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AT A GLANCE

Measles: Information for Health Care Providers

1st Edition: March 2024

This document outlines considerations and information to assist with timely identification and management of individuals suspected to have measles and information about measles prevention through immunization. It is intended for use by health care providers.

> **All suspect cases of measles should immediately be reported to your local public health unit. Do not wait for laboratory confirmation.**

Summary

- Immunization is the best way to protect against measles. Individuals travelling outside of Canada should ensure they are adequately protected prior to travelling.[1]
- If an individual's immunization records are unavailable, immunization with measles-containing vaccine is generally preferable to ordering serology to determine immune status. There is no harm in giving measles-containing vaccine to an individual who is already immune.
- Signs and symptoms of measles include fever and maculopapular rash, starting on the face and spreading cephalocaudally (head to toe) and centrifugally, often accompanied by cough, runny nose and conjunctivitis (non-purulent). Koplik spots are pathognomonic and may be present in the prodromal period.
- Clinicians should consider measles in patients presenting with these signs and symptoms, especially if they are unvaccinated, partially vaccinated or immunocompromised and there is a potential exposure risk, including either 1) recent travel, 2) known contact with a case of measles, or 3) residing in an area where measles cases have been recently identified.[1]
- If you suspect measles infection and the patient is an outpatient /virtual appointment, contact public health to arrange testing at an appropriate facility with Infection Prevention and Control (IPAC) measures in place. Instruct the patient to notify healthcare facilities prior to arrival (when possible), to allow IPAC measures to be put in place to prevent exposures.
- If you suspect measles infection in a patient presenting to you: 1) provide the patient with a medical mask (if able to tolerate use and no contraindications), 2) promptly isolate the patient in a negative pressure room, if available (if not available, place in a single patient room with the door closed); 3) obtain specimens for testing; 4) Contact your local public health unit immediately to report the case (do not wait for laboratory confirmation) and to receive additional guidance; 5) provide isolation guidance to the patient while results are pending.

Background

Measles is a highly contagious respiratory virus that causes a febrile rash illness and poses significant health risks. Before the introduction of the measles vaccine and a routine immunization program, measles was a common childhood illness that infected most individuals before the age of 20 years and caused over 2 million deaths each year worldwide.[2] The introduction of routine measles vaccination has led to a dramatic decline in the incidence of measles. Endemic measles has been eliminated (i.e. no sustained circulation) in Canada since 1998. However, Canada continues to see measles cases related to travel (i.e. imported cases) as measles continues to be endemic in many areas of the world. Measles can easily be spread to individuals who have not been previously infected or immunized against measles.

Measles infection and chains of transmission can be avoided by ensuring high rates of measles vaccine coverage, ensuring measles protection through vaccination prior to travel and the prompt isolation of suspect measles cases.

Measles Prevention through Immunization

Everyone in Ontario is recommended to stay up-to-date with measles-containing vaccines according to the Publicly Funded Immunization Schedules for Ontario[3]:

- Two doses of measles-containing vaccine are routinely given in Ontario with the first dose at 12 months of age using measles, mumps, rubella (MMR) vaccine and with a second dose given at 4-6 years of age using measles, mumps, rubella, varicella (MMRV) vaccine.[3]
- Adults who have only received 1 dose of MMR vaccine are eligible to receive a 2nd dose if they meet any of the criteria below, or based on the healthcare provider's clinical judgement.[3]
    - Health care workers
    - Post-secondary students
    - Planning to travel to areas where risk of measles exposure remains a concern

It is important to ensure that school-aged children who were due for their 2nd dose of measles-containing vaccine during the COVID-19 pandemic years receive this dose as soon as possible as it may have been missed due to disruptions to the delivery of immunization services during the COVID-19 pandemic.

Travel Immunization

Individuals travelling to destinations outside of Canada should ensure they are adequately vaccinated against measles prior to travel. Measles-containing vaccine should be given at an earlier age than the routine immunization schedule for children travelling outside of Canada where the disease is of concern or travelling to locations experiencing measles outbreaks.[1] Table 1 provides a summary of the Canadian Immunization Guide (CIG) recommendations for measles vaccination prior to travel outside of Canada.

