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AT A GLANCE

Measles: Information for Health Care Providers

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Introduction

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:
    - recent travel
    - known contact with a case of measles, or
    - residing in an area where measles cases have been recently identified.[1]
- 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 with the door closed, 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 suspect case (do not wait for laboratory confirmation) and to receive additional guidance
5. provide isolation guidance to the patient while results are pending

- If you are referring a patient for further assessment or diagnostic testing, the receiving facility (e.g., hospital emergency department) must be notified ahead of the patient's arrival to allow IPAC measures to be implemented to prevent exposures.

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 11 months)	One dose of MMR vaccine Note: 2 additional doses of measles-containing vaccine must be administered on or 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 for vaccine products differ)

† If a dose given for travel is administered on or 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 immuneglobulin 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 whole blood or serum specimens collected as outlined in Table 2). If referring patient for diagnostic testing, the Health Care Provider (e.g. hospital or other healthcare facility) must be notified ahead of the patient's arrival to allow IPAC measures to be implemented to prevent exposures. In addition, contact your local public health unit immediately to report a suspect measles case.

Public Health Ontario (PHO) will notify the submitter 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 suspect cases with a high index of suspicion, it may be warranted to test beyond the time periods noted above 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 measles 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 being performed), 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, specimen submission, or to request expedited testing.

Patient Counselling

Individuals with suspected measles should be advised to isolate while laboratory results are pending. Individuals with confirmed 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);
- Contact healthcare providers, hospitals or other healthcare 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 changes.[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:

- Only health care workers (HCWs) with presumptive immunity to measles should provide care to patients with suspect/confirmed measles due to increased risk of transmission of measles to susceptible individuals.[10-13]
- Presumptive evidence of immunity for HCWs includes at least two doses of measles-containing vaccine received on or after their first birthday or laboratory evidence of immunity, regardless of year of birth.
- 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).[7]
- **All HCWs regardless of presumptive immunity to measles are to wear a fit-tested, seal-checked N95 respirator when providing care to a patient with suspect or confirmed measles.[12-15]**
- Additional personal protective equipment such as gloves, gown and eye protection may be added as required based on a point of care risk assessment (PCRA) per Routine Practices and would be recommended as part of Additional Precautions for acute respiratory illnesses to provide respiratory particle protection (previously referred to as Droplet and Contact Precautions) when caring for individuals presenting with respiratory symptoms and/or undifferentiated viral symptoms.[7]
- Schedule the patient visit to minimize exposure of others (e.g., at the end of the day), and ensure the patient arrives wearing a medical mask and an appropriate room (see below) is available to place the patient in immediately upon arrival.

- If upon arrival the patient is not wearing a medical mask, instruct the patient to perform hand hygiene with alcohol based hand sanitizer or soap and water and put on a medical mask if tolerated and there are no contraindications (e.g., under two years old, unable to remove the mask themselves).
- Immediately, place the patient in a single room with negative air flow (*airborne infection isolation* room [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.[7]
- Patient movement should be curtailed unless absolutely necessary. Where possible patient investigations/procedures should be conducted in the patient room with the patient wearing a medical mask, if tolerated. Should patient transport be required, use transport routes that minimize contacts and clear all hallways and elevators along the route. The patient should wear a medical mask, if tolerated, and HCWs assisting with transport should be wearing a fit-tested, seal-checked N95 respirator.
- After the patient leaves, the door to the room where the patient was examined 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 changes are not known).[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)

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Summary of Revisions

Changes in this revision are summarized in the table below.

Date of Implementation	Description of Major Changes	Page
March 15, 2024	Updated to include additional counselling regarding isolation of case while results pending.	6
March 15, 2024	Table 1. Age Group for infants (6 months to 12 months) changed to infants (6 months to 11 months).	4
March 15, 2024	Removed instructions for calling PHUs to coordinate testing.	1
March 15, 2024	Updated IPAC recommendations regarding use of PPE while providing care to or transporting a suspect or known case.	6-7

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Public Health Ontario is an agency of the Government of Ontario is dedicated to protecting and promoting the health of all Ontarians and reducing inequities in health. Public Health Ontario links public health practitioners, front-line health workers and researchers to the best scientific intelligence and knowledge from around the world.

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