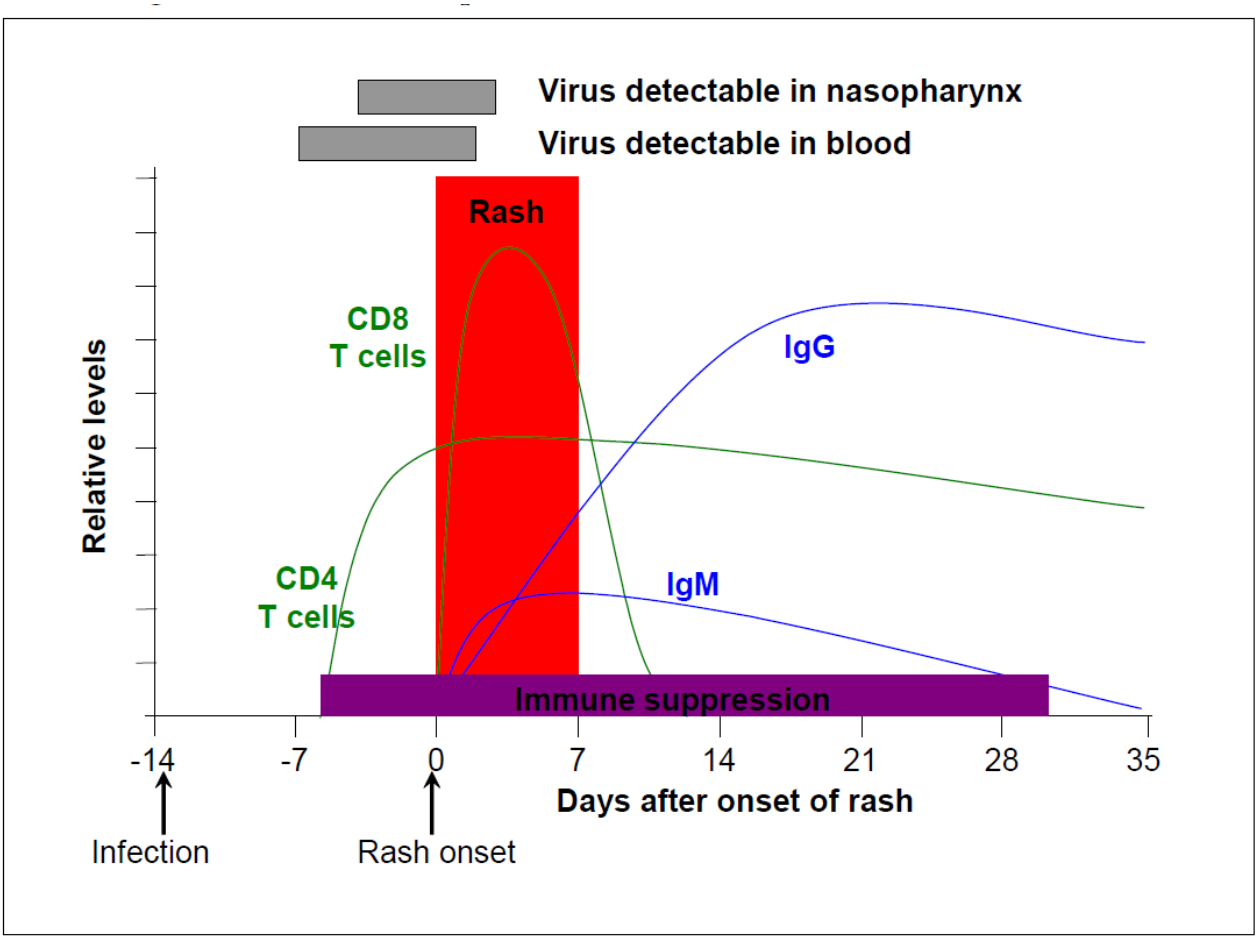
Diagnosis of measles is made on the basis of clinical picture, exposure history, molecular (RT-PCR) testing (on urine or NP swab) and/or serologic testing. Molecular detection of measles virus can precede a serological response, thereby presenting a significant advantage in the early and definitive detection of the virus which is important in initiating public health management of contacts.(7) Demonstration of a significant increase (fourfold or greater rise) in measles specific IgG titre is a reliable alternative serologic method for diagnosis.(8) In order to maximize the sensitivity of testing from a suspected case of measles in the acute phase of the illness, it is recommended that serum, NP swab and urine samples ALL be collected.(6) If measles is confirmed by PCR testing, convalescent serology is not necessary. **Note:** Serology cannot distinguish between wild-type and vaccine related illness; PCR testing, followed by further genotyping can.

