

# Measles

## Goal/Objective:

The Public Health (PH) goal in the management of measles disease is to maintain the elimination of endemic measles in Nova Scotia (NS) and prevent transmission from imported cases.

Endemic measles has been eliminated in Canada, but measles continues to occur elsewhere in the world. Measles is one of the most highly communicable of all infectious diseases. Although most people with measles recover, it can result in complications and very rarely death. Risk of severe outcomes are increased in children less than 5 years of age, pregnant women, and immunocompromised people.

**Due to the highly infectious nature of measles and the ‘time sensitive nature’ of post-exposure prophylaxis, immediate public health investigation must be initiated.**

## INFORMATION

### Case definition

The measles case definition can be found in the Nova Scotia Surveillance Guidelines found here: <https://novascotia.ca/dhw/populationhealth/surveillanceguidelines/measles.pdf>

### Outbreak definition

The outbreak definition varies with the outbreak under investigation.

Please refer to:

<https://novascotia.ca/dhw/populationhealth/surveillanceguidelines/measles.pdf> for guidance in developing a measles outbreak case definition as needed.

### Causative agent

Measles virus

### Source

Humans

### Incubation

An average of 11-12 days from exposure to onset of symptoms with a range of 7-21 days, and average of 14 days from exposure to onset of rash.

Note: The incubation period may be extended in an exposed individual if immune globulin (Ig) is given for passive protection early in the incubation period.

## Transmission

Measles is one of the most highly communicable infectious diseases.

The virus is transmitted by the airborne route, direct contact with infectious droplet or, direct person-to-person contact with the nasal or throat secretions of an infected person. The virus can survive and remain contagious in the air, or on infected surfaces, for up to two hours. The secondary attack rate among susceptible persons is greater than 90%.

## Communicability

From 4 days before the rash onset to 4 days after the appearance of the rash, with the day of the rash being day 0. Immunocompromised individuals who may have prolonged excretion of the virus in respiratory tract secretions, may be contagious for the duration of their illness.

## Symptoms

Prodromal fever, conjunctivitis, coryza, cough, Koplik spots (<https://phil.cdc.gov/Default.aspx>); then red maculopapular confluent rash on 3rd to 7th day often beginning on face and becoming generalized. Complications such as otitis media and bronchopneumonia occur in about 10% of reported cases. Acute encephalitis can occur in approximately 1 of every 1000 cases which can result in deafness or intellectual impairment. Subacute sclerosing panencephalitis (SSPE) is an extremely rare and fatal central nervous system disease, developing years after measles infection acquired in early life.

Individuals with 1 or 2 doses of measles vaccine can have an atypical presentation.

## Diagnostic testing

1. Nasopharyngeal swab (NPS) and/or throat swabs using a viral swab (same swab used for influenza testing; additional swabs can be obtained from the local laboratory).

**AND**

2. Minimum of 5 ml of urine in a sterile container.

Molecular detection of measles RNA is the best test to diagnose acute infection. Although NPS/throat (NPS preferred) or urine specimens can be positive for up to 14 days after the onset of the rash, detection rates fall after 7 days. After the rash has appeared for 7 days, serology can also be used for diagnosis, however, serology should NOT be used as the only test for measles diagnosis; viral swab and urine should be prioritized. If there is a high clinical suspicion of measles (i.e. contact of a laboratory-confirmed case) that is outside the window for detection of RNA, also order acute serology: IgM and IgG. Note: Measles IgM serology may be negative if blood is collected in the first 3 days of the measles rash. For further details see: <https://novascotia.ca/dhw/populationhealth/surveillanceguidelines/measles.pdf>.

## Treatment

Although there is no specific treatment for measles, care of a measles case is under the direction of the attending health care provider.

## Prevention: Vaccination

Immunization with a measles-containing vaccine is highly effective in the prevention of measles. One dose is approximately 93% effective, and two doses is over 95% effective.

