



Applicability:

Clinicians, Public Health, healthcare workers, laboratory staff

Background:

Measles is a highly infectious disease, transmitted from person to person by the airborne route, direct contact with nasal or throat secretions from an infected person, and less commonly, indirectly by articles freshly soiled by these secretions. Despite high levels of immunization, sporadic cases and outbreaks continue to occur in Alberta, often related to travel to areas where measles virus is circulating.

Note: Measles is a notifiable disease and all suspected cases must be reported immediately to the zone Medical Officer of Health (MOH).

Clinical Presentation¹:

Symptoms of measles includes:

- Fever 38.3° C or higher
- Cough, coryza OR conjunctivitis AND
- Generalized maculopapular rash

Note: the red blotchy rash appears 3-7 days after symptom onset, beginning behind the ears and on the face, then spreading down to the trunk and lastly to the extremities

¹Alberta Health Public Health Disease Management Guidelines for *Measles*, available at <https://www.alberta.ca/notifiable-disease-guidelines.aspx>

Testing for measles should be considered for individuals presenting with these symptoms, particularly if they have not been immunized against measles and were born after 1970, have recently returned from travel where measles is currently circulating, or if they have a known exposure to measles.

Laboratory Testing:

Recommended samples to be sent for measles testing

Presentation	Test Request and Sample		Comments
Acute illness, from rash onset to 5 days later	Nasopharyngeal swab AND Urine	Order measles NAT	
	Serum	Order measles IgM & IgG serology	Send a convalescent serum 7 to 10 days after the acute blood if the measles IgM antibody is negative and measles is still strongly suspected
Nasopharyngeal (NP) swab in Universal Transport medium - follow collection instructions given in the collection insert or on the ProvLab website @ http://www.albertahealthservices.ca/assets/wf/plab/wf-provlab-collection-of-nasopharyngeal-and-throat-swab.pdf Urine sample – about 10 mL in sterile container, should preferably be the first void of the day (morning sample) Serum - collect 3-5 mL blood in Serum Separator tube (SST – Gold Top vacutainer)			

Viral shedding occurs in the prodrome phase and can be detected for at least five days after the appearance of the rash. Infrequently, the vaccine strain can give rise to a mild measles-like presentation, hence, collection of samples for molecular testing (NAT/PCR) in the first 5 to 7 days after onset is strongly encouraged as the PCR assay can discriminate between wild type and attenuated vaccine strains that are authorized for use in Canada.

Furthermore, wild-type strains can be genotyped to determine the probable geographic area of origin, which is valuable for public health surveillance.

The measles specific IgM antibody can be absent at the rash onset, becoming detectable in some patients at three days, although at five days most patients will be positive. Patients recently immunized with a measles-containing vaccine, e.g., MMRV vaccine, will also produce a similar serological picture. Hence, providing the dates of immunization in conjunction with the clinical presentation is necessary for the accurate interpretation of serology results.

Individuals who received a single dose of a measles-containing vaccine or have waning immunity can demonstrate a variable serological response. In vaccinated persons or those with prior exposure, the clinical presentation can be milder and/or a shorter duration of illness. Serology results cannot distinguish between a wild-type virus infection and vaccine response.



Laboratory Testing for Measles

Infection Control Measures:

As measles virus is highly infectious, appropriate infection prevention precautions *MUST* be taken prior to collecting samples. Follow the guidelines provided by your zone Medical Officer of Health when collecting the nasopharyngeal swab and urine at the physician's office. Notify the Collection Site prior to sending the patient to have blood taken for serology, so that the appropriate measures can be taken to prevent other patients from being exposed.

Patient information:

- **Complete the ProvLab Virology requisition** (one per patient for all samples is acceptable, providing that ALL samples collected at that time are sent with this requisition) with **ALL** of the following information:
 - ordering physician
 - patient's name
 - date of birth
 - gender
 - PHN
 - home address and phone number
 - specimen type and source
 - date and time of sample collection
 - lab tests required and
 - clinical history, *i.e.*, date of onset of illness and/or rash, other symptoms, measles immunization and travel history within the past 3 weeks.
- The ordering physician's name and office address must be clearly provided. If copies to another physician are also required, provide that physician's name and complete address where copies should be sent as well to comply with current privacy legislation.