Determination of the viral genotype is important for public health surveillance in discriminating vaccine strains from wild-type virus and in determining the probable origin of the case.(7) Molecular samples that are positive by PCR are referred to the NML for genotyping and surveillance.(7)

Measles virus isolation (culture) may also be done to diagnose measles but is not performed in Alberta. The NML is able to do virus isolation when an appropriate clinical specimen is collected and processed in a timely manner.

If an epidemiological link to an already confirmed case has been established, laboratory-confirmation is not necessary to meet the confirmed case definition. It is however, extremely valuable, to have genotyping information on clusters/outbreaks so efforts should be made to collect specimens.

Immune Responses in Acute Measles Infection



Source: World Health Organization, Department of Vaccines and Biologicals, Manual for the laboratory diagnosis of measles and rubella infection. Second Edition, August 2007.

For a detailed description of the laboratory testing requirements, refer to ProvLab Laboratory Bulletin, Molecular Measles Testing

Epidemiology

Reservoir

Humans are the only natural hosts of measles virus.(3)

Transmission
Transmission is person-to-person, airborne, by direct contact with nasal or throat secretions of an infected person, and less commonly, indirectly by articles freshly soiled with nose and throat secretions.(3) Measles is one of the most communicable infectious diseases with a greater than 90% attack rate on susceptible persons.(4)

Incubation Period
The incubation period is approximately 7 – 18 days, usually 10 days from exposure to fever, and 14 days until the rash appears, rarely as long as 19 – 21 days.(3) If immune globulin (Ig) is given for passive protection later than the third day into the incubation period, the incubation period may be extended.(3)

Period of Communicability
Measles is communicable from one day prior to the onset of the prodromal period (usually about four days before rash onset) to four days after the appearance of the rash.(3) Immunocompromised patients who may have prolonged excretion of the virus in respiratory secretions can be contagious for the duration of their illness.(5) Vaccine-strain infection has not been shown to be communicable.(3)

Host Susceptibility
All persons who have not had measles disease or have not been successfully immunized are susceptible.(4) Measles infection appears to confer lifelong immunity.(8)

Generally, persons born prior to 1970 can be assumed to have acquired natural immunity to measles(1). Individuals born in or after 1970 are considered susceptible unless there is serological proof of immunity or documented history of 2 doses of measles-containing vaccine as recommended in the Alberta Immunization Policy (AIP).

Infants whose mothers have had measles are protected against disease for approximately 6 – 9 months or more depending on the amount of residual maternal antibody at the time of pregnancy. Children born to mothers with vaccine-induced immunity receive fewer antibodies and may be susceptible at an earlier age.(4)

Immunization at 12 – 15 months induces immunity in 95% or more of vaccine recipients. The second dose increases immunity levels to almost 100%.(1)

Occurrence

General
The first measles vaccines were licensed in 1963.(4) Prior to widespread immunization programs, there were an estimated 100 million cases and six million measles deaths each year worldwide and epidemics occurred about every 2 – 3 years.(3) In temperate areas, measles disease occurred primarily in the late winter and spring. Typically, more than 90% of individuals were infected by the age of 20.(4)

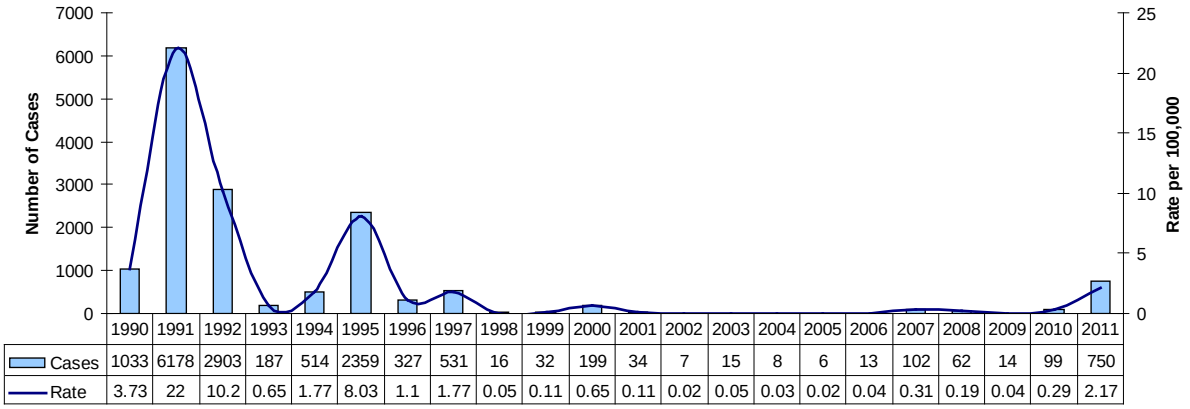
With the introduction of childhood immunization programs in many countries the number of reported measles cases has decreased. Nowadays, cases tend to occur in young unimmunized children or older children, adolescents or young adults who have received only one dose of vaccine.(3) Despite the existence of a safe, effective and inexpensive measles vaccine for 40 years, measles continues to occur throughout the world and remains the leading vaccine-preventable cause of death in children worldwide.(9)

