Measles

(Rubeola, Red Measles)

CHAPTER CONTENT

1. CASE DEFINITION

Confirmed Case (either laboratory or epidemiologically confirmed)

Laboratory confirmation

- Laboratory confirmation of infection in the absence of recent immunization with measles-containing vaccine by either:
  - Isolation of measles virus from an appropriate clinical specimen (e.g., nasopharyngeal (NP) swab, urine) ***OR***
  - Detection of measles virus RNA (e.g., RT-PCR) in a clinical specimen (e.g., NP swab or urine) ***OR***
  - Seroconversion or a significant (e.g., 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 using a recommended assay in a person who is either epidemiologically linked to a laboratory-confirmed case or has recently travelled to an area of known measles activity

Epidemiologic confirmation

- Clinical illness** in a person with an epidemiologic link to a laboratory-confirmed case

Probable case

- Clinical illness**
  - in the absence of appropriate laboratory tests ***OR***
  - In the absence of an epidemiologic link to a laboratory-confirmed case ***OR***
  - In a person who has recently travelled to an area of known measles activity

Laboratory note: *IgM serology 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, IgM results must be confirmed by the other listed confirmatory methods. Most acute measles cases develop IgM after 3 days post rash onset. Therefore, a suspected measles case in which serum collected ≤ 3 days after rash onset initially tests IgM negative should have a second serum specimen collected > 3 days after onset for retesting for IgM.*

**Clinical illness:

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 time frame can vary.

- Clinical illness is characterized by all of the following features:
  - Fever of 38.3° C or greater
  - Cough, coryza or conjunctivitis
  - Generalized maculopapular rash for at least 3 days

2. DIAGNOSIS

- Diagnosis of measles is based on the clinical picture, exposure history, molecular (RT-PCR) testing on urine or NP swab and serologic testing
- It is recommended that serum, NP swab and urine samples ALL be collected
  - Demonstration of a significant increase (fourfold or greater rise) in measles specific IgG is a reliable alternative serologic method for diagnosis however the ability to assess this may not be available at the Alberta Provincial Laboratory
  - 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, a second blood sample is needed 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
  - For IgG testing, acute samples should be obtained as soon as possible after the onset of rash and no later than seven days after; convalescent samples should be collected 10-20 days after the first sample
  - For viral detection, the NP swab should be collected as soon as possible and no later than 4 days from the onset of rash
  - Urine should be collected within 7 days from the rash onset
- If measles is confirmed by PCR testing, convalescent serology is not necessary
- Serology cannot distinguish between wild-type and vaccine related illness –PCR testing followed by genotyping at NML is the only way to distinguish between wild-type and vaccine related measles
- For more information, refer to the Alberta Provincial Laboratory Guide to Services

3. REPORTING

As described in the *NWT Public Health Act 2009*, a health care professional and laboratory shall provide the Chief Public Health Officer or designate with the information required by the regulations, within the time set out in the regulations.

Health Care Professionals

- Confirmed or probable cases are to be reported to the Office of the Chief Public Health Officer (OCPHO) by telephone or fax **immediately** after diagnosis is made or opinion is formed ***AND***
- Complete and fax the Communicable Disease Reporting Form to the OCPHO within **24 hours**
- Immediately report all outbreaks or suspect outbreaks by telephone to the OCPHO

Laboratories

- Report all positive results to the OCPHO immediately by telephone and fax results within **24 hours**

4. OVERVIEW

For more information about measles:

- Public Health Agency of Canada:
  - For health professionals: Measles - Canada.ca
  - Guidelines for the Prevention and Control of Measles Outbreaks in Canada - Canada.ca
- Centres for Disease Control and Prevention: Measles | Home | Rubeola | CDC
- World Health Organization: WHO | Measles

Causative Agent

- The measles virus is in the family Paramyxoviridea and is a member of the genus *Morbillivirus*

