Measles Toolkit

Tennessee Department of Health
Communicable and Environmental Diseases &
Emergency Preparedness Division

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Introduction

Purpose:

To provide guidance on the identification and investigation of measles cases, contacts to measles cases, and measles outbreaks to prevent the further spread of disease.

Point of Contact:

Tennessee Department of Health Vaccine Preventable Diseases and Immunization Program
710 James Robertson Parkway
Nashville, TN 37243
615-741-3857 or 800-404-3006

Acronyms:

Tennessee Department of Health (TDH)
Vaccine Preventable Diseases and Immunization Program (VPDIP)
State Public Health Lab (SPHL)
Communicable and Environmental Diseases and Emergency Preparedness (CEDEP)
Immunoglobulin (IG)
Intravenous Immunoglobulin (IVIG)
Intramuscular Immunoglobulin (IMIG)
Post Exposure Prophylaxis (PEP)

Measles Overview

Clinical Manifestation: Measles is a highly contagious viral illness that can infect up to 90% of susceptible contacts. Measles is characterized by a 3-to-5-day prodrome of fever, cough, coryza, conjunctivitis, and malaise, followed by a maculopapular rash that spreads from the head to trunk to lower extremities. Koplik spots, punctate blue-white spots on the bright red background of the buccal mucosa, may be present during the prodromal period, 1 to 2 days before the measles rash appears. While usually a mild or moderately severe illness, complications of measles may include diarrhea, otitis media, pneumonia, encephalitis, subacute sclerosing panencephalitis, and death. Complications occur more frequently in children younger than 5 years and adults.

Communicability Period: An infected person is contagious and should isolate from 4 days before through 4 days after rash onset with day of onset considered day 0.

Incubation Period: The average interval from exposure to rash onset is 14 days with a range of 7 to 21 days. Susceptible contacts should quarantine through 21 days following last exposure or 28 days following last exposure if IG is received.

Mode of Transmission: Measles is primarily spread through direct contact with infectious droplets, but airborne transmission in closed areas has been documented for up to 2 hours after an infected person was in the area.

Prevention: Two doses of measles containing vaccine (MMR or MMRV), received after a person's first birthday, provides long-term and lifelong immunity in 99% of people.

Susceptible Person: A person who has not developed immunity to measles through either vaccination or prior infection.

Treatment: No specific antiviral therapy available for the treatment of measles.

See, "Should I Test for Measles?" Guide for Tennessee Healthcare Providers for more information.

Disease Identification

Clinical description:

- An acute illness characterized by:
  - generalized, maculopapular rash lasting ≥3 days; and
  - temperature ≥101°F or 38.3°C; and
  - cough, coryza, or conjunctivitis

Probable:

- In the absence of a more likely diagnosis, an illness that meets the clinical description 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; or
  - IgG seroconversion[‡] or a significant rise in measles immunoglobulin G antibody[‡] using any evaluated and validated method; or
  - a positive serologic test for measles immunoglobulin M antibody[‡§]; 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.*

Note: *Genotype identification by a WHO reference laboratory (CDC or a public health laboratory that has validated their measles virus sequence analysis) is required to distinguish wild type from vaccine strain if vaccinated within 21 days of rash onset.*

More information can be found **here**.

Reporting

Timeline for reporting: Tennessee requires immediate reporting by phone for all suspected measles cases.

How to report/who to contact: Notification should be made by calling 615-741-7247 or 800-404-3006.

Who is responsible for reporting in TN?: Both providers and laboratories

Clinical criteria for reporting: Any person meeting the clinical criteria for measles without other explainable cause for illness. Laboratory testing for measles is available at the State Public Health Lab with prior consultation from a member of the VPD program or CEDEP Leadership Team. Measles testing is also offered at a number of commercial laboratories.

Lab criteria for reporting: Any positive measles IgM or rising IgG titer or detected by nucleic acid amplification or positive viral culture for any specimen.

Case Investigation

Measles case investigations should be initiated immediately following notification, and should include both provider and patient/guardian interviews. The case investigation should:

- confirm the person's diagnosis
- identify the source of infection
- locate persons who may have been exposed
- quarantine potentially infectious individuals to prevent further transmission within the community

The TDH Central Office VPDIP team should be notified within the same day a potential measles case is identified.

Case Isolation

Potential measles cases should be instructed to isolate at home through four days after rash onset, with day of rash onset considered to be day 0. If medical care is needed, the individual should notify the facility by phone, prior to arrival, so that appropriate infection prevention measures may be taken.

Hospitalized cases should be placed in negative pressure isolation and only be cared for by staff with evidence of measles immunity. Evidence of immunity includes documentation of two measles containing vaccines or documented lab evidence of immunity (a positive Rubeola IgG).

Sample Collection and Lab Testing

With prior consultation and approval, measles testing is available through the SPHL. Either an oropharyngeal or nasopharyngeal specimen, **AND** a serum specimen should be collected at the initial encounter.

- Any synthetic tip swab, **not cotton tipped swab**, may be used for specimen collection and should be placed on 1-3 mL of viral transport media. Specimen may be stored between 2-8° C for up to 5 days after collection. If testing is delayed more than 5 days, the specimen can be frozen at -70° C or colder.
- For serum specimen, collect whole blood in a serum separator tube (SST) or serum in a sterile, plastic, screw-capped vial.
- Specimen may be stored for up to 2 days at 2-8° C.

Additional information about testing for measles can be found here.