The World Health Organization (WHO) estimated that in 2008, there were 164,000 measles deaths globally – nearly 450 deaths every day or 18 deaths every hour.(9)

Canada

Measles became reportable in Canada in 1924. In 1992, following several large outbreaks (over 11,000 cases in 1989), the National Consensus Meeting on Measles Control announced a plan to eliminate indigenous measles in Canada by the year 2005.(10)

Cases and Rate of Measles Cases in Canada, 1990 to 2011



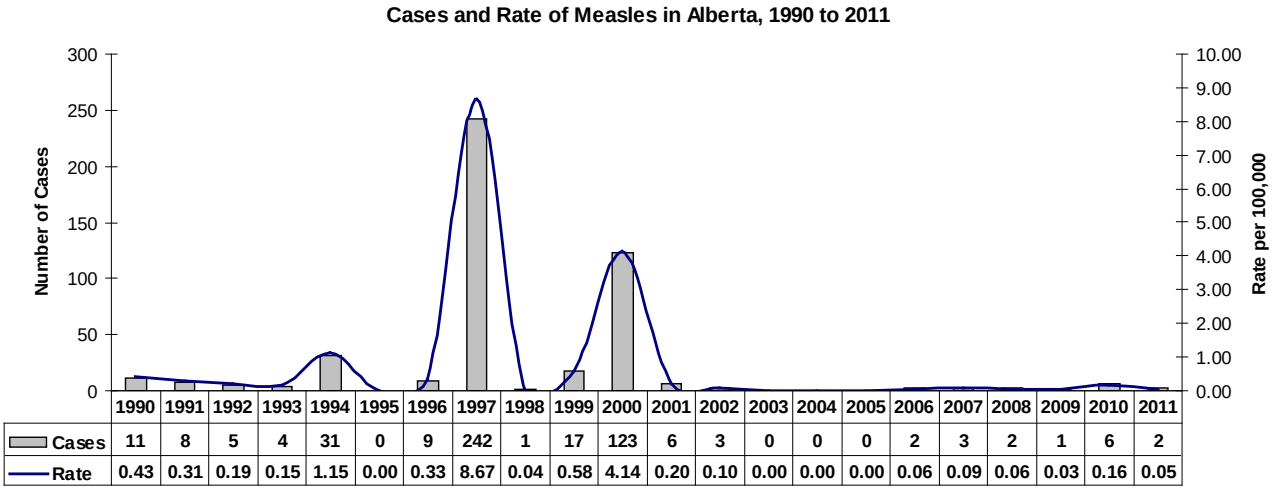
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Cases	1033	6178	2903	187	514	2359	327	531	16	32	199	34	7	15	8	6	13	102	62	14	99	750
Rate	3.73	22	10.2	0.65	1.77	8.03	1.1	1.77	0.05	0.11	0.65	0.11	0.02	0.05	0.03	0.02	0.04	0.31	0.19	0.04	0.29	2.17

Source: Public Health Agency of Canada(11;12)

Due to ongoing outbreaks of measles that continued to occur in Canada, in 1996/97 a second dose of measles-containing vaccine was added to the immunization schedule in all provinces.(1) Many provinces also conducted catch-up programs in school-aged children. This achieved immunization coverage for the second dose in excess of 85%.(11) The interruption of endemic measles transmission in Canada occurred in 1998.(2) Between 1998 and 2010, the number of measles cases in Canada has ranged from 7 – 199. The high number of cases in some years was mainly due to outbreaks in Quebec, Ontario and British Columbia.(13) In 2011, a measles outbreak occurred in Quebec. This outbreak resulted in 725 confirmed cases of measles reported between January 8, 2011 and December 22, 2011.(11) The first reported cases were among travellers who were exposed during vacations in Europe, primarily in France. Subsequently, local transmission in Quebec occurred, either through healthcare or community exposure.(14) The measles outbreak in Quebec demonstrated the continued importance of high vaccine coverage rates for measles.

Alberta

A measles vaccination program was introduced in 1966 using killed measles vaccine. In 1970, use of killed measles vaccine was replaced by live vaccine.(15) In 1996, children aged 4 – 6 years were offered a second dose of measles-containing vaccine to increase immunity and as a response to the outbreaks which had been present in the early 1990's.(15)



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Cases	11	8	5	4	31	0	9	242	1	17	123	6	3	0	0	0	2	3	2	1	6	2
Rate	0.43	0.31	0.19	0.15	1.15	0.00	0.33	8.67	0.04	0.58	4.14	0.20	0.10	0.00	0.00	0.00	0.06	0.09	0.06	0.03	0.16	0.05

Source: Alberta Health Communicable Disease Reporting System data pulled by onset date on January 12, 2012.