Refer to the Nova Scotia Publicly Funded Vaccine/Immunoglobulin Eligibility policy found here:

[https://novascotia.ca/dhw/cdpc/documents/Nova\\_Scotia\\_Vaccine\\_Immunoglobulin\\_eligibility.pdf](https://novascotia.ca/dhw/cdpc/documents/Nova_Scotia_Vaccine_Immunoglobulin_eligibility.pdf)

## Effect of recent vaccination

Measles-containing vaccines are live attenuated vaccine, and approximately 5% of people may develop fever, with or without a rash, which typically occurs 7 to 10 days post vaccination. Measles-vaccine virus can be detected by PCR. There is no evidence of human-to-human transmission of measles-vaccine virus in individuals developing this reaction, which is considered an adverse event following immunization (AEFI).

# PUBLIC HEALTH MANAGEMENT & CONTROL

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## Case management

Case investigation is a priority and requires immediate action to prevent spread and subsequent secondary cases.

### Case follow-up

All cases must meet the case definition and have appropriate laboratory testing (see above). Case follow up should occur for probable and confirmed cases.

A detailed case history outlining the following is a critical and necessary component of the assessment to inform further public health action:

- Detailed immunization history including number and timing of doses of measles-containing vaccine.
- Potential exposure/source:
  - Contact with anyone with known measles.
  - Ill family or household contact.
  - Ill friends, coworkers, roommates.
  - Travel to places in the world where measles is circulating or endemic areas.

- Contact with individuals visiting from places in the world where measles is circulating or endemic areas.
- Attendance/work locations including school, daycare, and medical facilities.
- Use of public transportation, conveyances include planes.
- Attendance at social events/group functions.
- Knowledge of other people with similar symptoms.

If investigation identifies areas where the case could have exposed others, details about exposure sites should be obtained.

If Public Health directs any possible cases for further testing or assessment by a health care provider, then the facility where the individual is being assessed should be advised and must ensure proper infection control measures are in place to accommodate these cases and prevent further spread.

### **Case Exclusion**

Measles cases should be advised to self-isolate at home (including exclusion from: childcare settings, schools, post-secondary educational institutions, workplaces, healthcare, and other group settings). Cases should isolate away from non-household contacts, and as much as possible from household members until the end of the fourth day after the appearance of the rash (with the day of the rash being day 0), noting that by the time of diagnosis household members will likely have been exposed. This should apply whether the case had been previously vaccinated or not. Self-isolation will help to prevent further transmission of the virus. If the case lives in a congregate living setting, they should isolate from others as much as can reasonable be achieved in that setting.

Immunocompromised individuals should be advised to isolate for the duration of their illness.

### **Education of case**

All cases must be educated about the following:

- period of communicability.
- how to prevent spreading to others.
- the importance of ensuring routine and travel immunizations are up to date for the case and their family ([\*\*\*NS Publicly Funded Vaccine/Immunoglobulin Eligibility Policy\*\*\*](#)).
- basic hygienic practices (washing hands often/using hand sanitizer, not sharing drinking glasses or eating utensils, covering coughs and sneezes with a tissue or elbow, staying home when sick).

Cases working or volunteering in a health care, long-term care setting, congregate living settings, childcare or educational settings should be advised to immediately notify their Occupational Health Safety and Wellness (OHSW) at their place of employment and their manager.

## Contact tracing and management

Contact tracing is the primary means of controlling the spread of measles. Identifying individuals who had contact with the case during their communicability period is critical. Immediate reporting, investigation and providing post-exposure prophylaxis (PEP) to susceptible contacts can stop secondary cases. The management of identified contacts depend on their vaccination status or susceptibility to measles and their exposure risk. In situations where there are poorly defined contacts (e.g., exposures in public enclosed spaces), additional communications are warranted (see communication below).