Clinical Presentation

- It is an acute, highly communicable viral disease

- Begins with a prodromal fever, conjunctivitis, coryza, cough, and koplik spots (white spots with bluish-white centers on the inner lining of the mouth-buccal mucosa)
- Fever rises as a rash appears
- A characteristic red blotchy rash appears on the face on the third to seventh day spreading down the trunk and to the extremities lasting 4-7 days
- The rash often disappears in the same direction it appeared, and occasionally ends in brawny desquamation
- Disease in an immunocompromised individual can be severe, have a prolonged course, and may occur without the typical rash

Major Complications

- Leukopenia is common and serum vitamin A levels are decreased
- About 30% of cases have complications and complications are more common among children under five years of age and individuals 20 years of age and older
- Complications can include: diarrhoea, otitis media with permanent hearing loss, pneumonia, encephalitis, laryngotracheobronchitis (croup), seizures and death
- Measles during pregnancy leads to an increased chance of miscarriage, premature birth and low birth weight; birth defects have rarely been reported
- Subacute sclerosing panencephalitis (SSPE) is a rare and fatal disease that can develop 7-10 years after a measles infection

Transmission

- Airborne by droplet spread; direct contact with nasal or throat excretions of infected person
- Less commonly transmitted by articles freshly soiled with nose and throat secretions
- Measles is one of the most highly communicable infectious diseases with a greater than 90% attack rate on susceptible persons (i.e., 9 out of 10 susceptible persons with close contact to a measles case will develop measles) – measles virus can remain infectious in the air for up to 2 hours after an infected person leaves an area
- Communicability extends from 4 days before rash onset to 4 days after rash appearance – transmission is minimal after the second day of rash
- The vaccine virus has not been shown to be communicable
- All persons who have not had disease or have not been successfully immunized are susceptible
- Measles infection appears to confer lifelong immunity
- Infants whose mothers have had the disease in the past are most likely protected against measles until they are about 6-9 months of age
- Children born to mothers with vaccine-induced immunity receive fewer antibodies and may be more susceptible to measles

Incubation Period

- Approximately 7-18 days, usually 10 days from exposure to fever and 14 days until the rash appears; rarely, incubation can be as long as 19-21 days
- The incubation period may be extended if immunoglobulin is given for passive protection early in the incubation period

Clinical Guidance

- For patient specific clinical management consult your local health care professional, paediatrician or infectious disease specialist

5. PUBLIC HEALTH MEASURES

- A single case of measles should be considered unusual or unexpected; however, the Public Health Agency of Canada defines a measles outbreak as: ***"Two or more confirmed cases linked, either epidemiologically or virologically or both"***
- The OCPHO or designate may declare an outbreak and initiate outbreak management protocol

Management of Cases

- Confirm the diagnosis by ensuring all appropriate specimens have been collected (blood, urine and NP swab)
- Obtain history of illness including onset, signs and symptoms
- Determine measles immunization history
- Determine possible source of infection including travel history or contact with probable or confirmed case of measles
- Determine the period of communicability for the case
- Exclude confirmed, probable and suspect cases from daycare, school and employment and keep cases away from non-household contacts for 4 days after the appearance of the rash
- For hospitalized cases, in addition to routine precautions, airborne precautions should be used from the onset of the catarrhal stage of the prodromal period through to the fourth day of the rash
- Immediately notify the facility's infection prevention & control practitioner upon admission
- See the NWT Infection Prevention and Control Manual for more information: Policies and Guidelines, Standards and Manuals | HSS Professionals
- Immunocompromised patients with measles should remain on routine and airborne precautions for the duration of their illness
- There is no specific treatment – supportive therapy should be provided as indicated