From 1997 to 2000, two large outbreaks occurred in the province. The first outbreak in 1997 resulted in 242 cases. A mass measles immunization campaign aimed at school-aged children was initiated as a means of controlling this outbreak. The initial cases were imported from British Columbia.(10)

The second outbreak occurred from March to October 2000 and resulted in 123 cases. These cases appeared in two clusters. They were associated with travel history, religious practices, and immunization preferences. The majority of cases (103) were not immunized. Cases ranged in age from three months to 29 years of age. Two thirds of the cases were reported in children between two and 14 years of age. More males than females were affected. There were no deaths reported. The initial cases were imported from Mexico and Bolivia.(16)

Between January 1, 2001 and December 31, 2011 there have been 25 cases of measles reported in Alberta. Of the 25 cases, 12 were likely acquired while travelling outside of Canada or through contact with a known case of measles that had acquired disease outside of Canada. Only five out of the 25 cases were considered up-to date for their immunization status.

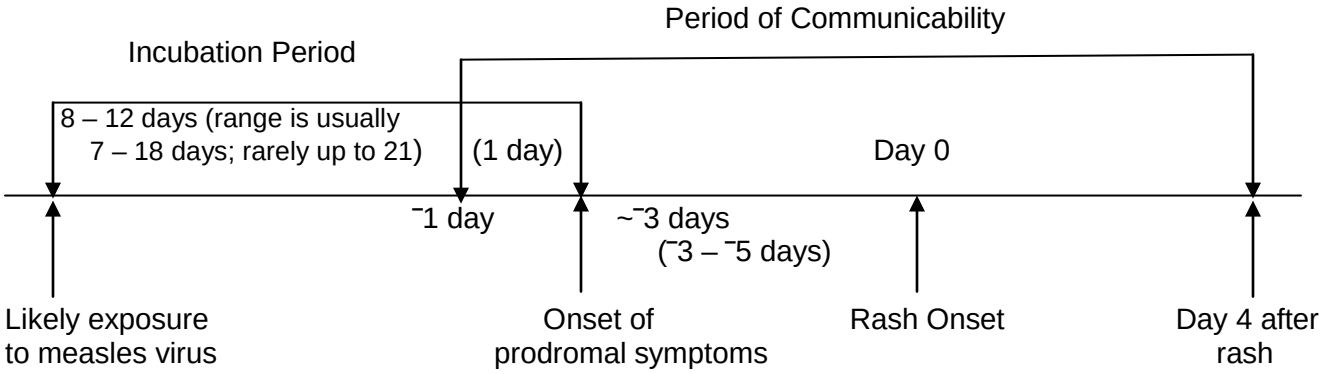
Key Investigation

Single Case/Household Cluster

- Confirm the diagnosis by ensuring all appropriate specimens have been collected (blood, urine, NP swab). See ProvLab Laboratory Bulletin, Laboratory Testing for Measles.
  - Notify the collection site prior to sending the patient to have blood taken for serology so that appropriate measures can be taken to prevent possible exposure of other patients/staff. **Note:** The collection sites do not collect NP swabs.
  - IgM antibody may be detectable three days after rash onset and can persist for 4 – 6 weeks.
  - Samples from the early acute phase of illness (i.e., those drawn before three days after rash onset) are more likely to result in a negative IgM antibody result compared with those drawn 5 – 28 days after rash onset. For this reason, if a person meets the clinical case definition for measles and the IgM serologic results from an early acute phase are

inconclusive or negative for measles, rubella, and parvovirus B19, a second blood sample is indicated.
    - A positive measles IgM antibody result does not distinguish vaccine-related rash from wild-type infection. IgG antibody serology using paired acute and convalescent specimens is a reliable test for diagnosing measles, provided that specimens are collected at the appropriate times.
    - For IgG antibody testing, acute samples should be obtained as soon as possible after the onset of the rash, and no later than seven days afterwards. Convalescent samples should be collected 10 – 20 days after the first sample. These paired sera must be tested simultaneously.
    - For viral detection, a NP swab should be collected as soon as possible and no later than four days from the onset of rash. Measles virus may be still detected after seven days from the onset of rash but with rapidly decreasing sensitivity.(2)
    - Measles virus can also be detected in urine, which should be collected within seven days from the rash onset for maximum sensitivity.(2)
- Obtain a history of illness from the case, including date of onset, signs and symptoms.
- Determine measles immunization history including:
    - number of doses,
    - date administered,
    - type of vaccine e.g., killed or live, if known, and
    - where the person was immunized (e.g., out-of-country) and type of immunization provider (e.g., public health, doctor's office, travel clinic).
- Determine the possible source of infection.
    - Identify recent history of travel (during the incubation period).
    - Identify recent contact with a confirmed or probable case of measles.
    - Assess for similar symptoms in other members of the household.
- Determine the period of communicability for the case (from one day prior to the onset of the prodromal period to four days after the appearance of the rash). **Note:** For the purposes of public health follow-up, where the onset of prodrome is not well defined the case can be considered contagious from four days before the onset of the rash to four days after the onset of the rash.