### Definition of contacts

Contacts are individuals who have spent any length of time in a room or enclosed space while the infectious measles case was present, or for up to 2 hours after the case left the room/space. Generally secondary transmission is higher among contacts who have more intensive exposure to the case, such as members of a household or individuals who have close contact with each other over a long period of time, children in the same day care, or students playing on the same sports team.

### Susceptibility

Within 24 hours of reporting a confirmed or probable case of measles, all possible efforts should be made to identify contacts and classify them as **susceptible\***, **high-risk\*\***, or non-susceptible. The immunization status of all contacts of cases should be ascertained to determine susceptibility to measles.

#### **\*Susceptible:**

The following people should be considered susceptible to measles:

- Individuals who lack documented evidence of vaccination with measles-containing vaccine:
  - Two valid doses for persons born in 1970 or later given after their 1st birthday and given at least one month apart.
  - Two valid doses for health care workers, or military personnel, regardless of age and year of birth.
  - One dose for students in post-secondary educational settings who are born before 1970.

**OR**

- Individuals who lack laboratory evidence of prior measles infection or documentation of prior confirmed measles disease.

**OR**

- Individuals who lack laboratory evidence of immunity.

**OR**

- Infants under age 12 months.

**Note:** The susceptibility criteria above apply on a population basis. There will be a small number of individuals who are classified as non-susceptible who will be susceptible and vice versa. Therefore, contacts should be advised of any relevant exposure and counselled to monitor for signs and symptoms, even if they are not recommended to receive PEP or other public-health management (self-isolation or exclusion).

**\*\*High-Risk:**

A high-risk contact is one that is at an increased risk of measles complications. The following contacts are at high-risk:

- Pregnant people who have never had measles infection or 2 doses of measles-containing vaccine. Pregnant people who have received one dose of vaccine are more protected and therefore lower risk than those with zero doses of vaccine.
- Infants under 12 months of age, particularly those who are unvaccinated or who lack laboratory evidence of immunity.
- Immunocompromised individuals.

## Post Exposure Prophylaxis

Recommendations for post exposure prophylaxis (PEP) for susceptible contacts are based on the October 2018 [National Advisory Committee on Immunization \(NACI\)](#) recommendations. The timely administration of measles-containing vaccine or Ig can be used to reduce the risk of infection in susceptible individuals exposed to measles. Measles-containing vaccine provides long term protection against measles whereas Ig provides only short-term protection. Despite the use of PEP, measles infection can occur. Exposed individuals should be counseled regarding signs and symptoms of measles; avoiding contact with others should they become ill with symptoms compatible with measles; and the need to seek medical care; including the need to advise any health care providers of the possibility of measles before going to a health care setting so that appropriate precautions can be taken.

### MMR Vaccine

Susceptible immunocompetent individuals six months of age and older who are exposed to measles and who have no contraindications, should be given MMR vaccine within 72 hours of the exposure. Parents of infants 6 to 12 months of age should be advised that this is an early dose of vaccine, and they should receive two additional doses after 12 months of age to be fully protected.

If contacts are given measles-containing vaccine as PEP and develop a fever/rash illness after receiving the vaccine, this could represent either a wild-type measles infection or vaccine-associated measles (i.e., an AEFI). These individuals should be managed as suspected case of measles until vaccine genotype PCR results are available.

### Immunoglobulin (Ig)

Susceptible high-risk contacts including infants under 6 months of age, susceptible pregnant women, and immunocompromised individuals, who are within 6 days of exposure should be offered Ig at the recommended dose. See [Table 1](#) for a summary

of recommended measles PEP strategies.

Susceptible immunocompetent infants six to 12 months of age who are identified after 72 hours and within six days of a measles exposure should receive IMIg (0.5 mL/kg) if injection volume is not a major concern (to a maximum of 15 mLs administered over multiple injection sites).

A risk assessment should be conducted in consultation with the Medical Officer of Health for pregnant persons who have received one documented dose of measles-containing vaccine prior to receiving Ig, including consideration of rapid IgG antibody testing. The microbiologist on call should be notified when serology is urgently needed to facilitate testing.

