Measles (Rubeola)

Summary

Measles is an acute viral disease characterized by fever (as high as 105°F), cough, coryza, conjunctivitis and followed by a maculopapular rash. The rash begins in the face and spreads down to the rest of the body. The diagnosis should be confirmed by laboratory testing using serology and reverse transcriptase polymerase chain reaction assay (RT-PCR) or culture.

See here for Surveillance Worksheet.

Agent

Measles virus is a single stranded RNA virus (*Morbillivirus*) that belongs to the family Paramyxoviridae.

Transmission

Reservoir**:**

Humans are the natural hosts and there are no known animal reservoirs.

Mode of transmission:

- Airborne by droplet spread and direct contact with nasal or throat secretions of infected people. Measles is one of the most highly communicable infectious diseases, infecting >90% of susceptible contacts.

Period of communicability:

- From 4 days before the onset of rash through four days after rash onset.

Clinical Disease

Incubation period:

Range of 8-12 days (mean: 10 days) from exposure to onset of prodromal symptoms. The average interval from exposure to the appearance of rash is 14 days, with a range of 7-21 days.

Illness:

Measles is an acute disease with prodromal fever, conjunctivitis, coryza, and cough. A characteristic rash usually appears around two weeks after exposure. The rash typically begins behind the ears and on the forehead, and then spreads centrifugally from the head to the feet; however, atypical rash presentations occur as well. The rash is initially erythematous and maculopapular but becomes confluent as the rash spreads. Koplik spots, which are small spots with white or bluish-white centers on the buccal mucosa, can be present. Leukopenia is common. About 20% of cases in the United States are hospitalized. Complications are more common in infants, children under 5 years old, adults over 20 years old, and people who are pregnant or immunocompromised. Complications can include, but are not limited to, otitis media, diarrhea, dehydration, pneumonia, and encephalitis.

Laboratory Diagnosis

Confirmatory laboratory testing for measles is essential to confirm the diagnosis, and typically involves molecular (PCR) testing of a nasopharyngeal or throat swab, and/or serologic testing.

Sporadic suspect cases of measles should have a nasopharyngeal or throat swab for PCR collected within 10 days after rash onset, **and** serum for IgM/IgG serology. (NMDOH may modify testing guidance in outbreak settings.) Urine is also an acceptable specimen for PCR, though swabs are generally preferred. False positive serological measles IgM results do occur, as do cross-reactions with other causes of viral exanthem, such as parvovirus B19 or human herpesvirus 6.

See SLD Specimen Collection for Measles PCR Guidance.

Treatment

No specific antiviral therapy is available for measles. Ribavirin has been used to treat severely ill and immunosuppressed children, but clinical data are lacking on its efficacy, and it is not currently approved by FDA for the treatment of measles.

Vitamin A administration is recommended for children diagnosed with measles where vitamin A deficiency is a recognized problem, as vitamin A deficiency is associated with higher severity of measles. Taking too much vitamin A can be dangerous, so it should only be administered under the supervision of a healthcare professional.

Surveillance

Case Definition (2013):

Clinical case definition:

An acute illness characterized by:

- Generalized, maculopapular rash lasting ≥3 days, and
- Temperature ≥101°F (38.3°C); and
- Cough, coryza, or conjunctivitis.

Probable – In the absence of a more likely diagnosis, an illness that meets clinical criteria with:

- No epidemiologic linkage to a laboratory-confirmed measles case; and
- Noncontributory or no measles laboratory testing

Confirmed – An acute febrile rash illness[†] with:

- Isolation of measles virus from a clinical specimen; or
- Detection of measles-virus specific nucleic acid[‡] from a clinical specimen using polymerase chain reaction (PCR); or
- IgG seroconversion[‡] or a significant rise in measles IgG antibody[‡] using any evaluated and validated method; or
- A positive serologic test for measles IgM[‡§]; or
- Direct epidemiologic linkage to a case confirmed by one of the methods above.

† Temperature does not need to reach ≥101°F/38.3°C and rash does not need to last ≥3 days.
‡ Not explained by MMR vaccination during the previous 6-45 days.
§ Not otherwise ruled out by other confirmatory testing or more specific measles testing in a public health laboratory.

Epidemiologic Classification of Internationally-Imported and US-Acquired Cases

Internationally-Imported Case:

An internationally imported case is defined as a case in which measles results from exposure to measles virus outside the United States (US) as evidenced by at least some of the exposure period (7–21 days before rash onset) occurring outside the US and rash onset occurring within 21 days of entering the US and there is no known exposure to measles in the US during that time. All other cases are considered US-acquired.

US-Acquired Case:

A US-acquired case is defined as a case in which the patient had not been outside the US during the 21 days before rash onset or was known to have been exposed to measles within the US.

Reporting:

Report all suspected or confirmed cases of measles immediately (24/7/365) to the New Mexico Department of Health's Infectious Disease Epidemiology Bureau (IDEB) at 1-833-SWNURSE (1-833-796-8773). Information needed includes: patient's name, age, sex, race, ethnicity, home address, home phone number, occupation, and health care provider.

Case Investigation:

Complete the CDC Measles Surveillance Worksheet and mail to the IDEB to P.O. Box 26110, Santa Fe, New Mexico 87502-6110, or (preferably) fax to 505-827-0013. Investigation information should also be entered in NM-EDSS by an epidemiologist per established procedures.