Timeline for Assessing Measles Contacts



- Identify contacts that have had exposure to the case during the determined period of communicability.
    - Contacts include any individual who:
        - is living in the household with the case, or

- had face-to-face contact with the case, or
- shared confined air space or was in the same confined air space with the case and within the two-hour period after the case had left (e.g., doctor's offices, laboratories, classrooms, locker rooms). There is no minimum duration of time for which the case had to be present in the room, or
- for practical purposes, all students attending the same school or facility should be considered contacts.(1)

Control

Management of a Case

- Provide information about disease transmission and appropriate infection control measures to minimize the possibility of transmission.
- Exclude confirmed, probable and suspect cases from daycare, school and employment, and keep cases away from non-household contacts for four days after the appearance of the rash.
- For hospitalized cases, in addition to routine practices, airborne precautions should be used from the onset of the catarrhal stage of the prodromal period through to the fourth day of the rash to reduce exposure to other patients who may be susceptible and at high-risk.(3)
- Measles cases in immunocompromised patients should be isolated and remain on airborne precautions for the duration of their illness.(5)

Treatment of a Case

- No specific treatment for measles is available. Supportive therapy should be provided as indicated.(5)

Management of Contacts

- Review signs and symptoms of measles disease and stress the importance of notifying public health if measles symptoms appear. **NOTE:** If symptoms compatible with measles disease appear in a contact of a measles case, an investigation should be considered regardless of whether or not the contact received post exposure prophylaxis. If there is reason to believe that the symptoms could be vaccine related it would be prudent to collect urine and NP swabs for PCR and genotyping. Genotyping (done at NML) can determine if the symptoms are caused by vaccine or wild-type virus.
- Review immunization and health status of all contacts (this should be done within 24 hours of reporting a case).(2)
- Assess whether identified contacts have adequate protection from measles or whether they are susceptible to measles. **The following DOES NOT apply to Healthcare Workers.** See Management of Healthcare Workers (HCW).

  - **Adequate protection** is :
    - birth before 1970, or
    - laboratory evidence of prior measles infection, or
    - serological proof of immunity (i.e., "reactive" or "positive" anti-measles IgG antibody or a previous measles antibody level of ≥ 200 mIU), or
    - documentation of two doses (given at appropriate intervals) of a measles-containing vaccine given on or after 12 months of age according to the current AIP.

    NOTE: When determining who is adequately protected, consideration should be given to individuals who have recently received Ig or intravenous immune globulin (IVIG). Duration of protection will depend on the dose, frequency of administration of IVIG and immunocompetence. Consultation with a specialist may be required.

- **A susceptible individual** is defined as
  - Birth in 1970 or later and meets the following criteria;
    - lack of documented evidence of immunization with two doses of measles-containing vaccine given at appropriate intervals, on or after the first birthday AND,
    - lack of serological proof of immunity (i.e., "reactive" or "positive" anti-measles IgG antibody or a previous measles antibody level of ≥ 200 mIU) AND,
    - lack of laboratory evidence of prior measles infection.
  - An individual with certain immunocompromising conditions as listed in the current Canadian Immunization Guide (CIG).

- A high-risk contact is a contact that is at an increased risk of complications from measles disease. A high-risk contact meets the criteria of a susceptible individual but also falls into the following groups:
  - Pregnant women,
  - Infants, or
  - Immunocompromised persons.(2)

Exclusion of Susceptible Contacts

- The MOH shall exclude susceptible contacts that refuse or cannot receive measles-containing vaccine or Ig within the appropriate timeframe, from school and childcare facilities.
- The MOH may exclude susceptible contacts from work places, and post-secondary educational institutions or other group settings, including travel. Consideration should be given to: the number of susceptible persons 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.(2)
- If exclusions occur, the period of exclusion should extend from five days after the first exposure and up to 21 days after the last exposure, or until the individual is:
  - adequately immunized (documentation of two doses of a measles-containing vaccine), or
  - demonstrates serological confirmation of immunity, or
  - has received Immune Globulin within 6 days of exposure.