If injection volume is not a major concern, the Ig should be provided intramuscularly (IMIg) at a concentration of 0.5 mL/kg, to a maximum dose of 15 mLs administered over multiple injection sites.

Recipients weighing 30 kg or more will not receive the measles antibody concentrations that are considered to be fully protective. Where injection volume is a concern or for recipients weighing 30 kg or more, IVIg can be provided alternatively at a dose of 400 mg/kg. Although IVIg products are not indicated for use as measles PEP in Canada, NACI now recommends them as an alternative to IMIg because there are no comparable appropriate prophylaxis strategies in some situations.

Individuals receiving IVIg as part of the management of an underlying condition (400 mg/kg of body weight or higher) are considered protected against measles and do not require PEP if the last dose of IVIg was received within three weeks prior to the measles exposure.

NACI does not recommend that susceptible immunocompetent individuals older than 12 months of age, who are not pregnant, receive Ig PEP for measles exposures due to the low risk of disease complications and the practical challenges of administration for cases and contact management.

If Ig is received as PEP (or any indication), future doses of live virus vaccines (e.g., MMR vaccine and varicella-containing vaccines) must be delayed. Further information on measles PEP and the timing of immunization following the receipt of an Ig product, can be found in the Section 1: of the CIG at the [Canadian Immunization Guide](#) Blood products, human immunoglobulin and timing of immunization).

### **Accessing Immunoglobulin (Ig) for Post-Exposure Prophylaxis**

All Ig products are only available through the Canadian Blood Services (CBS):

- During regular business hours, Nova Scotia Health (NSH) hospitals with a Transfusion Medicine Laboratory (TML) request Ig products directly from CBS, completing the appropriate Volume Expanders and Immune Globulins Order Form found at [F801720 Revision 3.pdf \(blood.ca\)](#) (STAT orders must be faxed and phoned).
- After hours, weekends and holidays, only Nova Scotia Health hospitals with a 24/7 hour staffed TML, order the Ig product directly from CBS.

- During regular business hours, after hours, weekends and holidays, NSH hospitals without a TML need to have the Ig products ordered through NSH Public Health Bio-Depot. The on-call Pharmacy Practicing Assistant requests Ig products directly from CBS, completing the appropriate Volume Expanders and Immune Globulins Order Form found at [F801720 Revision 3.pdf \(blood.ca\)](#) (STAT orders must be faxed and phoned).

**Table 1: Summary of updated measles post-exposure prophylaxis recommendations for susceptible contacts**

Population	Time since exposure to measles <sup>a</sup>	
	≤ 72 hours	73 hours–six days
Susceptible infants 0–6 months of age <sup>b</sup>	IMIg (0.5 mL/kg) <sup>c</sup>	
Susceptible immunocompetent infants 6–12 months of age	MMR vaccine <sup>b</sup>	IMIg (0.5 mL/kg) <sup>b,d</sup>
Susceptible immunocompetent individuals 12 months of age and older	MMR vaccine series <sup>d</sup>	
Susceptible pregnant individuals <sup>e</sup>	IVIg (400 mg/kg) <b>OR</b> IMIg (0.5 mL/kg), limited protection <sup>f</sup>	
Immunocompromised individuals six months of age and older	IVIg (400 mg/kg) <b>OR</b> IMIg (0.5 mL/kg), limited protection if 30 kg or more <sup>f</sup>	
Individuals with confirmed measles immunity	Not applicable	

Abbreviations: IMIg, intramuscular immunoglobulin; IVIg, intravenous immunoglobulin; MMR, measles-mumps-rubella

a: Ig should only be provided within six days of measles exposure. Individuals already receiving replacement IVIg (400 mg/kg of body weight or higher) are considered protected against measles and do not require Ig if the last dose of IVIg was received within three weeks prior to measles exposure.

b: Two doses of measles-containing vaccine are still required after the first birthday for long-term protection

c: If injection volume is a major concern, IVIg can be provided at a concentration of 400 mg/kg.

d: MMR vaccine will not provide PEP protection after 72 hours of exposure, however, starting and completing a two-dose series should not be delayed to provide long-term protection.

e: Provide two doses of MMR vaccine postpartum for long-term protection.

f: For individuals weighing 30 kg or more, IMIg will not provide complete protection but may provide partial protection.