Table 1. Measles vaccination recommendations prior to travel outside of Canada[1]*

Age Group	Canadian Immunization Guide Advice
Infants (6 months to 12 months)	One dose of MMR vaccine Note: 2 additional doses of measles-containing vaccine must be administered after 12 months of age for those vaccinated prior to their first birthday to ensure long lasting immunity to measles
Children under 4 years of age who have received one previous dose according to the routine schedule (i.e. on or after 12 months of age)	Administration of the second dose of measles-containing vaccine**†
Individuals born in/after 1970 and 12 months of age and older	2 doses of measles-containing vaccine** (total)
Adults born before 1970	1 dose of MMR vaccine (total) • Unless there is lab evidence of immunity or history of lab-confirmed measles *(vaccination is recommended over serological testing)*

*Doses outlined above are publicly funded in Ontario for travel to areas where disease is of concern. Refer to the Government of Canada's Travel health notices to access up to date information on measles outbreaks occurring outside of Canada.

**MMR or MMRV can be used (note: age indications differ)

† If a dose given for travel is administered after the first birthday and is separated from any previous live attenuated vaccine by at least 28 days, the dose is valid and will meet school-entry immunization requirements in Ontario.

Immunization of Individuals with Missing Immunization Records

If a patient's immunization records are unavailable, immunization with measles-containing vaccine is preferable to ordering serological testing to determine immune status.[1] This avoids the potential for false positive and/or false negative results, reduces the risk of missed opportunities for immunization and is consistent with advice from the CIG. It is safe to give additional doses of MMR vaccine to those who are already immune. Routine serological testing to determine immunity in healthy individuals is not routinely recommended.[1]

Clinical Presentation of Measles

Following exposure to measles, the incubation period from exposure to prodromal symptoms averages 10 to 12 days.[4,5] The time from exposure to rash onset averages 14 days (range: 7 to 21 days).[4,5] It may be longer (up to 28 days) for those who have received immunoglobulin for post-exposure prophylaxis.[6] Cases are considered to be infectious from one day before the start of the prodromal period, which is usually four days before rash onset to four days after rash onset.[4]

Clinically compatible signs or symptoms include:

- Prodromal fever (≥ 38.3◦C - oral), cough, coryza (runny nose) and conjunctivitis.
- Koplik spots (tiny blue-white spots on the buccal mucosa) may also be present during the prodromal period.[4]
- Red maculopapular rash appears 3-7 days after these symptoms, first appearing on the face at the hairline spreading downward to the neck, trunk, arms, legs and feet and lasting 5 to 6 days.[4]

The most frequent complications of measles infection include diarrhea, otitis media, bronchopneumonia, and laryngotracheobronchitis (croup) and are more common in young children. Among adults, people who are immunocompromised and pregnant individuals are at increased risk of complications.[1,5] Measles during pregnancy results in a higher risk of premature labour, spontaneous abortion/miscarriage and low birth weight infants.[1]

Diagnosis of Measles

Diagnostic laboratory testing is essential for all suspected measles cases and should include both measles virus detection by polymerase chain reaction (PCR) in nasopharyngeal/ throat swab **AND** urine as well as diagnostic serology (acute and convalescent samples collected as outlined in Table 2). If you are ordering diagnostic tests for measles, contact the local public health unit where the patient resides to report a suspect measles case. If referring patient to hospital for assessment and testing, it is strongly recommended to notify the hospital ahead of the patient's arrival.

Public Health Ontario (PHO) will notify the requestor and the patient's local public health unit of all measles positive results. For the most up-to-date testing information, refer to PHO's Laboratory Test information Index. Table 2 provides a summary of diagnostic tests for measles detection.

Table 2. Diagnostic laboratory tests for detection of measles

Test	Specimen type/volume	Collection Kit	Timing of collection
Measles virus detection (PCR)*	Nasopharyngeal swab	Virus respiratory kit order # 390082	Within 7 days of rash onset**
Measles virus detection (PCR)*	Throat swab	Virus culture kit order # 390081	Within 7 days of rash onset**
Measles virus detection (PCR)*	Urine/50.0 mL	Sterile container	Within 14 days of rash onset**
Measles serology (diagnosis)***	Whole blood (5.0 mL) or serum (1.0 mL)	Blood, clotted-vacutainer tubes (SST)	Acute: Within 7 days of rash onset Convalescent: 7-10 days after the acute; preferably 10 to 30 days after acute

*Molecular assays for measles (PCR) is the preferred diagnostic test during acute stage of illness due to higher sensitivity compared to measles serology.
**For suspected cases with a high index of suspicion, it may be warranted to test beyond the above time periods after discussion with PHO.
*** IgM serology should not be the only diagnostic test relied upon for the diagnosis of measles. Diagnosis for a symptomatic patient requires additional samples (i.e. throat swab and urine) for testing by PCR.