Post Exposure Prophylaxis

Post exposure prophylaxis given to susceptible contacts in the appropriate timeframe can modify or prevent disease.(1) Susceptible contacts of a measles case should receive either measles-containing vaccine or Ig depending on the time-lapse from exposure, age and health status.(15)

Vaccine

- Immunization with a measles-containing vaccine should be considered as the primary intervention for all susceptible contacts over 12 months of age, **EXCEPT** where measles-containing vaccine is contraindicated.
- In order to provide protection against measles, vaccine should be offered within 72 hours of exposure.
- Vaccine, when indicated, should not be delayed past 72 hours pending serology results.
- If measles vaccine is contraindicated, Ig may be offered within six days of exposure. To prevent disease, Ig should be given as soon as possible after exposure (preferably within three days).(1)
- If the vaccine is given beyond the recommended time frame (i.e., >72 hours) it would not offer protection against the current exposure, however it would offer protection against subsequent exposures.

- A child that has received one dose of measles-containing vaccine and is considered "up-to-date" for age should receive a second dose of measles-containing vaccine within the appropriate time intervals if they are exposed to a case of measles.

Immune Globulin

- **Ig should not be used to control outbreaks**.(17)
- Ig is offered as soon as possible**, preferably within 72 hours** of exposure, but can be given up to six days after exposure to prevent or modify disease.(1)
- Ig should be considered for high-risk susceptible contacts of measles, particularly:
  - immunocompromised people for whom measles-containing vaccine is contraindicated,
  - infants between 6 – 12 months of age, and
  - pregnant women.(1;2)
- Ig is not generally indicated for contacts who have received one dose of vaccine at 12 months of age or older, unless they are immunocompromised.(5)
- Children under six months of age are usually considered immune due to antibody transferred from the mother. If, however, the mother contracts measles or is known to be non-immune, the child should be offered Ig.(1)
- The CIG recommends Ig for prophylaxis for HIV-infected children after a known exposure to a confirmed measles case even if there is documentation of previous MMR immunization (measles antibody titre is known to decline more rapidly over time in HIV-infected children as compared to HIV-uninfected children).(1) **Note: An Infectious Diseases Physician should be consulted if any HIV-infected person is exposed to measles.**
- On a case-by-case basis the MOH may, in consultation with the CMOH, consider offering Ig to other susceptible persons.
- Ig dosage (see AIP for details):
  - immunocompromised contact: 0.5 mL/kg (maximum 15 mL)
  - all other contacts: 0.25 ml/kg (maximum 15 mL)
- Ig offered beyond six days is not recommended. It is not useful in preventing disease and can delay immunization with a measles-containing vaccine to protect from further exposures. Counselling regarding signs and symptoms of measles disease and self reporting is recommended.
- Unless contraindicated, individuals who receive Ig should receive a measles-containing vaccine at a later date, at the intervals specified in the current AIP.

Management of Healthcare Workers (HCW) (2)

- Healthcare workers include individuals who provide health care or support services such as nurses, physicians, dentists, nurse practitioners, paramedics and sometimes emergency first responders, allied health professionals, unregulated healthcare providers, clinical instructors, students, volunteers and housekeeping staff.
- Healthcare workers (regardless of their year of birth) who do not have documented evidence of receiving two doses of measles-containing vaccine, laboratory confirmation of measles infection or serological proof of immunity should be considered susceptible.
- Exposed HCW who do not have documentation of 2 doses of measles-containing vaccine, laboratory confirmation or serological proof of immunity should be managed by:
  - Drawing blood for measles IgG serology.
  - Providing a dose of MMR vaccine (immediately after specimen taken) unless a contraindication to immunization exists OR
  - Consider the administration of Ig within six days of exposure in a seronegative HCW who is pregnant or severely immunocompromised.

- While waiting for serology results, HCW should be excluded from work from the fifth day after the first exposure to the 21st day after the last exposure.
  - If measles IgG serology is negative, continue exclusion (regardless of whether they received the vaccine or Ig after the exposure) and offer a second dose as necessary.
  - If measles IgG serology is positive, consider immune and return to work.

General Outbreak Control

- During a measles outbreak, the MOH may recommend MMR vaccine for children between six months and <12 months of age. This dose of vaccine would be used as an outbreak control strategy and not as post-exposure prophylaxis. Two additional doses of measles-containing vaccine must be administered after the child is 12 months old to ensure long lasting immunity.(2)