Public Health Agency of Canada. (2018). NACI Recommendation for PEP. CDR 2018, Volume 44-9, September 6, 2018. Retrieved from: <https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2018-44/issue-9-september-6-2018/article-7-naci-recommendation-pep.html>

### Exclusion of Contacts:

Susceptible contacts (See Susceptible; Contact Tracing section) who refuse or cannot receive MMR vaccine or Ig should be excluded from childcare settings, schools, health care settings and post-secondary educational institutions. In addition, at the discretion of the Medical Officer of Health, exclusion may be required for other workplaces, or



group settings, including travel. A risk assessment should be done; considerations include the type of exposure to the case (intensity and duration); vaccination status of the contact (unknown, zero or 1 dose); the potential for susceptible and high-risk individuals in the setting and the reliability of the individual to comply with early symptom recognition and self-isolation should symptoms develop.

If exclusion is warranted, the period of exclusion should extend from 5 days after the first exposure and up to 21 days after the last exposure until the individual meets any of the following criteria:

- Has had at least one recent measles-containing vaccine within 72 hours of the first measles exposure (except health care workers\*) OR
- Demonstrates serological confirmation of immunity OR
- Has received Ig, if eligible (except health care workers\*).

**NOTE:**

\*Individuals working in health care settings, long term care facilities or congregate living settings, should consult their occupational health safety and wellness (OHSW) guidelines and manager to determine exclusions and if additional measures are necessary.

For further information on managing measles in a health care setting refer to the [Guidelines for the Prevention and Control of Measles Outbreaks in Canada](#).

**Considerations for Specific Settings:**

**School/Childcare settings:**

Consider reaching absent school/childcare attendees in order to determine if they are cases. A communication plan for the school should be determined.

PH will inform school/childcare setting when it is permissible for the contact to return.

**Health Care Facilities:**

Management of patients who have been exposed to measles in health care facilities should be carried out by the healthcare organization's infection control professionals or delegate in consultation with local public health authorities. Refer to the [Guidelines for the Prevention and Control of Measles Outbreaks in Canada](#)

**Education of contacts**

Contacts should be educated about the signs and symptoms of measles. They should also be advised:

- How measles is transmitted.
- Period of communicability, 4 days before the onset of the rash, until 4 days after rash onset.
- Use self-isolation (work, school, travel, and other activities) as per exclusion.
- Should symptoms develop urgent notification of Public Health and their health care provider.

- Should symptoms develop to call ahead before going to any health care facility, including blood or specimen collection sites, to inform the staff of measles symptoms so that they can be isolated on arrival to avoid exposing any susceptible persons.
- Should symptoms develop among students while they are in a school setting, the student should be sent home but not on public transportation or a school bus.
- Ensure the contact keeps a record of activities for the timeframe after exposure until they are cleared by Public Health.

### **Following up contacts**

Follow up with contacts within 1 week to confirm that they received appropriate vaccination and to determine if they have or have not become cases. In outbreaks or where large numbers of contacts are identified, resources may need to be assessed to determine feasibility of follow up.

### **Air Travel Contacts:**

If a case of measles was infectious during air travel (from 4 days before the rash onset to 4 days after the appearance of the rash) the follow up will depend on the timeframe between case identification and air travel. In most cases, a public advisory should be the default approach to notify potentially exposed passengers. However, in certain circumstances, when there is extremely timely notification of a case with recent travel, mass messaging directly to passengers in addition to a public advisory could be considered. This decision should be made in consultation with a Medical Officer of Health. Airlines should be notified regarding potential flight crew exposures. A request for airline contact information and assistance obtaining a manifest and PNR, should be directed to the PHAC. Refer to [Appendix A](#) for Management of air travel contacts.