Specimen Documentation and Transport

Clearly mark "Suspect case of measles" for indication of testing on each laboratory requisition for virus detection (PCR) and diagnostic serology. All requisitions should contain the following information: patient's symptoms and onset date (for diagnostic serology, failure to include clinical information may result in only measles IgG testing), exposure history, travel history (if applicable) and vaccination history. The "diagnosis" box should also be checked. Specimens should be stored at 2-8°C following collection and shipped to PHO on ice packs.

Contact PHO's Laboratory Customer Service at 416-235-6556 or 1-877-604-4567, or the After-Hours Duty Officer at 416-605-3113 if you have questions about specimen collection, to request expedited testing or transportation.

Patient Counselling

Individuals with confirmed or suspected measles should be provided with the following advice to follow until the end of the infectious period. Individuals with measles are considered infectious from 4 days prior to rash onset through to 4 days after rash onset (9 days total). Immunocompromised individuals may be infectious for longer and should be advised to isolate for the duration of illness.

- Self-isolate from all public places such as child care settings, schools, post-secondary educational institutions, work places, places of worship, sporting events, health care and other group settings;
- Avoid contact with non-household contacts;

- Avoid contact with high risk individuals (pregnant individuals, infants < 12 months of age and immunocompromised individuals).
- If possible, contact healthcare practitioners or facilities prior to arrival so appropriate IPAC precautions can be implemented to avoid exposures (i.e. mask upon arrival, arrange for patient to be placed immediately in an appropriate isolation room)
- If urgent assessment is required such that they cannot call ahead, alert triage immediately of the suspect or confirmed measles diagnosis so that immediate IPAC measures can be put in place.

Contact Management

The local public health unit is responsible for the follow-up of any measles case, including contact identification and management, which may include recommendations for post-exposure prophylaxis.

Infection Prevention and Control (IPAC) Practices

The measles virus is spread by contact with respiratory particles (through inhalation or contact with mucous membranes) at short and long range (e.g. airborne). These particles can remain suspended and contagious in the air for up to two hours, depending on the number of air exchanges.[4]

Patients suspected of having a measles infection should be managed under Routine Practices and Airborne Precautions. The following may help minimize the risk of transmission:

- All health care workers and staff entering the room should ensure they are immune to measles. Only health care workers with evidence of immunity should be assigned to care for patients with confirmed/suspected measles.[7] Evidence of immunity may include: two documented doses of measles-containing vaccine on or after the first birthday (regardless of year of birth); or laboratory evidence of immunity.[1,7] Non-immune, susceptible staff may only enter the room in exceptional circumstances (i.e., no immune staff are available and patient safety would be compromised otherwise) and must wear a fit-tested, seal-checked N95 respirator.
- Schedule the patient visit to minimize exposure of others (e.g., at the end of the day), and ensure an appropriate room (see below) is available to place the patient in immediately upon arrival.
- Upon arrival at the entry to the facility, instruct the patient to perform hand hygiene and put on a surgical mask if it can be tolerated and there are no contraindications.
- Immediately, place the patient in a single room with negative air flow (*airborne infection isolation* room or AIIR) with the door closed. If an AIIR is not available, the patient should be immediately placed in a single room with the door closed.
- Additional personal protective equipment (PPE) such as gloves, gowns and eye protection may be added as required based on a point of care risk assessment as per Routine Practices and would be recommended as part of Droplet and Contact precautions for individuals presenting with respiratory symptoms and/or undifferentiated viral symptoms.
- Patient movement should be curtailed unless absolutely necessary and then only conducted with the patient wearing a surgical mask (e.g. arrange for investigations to be done in patient room where possible).
- Following the patient's visit, the exam room door must remain closed with signage to indicate that the room is not to be used. Allow sufficient time for the air to change in the room and be free of respiratory particles before using the room for non-immune individuals (two hours is a

conservative estimate if air exchanges are not known). The time required may be minimized if the patient has worn a surgical mask consistently.[8] For institutional settings, this time period can be reduced depending on the number of room air changes per hour. Consult with facility plant engineers to determine the air changes per hour for each AIIR (refer to Appendix D, Time Required for Airborne Infection Isolation Room to Clear *M. tuberculosis* in Provincial Infectious Diseases Advisory Committee's (PIDAC) Routine Practices and Additional Precautions in All Health Care Settings, 3rd edition, November 2012).[7]

- Conduct routine cleaning of the room and equipment once sufficient time has elapsed to ensure adequate air exchange has occurred in the room as described above.[8,9]

Resources

For additional information about measles including immunization, surveillance and laboratory testing please refer to the following resources:

- Ministry of Health
  Publicly Funded Immunization Schedules for Ontario
  Ontario Public Health Standards, Infectious Diseases Protocol: Appendix 1

- Public Health Ontario
  Measles Diagnostic Serology Test Information
  Measles
  Measles Diagnostic PCR Test Information

- **Government of Canada:**
  Measles: For health professionals
  Measles vaccine: Canadian Immunization Guide
  Travel health notices

- **Centers for Disease Control and Prevention:**
  Measles Fact Sheet
  Measles Clinical Features and Diagnosis (Video)

References

1. Public Health Agency of Canada; National Advisory Committee on Immunization; Committee to Advise on Tropical Medicine and Travel. Measles vaccines: Canadian immunization guide [Internet]. Evergreen ed. Ottawa, ON: Government of Canada; 2020 [modified 2020 Sep; cited 2023 Jul 30]. Available from: https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-12-measles-vaccine.html

2. Heymann DL, editor. Control of communicable diseases manual. 21st ed. Washington, DC: American Public Health Association; 2021.

3. Ontario. Ministry of Health and Long-Term Care. Ontario's publicly funded immunization schedules – June 2022 [Internet]. Toronto, ON: Queen's Printer for Ontario; 2022 [cited 2023 Nov 17]. Available from: https://www.ontario.ca/files/2024-01/moh-publicly-funded-immunization-schedule-short-en-2024-01-23.pdf

4. Gastanaduy P, Haber P, Rota PA, Patel M. Measles. In: Centers for Disease Control and Prevention, author; Hall E, Wodi PA, Hamborsky J, Morelli V, Schillie S, editors. Epidemiology and prevention of vaccine-preventable diseases. 14th ed. Washington, DC: Public Health Foundation; 2021 [cited 2023 Nov 17]. Available from: https://www.cdc.gov/vaccines/pubs/pinkbook/meas.html

5. American Academy of Pediatrics, Committee on Infectious Diseases; Kimberlin DW, Barnett ED, Lynfield R, Sawyer MH, editors. Red Book: 2021-2024 report of the committee of infectious diseases [Internet]. 32nd ed. Itasca, IL: American Academy of Pediatrics; 2021.

6. Watson JC, Hadler SC, Dykewicz CA, Reef S, Philips L. Measles, mumps, and rubella—vaccine use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep. 1998;47(RR-8):1-57. Available from: https://www.cdc.gov/mmwr/preview/mmwrhtml/00053391.htm

7. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Routine practices and additional precautions in all health care settings [Internet]. 3rd ed., 3rd revision. Toronto, ON: Queen's Printer for Ontario; 2012 [cited 2024 Feb 21]. Available from: https://www.publichealthontario.ca/-/media/Documents/B/2012/bp-rpap-healthcare-settings.pdf?sc_lang=en

8. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infections Diseases Advisory Committee. Infection prevention and control for clinical office practice [Internet]. 1st revision. Toronto, ON: Queen's Printer for Ontario; 2015 [cited 2024 Feb 21]. Available from: https://www.publichealthontario.ca/-/media/Documents/B/2013/bp-clinical-office-practice.pdf?rev=00bd9993882345069be3929ebc620b7c&sc_lang=en

9. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Best practices for environmental cleaning for infection prevention and control [Internet]. 3rd ed. Toronto, ON: Queen's Printer for Ontario; 2018 [cited 2024 Feb 21]. Available from: https://www.publichealthontario.ca/-/media/documents/B/2018/bp-environmental-cleaning.pdf

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Revision History

This document replaces Measles Information for Clinicians, published in 2019. The following table shows the revisions made in this version of the document.

Date	Section	Summary of changes
March 2024	Title	Title change.
March 2024	Summary	Addition of signs and symptoms of measles and IPAC measures.
March 2024	Background	Section added.
March 2024	Measles Prevention Through Immunization	Section added. Description of routine schedule for measles-containing vaccine as per Ontario Publicly Funded Immunization Schedules for Ontario.
March 2024	Travel Immunization	Addition of Table 1 Measles vaccination recommendations prior to travel outside of Canada.
March 2024	Immunization of Individuals with Missing Immunization Records	Section added.
March 2024	Clinical Presentation of Measles	Replaces Clinical Aspect of Measles Infection.
March 2024	Diagnosis of Measles	Replaces Diagnostic Laboratory Testing. Addition of Table 2 Diagnostic laboratory tests for detection of measles.
March 2024	Patient Counselling	Section added.
March 2024	Infection Prevention and Control Practices	Addition of further measures to mitigate exposure in clinical settings.

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