Control Measures

1. Case management

   1.1. Isolation: Persons with measles should be excluded from work, school, childcare, and all other public settings (aside from medical visits) through four days after rash develops. (In other words, may return to usual activities on day 5 after rash onset.)

   1.1.a In hospitals and institutions, patients should be placed in airborne precautions as soon as measles is suspected, through the fourth day of rash. Immunocompromised patients should be presumed infectious throughout the course of illness.

2. Contact management

   2.1. Evidence of measles immunity: Persons can be considered immune to measles if they meet at least one of the following criteria:

2.1.a Have written documentation of adequate measles vaccination: receipt of one or more doses of measles-containing vaccine administered on or after the first birthday for preschool-age children and adults not at high risk, and two doses of measles-containing vaccine for school-age children (grades K-12) and adults at high risk for exposure transmission (i.e., health care personnel, international travelers, and students at post-high school educational institutions); or

2.1.b Have laboratory evidence of immunity to measles (i.e., IgG+ titer); or

2.1.c Were born before 1957; or

2.1.d Have documentation of laboratory-diagnosed measles

2.1.e Some adults may have received a killed measles vaccine during 1963 to 1968. People vaccinated during those years are not considered to have adequate immunization and the recommendation is for them to be re-vaccinated.

2.1.f During an outbreak, a second dose of MMR is recommended for children aged 1 through 4 years and adults who have previously only received 1 dose. In outbreak settings, NMDOH may recommend that infants aged 6-11 months be vaccinated early; however, infants who receive an early dose must still get two more MMR doses at the appropriate ages and intervals after they turn 12 months old.

2.2. Quarantine: If exposed susceptible persons (those who cannot demonstrate adequate immunity as listed above) do not receive post-exposure prophylaxis as listed below within the appropriate timeframes after exposure (72 hours for vaccine or 6 days for IG), they should be excluded from work, school, childcare, or any other group activities until at least 21 days after their last exposure to an infectious measles case.

2.3. Post-Exposure Prophylaxis:

2.3.a Live-attenuated virus measles vaccine (MMR or MMRV), if given within 72 hours of measles exposure, may prevent disease in susceptible persons. If the exposure does not result in infection, the vaccine should induce protection against subsequent measles exposures. Vaccine is the intervention of choice for control of measles outbreaks in schools and childcare centers. It is also preferred for infants aged 6-11 months, although it does not count towards their recommended two-dose series.

2.3.b Immune globulin (IG) for post-exposure prophylaxis can be used within six days of exposure for susceptible household or other contacts, particularly in whom the risk of complications is very high (such as pregnant women without evidence of immunity, immunocompromised persons, and those under one year of age).

2.3.b.1 The recommended dose of intramuscular (IGIM) is 0.50 mL/kg with a maximum dose of 15mL. Pregnant women without evidence of immunity and immunocompromised persons of any vaccination status should receive intravenous (IVIG) at a dose of 400 mg/kg. If a person with a history of one vaccine dose is not able to get a second dose, IG is not indicated, unless they are immunocompromised. Do not give vaccine and IG at the same time.

3. Prevention

3.1. Immunization:

3.1.a A single dose of live, attenuated measles virus vaccine is 93% effective against measles, while two doses are 97% effective. Measles vaccine is a component of the MMR or measles/mumps/rubella/varicella (MMRV) vaccine, recommended to be given in two doses, at 12-15 months of age and at school entry (4-6 years). The second dose may be received earlier, as long as it occurs at least 28 days after the first dose.

3.1.a.1 The first dose should preferably be MMR rather than MMRV, to lessen the risk for fever and side effects.

Management of *Measles* in Child Care Centers

- Contact NMDOH **immediately** for any suspected or confirmed case of measles in a school or childcare center.
- Children with measles should be kept out of school or childcare for four days after rash develops (i.e., may return on day 5 after rash onset if feeling well enough).
- Immunization records of all childcare attendees and staff should be reviewed. Refer to section 2.1 above for definition of immunity to measles. Exposed susceptible persons, including those who have been exempted from measles vaccination, who do not receive post-exposure prophylaxis within the specified timeframes after exposure should be excluded from the childcare facility through at least 21 days after their last exposure to an infectious case of measles.

References

American Academy of Pediatrics. “Measles.” In: Kimberlin, DW, et al eds. Red Book: 2018 Report of the Committee on Infectious Diseases. 31st ed. Itasca, IL: American Academy of Pediatrics; 2018.

Heymann D, ed. Control of Communicable Diseases Manual. 19th ed. Washington, DC: American Public Health Association; 2008.

Centers for Disease Control and Prevention. “Measles.” In: Hall E, Wodi AP, Hamborsky J, et al., eds. *Epidemiology and Prevention of Vaccine-Preventable Diseases.* 14th ed. Washington, D.C. Public Health Foundation; 2021:193-206.

Centers for Disease Control and Prevention. “Measles.” In: Gastanaduy PA, Redd SB, Clemmons NS, Lee AD, Hickman CJ, Rota PA, Patel M, eds. *Manual for the Surveillance of Vaccine-Preventable Diseases.* 3 June 2025. https://www.cdc.gov/surv-manual/php/table-of-contents/chapter-7-measles.html.

See Measles Fact Sheets (English) (Spanish).