### **General Communication**

Public Health Alerts through CNPHI should be considered to notify the public health community about measles cases occurring within Nova Scotia. In addition, a public advisory should be considered to notify the public about exposure sites when relevant. This includes potential exposures in public enclosed spaces and travel conveyances (airline exposures). Specific details of exposure sites should be included in the communication.

The purpose of these notifications is to enable early identification of secondary cases, should they occur, and to allow the administration of PEP to susceptible individuals when possible.

## **[General Information Sheet](#)**

## References

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Public Health Agency of Canada. Guidelines for the Prevention and Control of Measles Outbreaks in Canada. 2013. Retrieved from <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/13vol39/acs-dcc-3/assets/pdf/meas-rouq-eng.pdf>

## **Appendix A: Management of air travel contacts**

1. Assess available information to determine if the measles case was infectious during air travel. (4 days before or 4 days after rash onset).
2. Send an email to the Department of Health and Wellness (DHW) Surveillance inbox at [surveillancedhw@novascotia.ca](mailto:surveillancedhw@novascotia.ca) to provide the necessary information for an Interjurisdictional Notification (IJN) and the required details for PHAC notification, including:
  - Flight details –
    - i. airline/ flight number
    - ii. Departure airport
    - iii. Departure date and time
    - iv. Arrival airport
    - v. Arrival date and time.DHW Surveillance will notify PHAC at the Vaccine Preventable Division ([vpd-mev@phac-aspc.gc.ca](mailto:vpd-mev@phac-aspc.gc.ca)) of the measles on a plane event, including the flight details provided by Public Health.
  - DHW Surveillance will also notify the airline(s) that brought the case to Nova Scotia of the potential flight crew exposure. If contact information for the airline is required, an email is sent to the Central Notification System ([cns-snc@phac-aspc.gc.ca](mailto:cns-snc@phac-aspc.gc.ca)). As necessary, a flight manifest can be requested including the authority under which it is being requested. Air travel contact notification after hours, an email can be sent to CNS [cns-snc@phac-aspc.gc.ca](mailto:cns-snc@phac-aspc.gc.ca) and cc HPOC ([h poc-cops@phac-aspc.gc.ca](mailto:h poc-cops@phac-aspc.gc.ca)).
3. Nova Scotia Health (NSH) Public Health and DHW Surveillance should work together to develop a Canadian Network for Public Health (CNPHI) Public Health Alert.
4. Nova Scotia Health Communications will issue a Public Service Announcement as deemed appropriate by the RMOH managing the measles case through usual public communication mechanisms (NSH [News and Notices](#)), local media, NSH Social media channels). The Public Service Announcement should include, flight details, date of exposure, additional community exposures, and instructions for monitoring symptoms and seeking care.
5. If there will be mass messaging directly to passengers to inform them of the exposure:
  - NSH Public Health will develop messaging with pertinent information, such as list of symptoms, communicability period, immediate consultation with a health care provider if symptoms develop, and instructions for accessing post exposure prophylaxis, if applicable.
  - Send messaging to DHW Surveillance who will then send a single email to all passengers using email addresses included on the flight manifest and using bcc to protect their personal information.

6. Outside of regular business hours, the following process is followed:
- The RMOH on call will notify the provincial MOH on call (CMOH/DCMOH/provincial MOH) when a circumstance requiring out of province notification and a potential public health alert arises. This notification must indicate which province(s) and/or territory(ies) (P/Ts) need to be notified and what the content of the notification should be.
  - The provincial MOH on call will notify those P/Ts as per their after-hours documentation.
  - A CNPHI Public Health Alert will then be developed and posted the next business day.