Management of Contacts

- Within 24 hours of reporting a suspect case of measles, identify all contacts and obtain the ages, immunization status, weights and dates of contact
- Classify all contacts as susceptible or non-susceptible and whether or not they are high risk:
  - Adequate protection from measles includes:
    - Birth before 1970 (unless they are a health care worker)
    - Laboratory evidence of prior measles infection
    - Serological proof of immunity or documentation of two doses (given at appropriate age and intervals) of a measles containing vaccine
  - Susceptible contact includes:
    - Birth in 1970 or later, **AND**
    - Lack of documented evidence of immunization with two doses of measles containing vaccine (given at the appropriate age and intervals), **AND**
    - Lack of serological proof of immunity, **AND**
    - Lack of laboratory evidence of prior measles infection
  - High risk contacts include susceptible individuals with the following:
    - Pregnant women
    - Infants
    - Immunocompromised individuals
- Assess contacts for signs and symptoms of measles – review signs and symptoms of measles and stress importance of self-isolation and report to public health if measles symptoms appear
- Exclusion of susceptible contacts that refuse or cannot receive MMR vaccine or immune globulin may be required as per the CPHO or designate
  - Contacts would be excluded from school, work, child care facilities
  - They may be asked to self-isolate from work, group settings and travel
  - The period of exclusion should extend from 5 days after the first exposure and up to 21 days after the last exposure or until the individual has one of the following:

- » Adequately immunized (documentation of at least one recent dose of measles containing vaccine) within 72 hours of exposure as per the Evergreen Canadian Immunization Guide: Page 12: Canadian Immunization Guide: Part 4 - Active Vaccines - Canada.ca
- » Demonstrates serological confirmation of immunity
- » Has received measles immunoglobulin (IG) as per the Evergreen Canadian Immunization Guide: Page 12: Canadian Immunization Guide: Part 4 - Active Vaccines - Canada.ca and administered as soon as possible, preferably within 6 days after exposure to measles

Prevention

- Measles is a vaccine preventable disease
- The vaccine for measles is publicly funded in the NWT and offered according to the NWT Immunization Schedule | HSS Professionals
- Primary vaccination occurs in early childhood but the vaccine can also be offered to susceptible adults born on or after 1970
- Immunization with 1 dose of vaccine provides approximately 85-95% protection against measles disease and immunization with the second dose provides almost 100% protection
- A herd immunity of at least 95% may be needed to interrupt community transmission
- For more information on measles immunization refer to the Evergreen Canadian Immunization Guide: Page 12: Canadian Immunization Guide: Part 4 - Active Vaccines - Canada.ca

6. PUBLIC & HEALTH PROFESSIONAL EDUCATION

- Government of Canada website for Measles

7. EPIDEMIOLOGY

- For more information on the epidemiology of measles in the NWT see: http://professionals.hss.gov.nt.ca/sites/default/files/epidemiological-summary-measles.pdf

8. REFERENCES

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2. Alberta Provincial Laboratory Guide to Services: http://www.provlab.ab.ca/guide-to-services.pdf
3. American Public Health Association Control of Communicable Disease Manual online edition: http://secure.apha.org/imis/ItemDetail?iProductCode=978-087553-0185&CATEGORY=BK
4. Canada Communicable Disease Report CCDR September 2013, Volume 39; Guidelines for the Prevention and Control of Measles Outbreaks in Canada: https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2013-39/guidelines-prevention-control-measles-outbreaks-canada.html
5. Centres for Disease Control Measles information for Health care Professionals: https://www.cdc.gov/measles/hcp/index.html
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7. Government of Canada information on measles: http://www.healthycanadians.gc.ca/diseases-conditions-maladies-affections/disease-maladie/measles-rougeole/index-eng.php
8. NWT Communicable Disease Forms: http://www.professionals.hss.gov.nt.ca/tools/forms/communicable-disease

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10. NWT Immunization Schedule: http://www.professionals.hss.gov.nt.ca/content/nwt-immunization-schedule
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14. Public Health Agency of Canada Pathogen Safety Data Sheets and Risk Assessment: https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/measles-virus.html
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