Transport:

- Samples should be put in the reclosable side of the biosafety bag, with the zip-lock seal together with absorbent material, and the requisition in the adjoining pouch.
- When sending blood, nasopharyngeal swab and urine together with ONE requisition, ensure that EACH of these samples are placed in SEPARATE baggies with absorbent material, which can then be put into one biosafety bag with a zip-lock seal. If one sample leaks, then the other samples will not become contaminated and have to be discarded.
- Samples can be sent at ambient temperature if within 8 hours of collection. If more than 8 hours – use a Cold-Pak or ice-pack to maintain the integrity of the virus in the sample.

Note: If the MOH has recommended STAT testing, the samples should be sent to the ProvLab as soon as possible, and the requisition clearly labeled STAT. As well contact the Microbiologist/Virologist-on-Call to alert them to the MOH's STAT request.



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Interpretation of Laboratory Tests:

The measles PCR assay can differentiate between wild-type and vaccine strains, only if the vaccines are prepared from Schwartz and Moraten strains, which are vaccines currently authorized in Canada, USA and Western Europe. Vaccines prepared from other strains, such as Zagreb, Leningrad & Shanghai will be reported as “likely wild type”. Genotyping can be used to verify their vaccine origin.

In the table below are some of the most likely combinations of test results and their probable interpretations. The Virologist-on-Call (contact information below) is available to discuss other unusual results.

Measles NAT/PCR result	IgM antibody result	IgG antibody result	Interpretation
+ or Ind ^a	-	-	Recent infection with measles, consider infectious, unless result specifies “vaccine strain”.
	+	Ind ^a or -	<i>Note: Patients receiving measles-containing virus within the past 14 days can test positive on the molecular (NAT/PCR) assay.</i>
	+ or Ind	+	<i>In some vaccinated patients or those with prior natural infection, the IgM response can be short lived or indeterminate in the acute phase of a re-infection.</i>
-	+	+ or Ind	Suggestive of recent infection, but is no longer infectious. <i>IgM antibody may be detectable 3 days after rash onset and can persist for 4 to 6 weeks.</i> <i>Note: A similar serologic response occurs in recently immunized patients.</i>
-	Ind or -	+	Indicates convalescence, no longer infectious. <i>Note: In some immunized patients or those with prior natural exposure, the IgM response can be short lived or indeterminate in the acute phase of a re-infection.</i>
-	+	-	<i>In the absence of compatible symptoms, a positive IgM result alone may infrequently be a false positive</i>
-	-	+	Patient likely immune due to immunization or natural infection. <i>Note: A single dose of the vaccine can produce a detectable IgG response but the individual may be susceptible to infection</i>

^aInd = Indeterminate serology or measles NAT result

The zone Medical Officer of Health and Communicable Diseases, Alberta Health Services are automatically notified of positive measles NAT and IgM antibody results

Supplies

If nasopharyngeal swabs and Universal Transport medium are not available from your local laboratory or collection site, contact the respective ProvLab site at the addresses below

Laboratory Information	Calgary Site	Edmonton Site
General Inquiries	403-944-1200	780-407-7121
Supplies	Ph # 403-944-2583 FAX # 403-944-2317	Ph # 780-407-8971 FAX # 780-407-8984
Address	3030 Hospital Drive NW Calgary, AB T2N 4W4	Walter Mackenzie Health Sciences Centre University Hospital Room 2B4.04 8440-112 Street Edmonton, AB T6G 2J2



**ALBERTA PRECISION
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Laboratory Testing for Measles

Contact Information:

Microbiologist/Virologist-on-Call phone numbers:

Edmonton site: 780 407 7121

Calgary site: 403 944 1200

Questions & Comments

Contact: Dr. Kevin Fonseca

Phone number: (403) 944 1263

E-mail: kevin.fonseca@albertahealthservices.ca