Preventive Measures

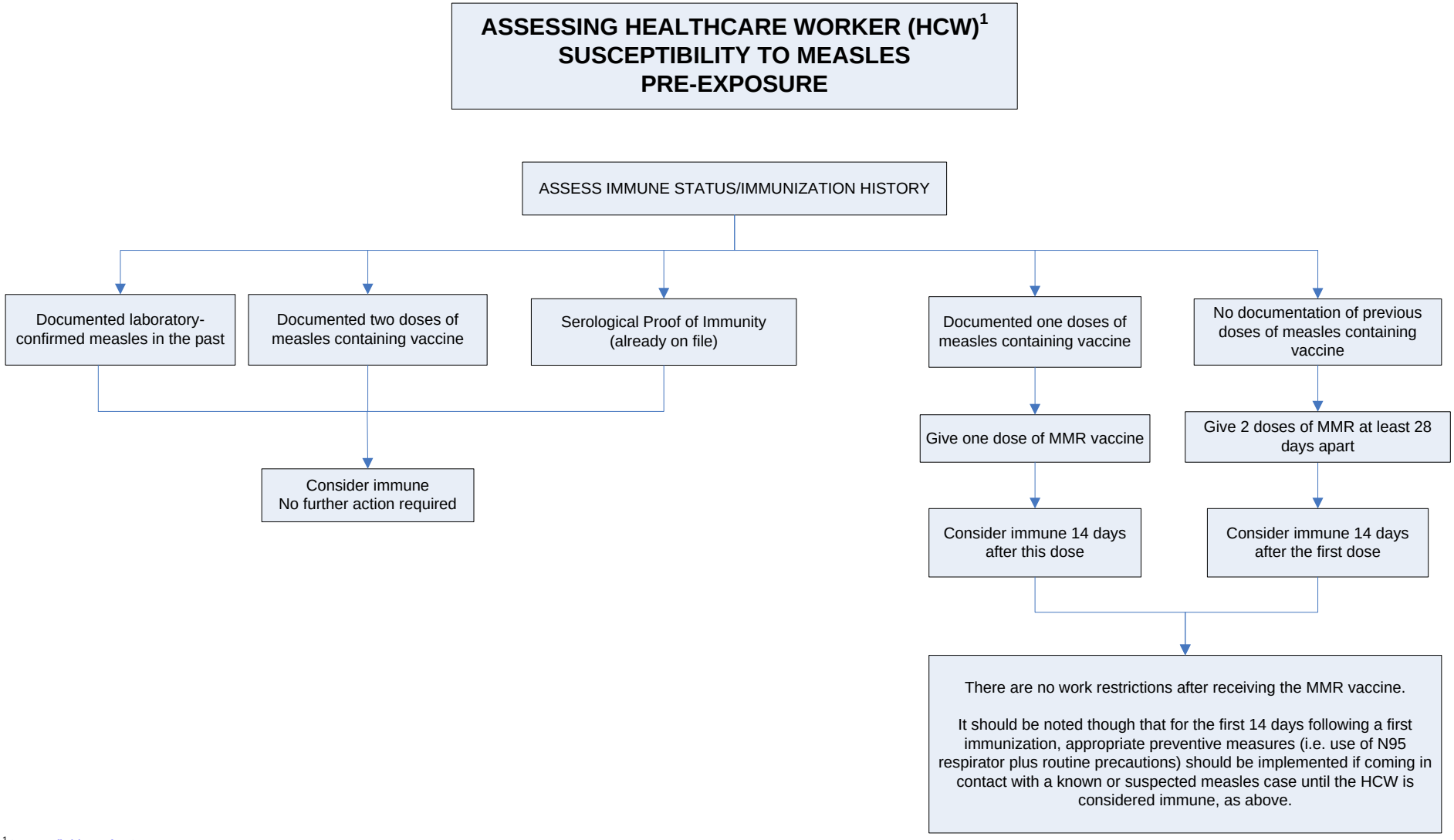
- Provide public education about the risks of measles disease and the importance of immunization.
- Unless contraindicated, all children should receive a measles-containing vaccine at 12 months and again at 4 – 6 years of age as per the current AIP.
- Review immunization records of grades one, five and nine students and ensure that all individuals have received two doses of a measles-containing vaccine before leaving school as per the current AIP.(15)
- Adults born in 1970 or later should be assessed for adequate measles immunization.
- All adults, regardless of year of birth, who are at greatest risk of exposure to measles infections (e.g., HCW, students at post-secondary institutions, military recruits) should be assessed for adequate protection.
- Individuals who are travelling to countries with circulating measles disease should be assessed to ensure they are adequately protected.
- See the current AIP for additional measles vaccine recommendations.

Appendix A
Immunoprophylaxis of Susceptible Contacts Exposed to Measles Disease

Time Since First Exposure	All Infants <6 months of age[2]	All Infants ≥6 months to <12 months of age	≥12 months of age for whom vaccine is safely indicated (unimmunized)	≥12 months of age for whom vaccine is safely indicated (history of one dose of measles vaccine)	≥12 months High-risk contacts (e.g., pregnant, immunocompromised) excluding HIV infected individuals[1]
Less than 72 hours	Assess on a case-by-case basis[2]	Ig	Measles-containing vaccine	Measles-containing vaccine[6]	Ig
Between 72 hours and 6 days	Assess on a case-by-case basis[2]	Ig[3]	Ig may be considered on a case-by-case basis.[4]	Measles-containing vaccine [5]	Ig
Greater than 7 days	N/A	N/A	Measles-containing vaccine [5]		N/A

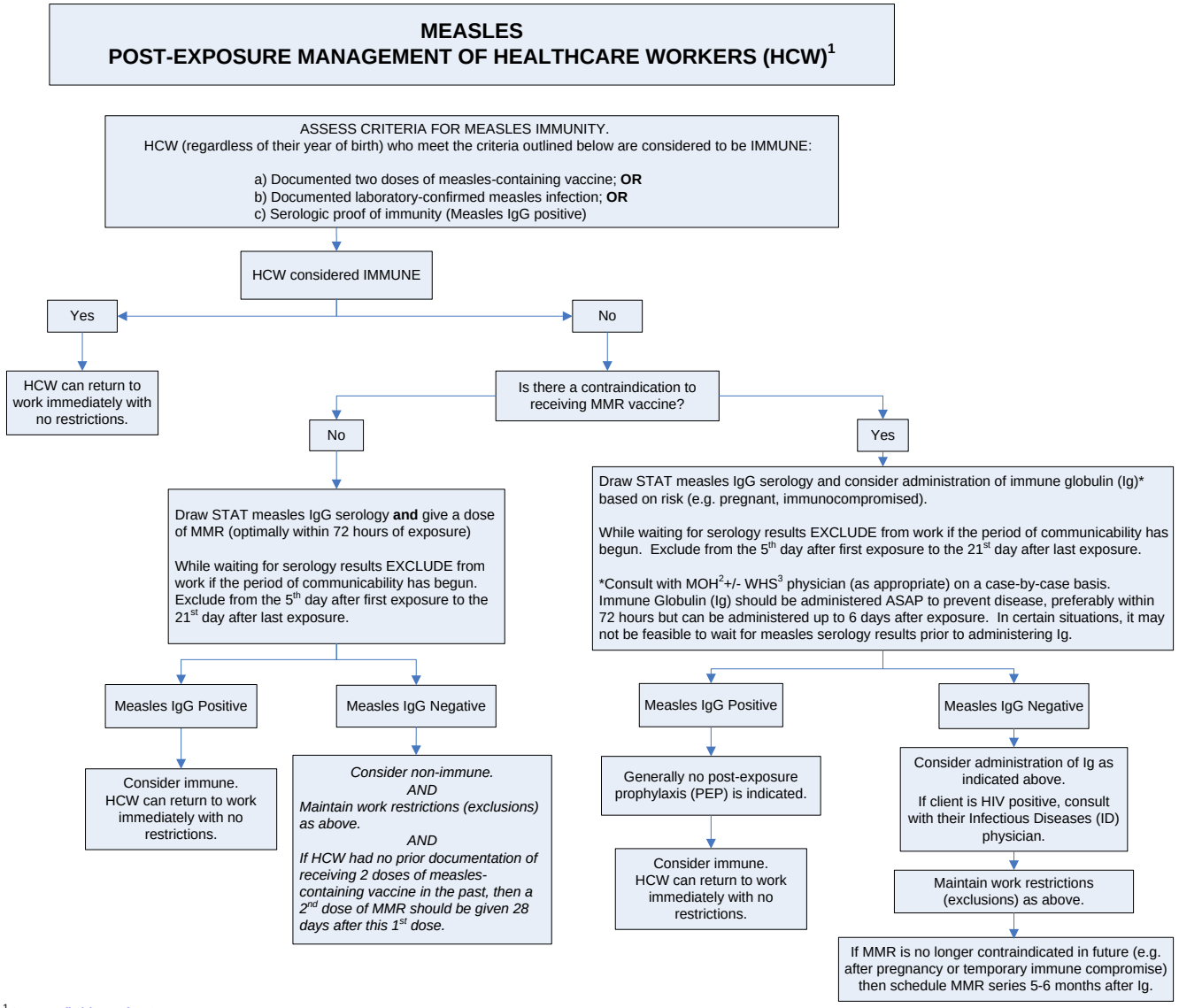
[1] An Infectious Disease Physician should be consulted if any HIV-infected person is exposed to measles.
[2] Children <6 months are generally considered immune from antibody transfer from the mother. If the mother contracts measles or is known to be non-immune, the child should receive Ig.(1)
[3] Ig should be given within 72 hours of exposure but has been shown to be effective in preventing or modifying disease if administered within 6 days of exposure**.**
[4] Ig is usually reserved for susceptible high-risk contacts but may be considered in other situations**.**
[5] If infection has already occurred it will not prevent or modify disease. The vaccine will offer protection for subsequent measles exposures.
[6] A dose of measles-containing vaccine would be indicated even if the child is considered “up-to-date” for age (e.g., a 3 year old that has had one dose of vaccine at 12 months of age).

Appendix B



[1] See Definition of HCW

Appendix C



[1] See Definition of HCW
[2] Medical Officer of Health
[3] Workplace Health and Safety

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