Patient and Provider Interviews

A thorough patient and provider interview is essential in determining clinical compatibility and the source of infection. A thorough interview should answer the following:

- Symptoms, including timing of prodromal symptoms: cough, coryza, conjunctivitis, and fever (max temperature)
- Date of symptom onset
- Date of rash onset
- Description of rash: how does it look, where did it start, how did it progress, how long did it last?
- Vaccination status and dates

In addition to clinical symptoms, a detailed patient history should be obtained for the 21 days preceding rash onset. This may help to identify the source of exposure.

- Travel: in and out of state/country
- Sick contacts or contact with known cases
- Contact with recent travelers
- Events or gatherings attended (concerts, conferences, festivals, resorts, theme parks, casinos, other tourist destinations, etc.)

Collecting a detailed history for the person's infectious period (4 days prior to rash onset through 4 days after rash onset) is crucial to identify close contacts and settings where exposure may have occurred. Be sure to ask about any places the case may have visited during this timeframe. Examples include but are not limited to:

- Medical facilities: urgent care, hospitals, doctor offices, pharmacies (including waiting rooms)
- Childcare facilities
- Schools or college campuses
- Restaurants
- Grocery stores
- Gyms
- Events or gatherings
- Lodging: hotels, resorts, etc.
- Church
- Public transportation: busses, taxis, trains, airplanes, etc.

A **Measles Case Report Form** should be completed and returned to Central Office for each measles investigation. Information should also be recorded in NBS. Additional information needed for measles cases will be collected using a REDCap project, "Measles Response – Case Management". Contact Central Office VPD team for access to REDCap, if needed.

Contact Investigation

A close contact is anyone with direct exposure to an infectious person or those with anything but brief exposure to shared airspace within two hours of the infectious person's presence. Close contacts should first be evaluated for their immunity to measles, and PEP should be offered to those without acceptable presumptive evidence of immunity.

Presumptive Evidence of Immunity for Healthcare Workers

- Documentation of 2 MMR vaccines
- Documented positive Rubeola IgG

Healthcare workers confirmed to have evidence of immunity may continue working with no restrictions. Those without presumptive evidence of immunity must be furloughed from day 5 through 21 after exposure (day 28 if IG administered) regardless of PEP administration.

Information about testing for measles immunity for exposed individuals can be found here.

Presumptive Evidence of Immunity for Non-Healthcare Workers

- Documentation of 2 MMR vaccines
- Documented positive Rubeola IgG
- Born before 1957
- Lab confirmation of disease

Individuals with presumptive evidence of immunity do not need to quarantine or require any restrictions. They should be educated on measles symptoms and instructed to call the health department should they develop any symptoms. Those without evidence of immunity should quarantine through 21 days (28 days if IG received) following their last measles exposure and receive daily monitoring for symptoms and quarantine compliance by public health.

Post Exposure Prophylaxis

MMR vaccine can be given as PEP within 72 hours of initial contact for contacts greater than 1 year old and *not* immunocompromised or pregnant. MMR vaccine may be given to children as young as 6 months; however, they will still require two doses after their 1st birthday. Contacts receiving an MMR vaccine within 72 hours of exposure are not required to quarantine but should be informed of signs and symptoms of measles and instructed to notify public health if any develop.

If MMR vaccine is given > 72 hours following the initial exposure to measles, the person should continue to quarantine through 21 days following their last exposure and will require active monitoring for symptoms and quarantine compliance by public health.

Immune Globulin (IG) may be given to infants less than 12 months old, immunocompromised people, and pregnant people. IG should be administered within 6 days of the initial measles exposure. People receiving IG should quarantine through 28 days following their last measles exposure and will require active monitoring by public health for symptoms and quarantine compliance.

- IGIM – Use for infants less than 12 months of age.
    - MMR vaccine may be used in place of IG for infants 6 through 11 months of age, if administered within 72 hours of exposure
- IGIV – Use for immunocompromised or pregnant people

Immune Globulin Dosage for Measles Exposure [1, 2, 3, 4]

Indications	Dose	Interval before MMR vaccine administration
Infants <12 months of age	0.5 ml/kg IM (max dose = 15mL)	6 months
Susceptible immunocompetent contacts <30 kg/66lbs[5]	0.5 ml/kg IM (max dose =15mL)	6 months
Pregnant women without evidence of immunity	400 mg/kg IV (intravenously)	8 months and nonpregnant
Severely immunocompromised persons[6]	400 mg/kg IV (intravenously)	8 months

[1] IGIM should be administered at room temperature and within 6 days of exposure.

[2] IG should be administered to susceptible infants and children <30kg and high-risk persons (pregnant women and severely immunocompromised persons). See footnote 7.

[3] IGIM can be given to any person <30kg who lacks evidence of measles immunity, but priority should be given to persons exposed in settings with intense, prolonged, close contact (e.g., household, child care, classroom, etc.) or persons who are more likely to develop severe measles (infants, immunocompromised children).

[4] The maximum intramuscular dose of IG is 15 ml for all persons.

[5] Persons weighing >30 kg/66lbs are unlikely to receive an adequate amount of measles antibody from IGIM.

[6] Severely immunocompromised patients who are exposed to measles should receive IGIV prophylaxis regardless of immunologic or vaccination status because they might not be protected by the vaccine. Per CDC and IDSA, persons with high-level immunosuppression include those:

- with combined primary immunodeficiency disorder (e.g., severe combined immunodeficiency);
- who are receiving cancer chemotherapy;
- on treatment for ALL within and until at least 6 months after completion of immunosuppressive chemotherapy;
- within 2 months after solid organ transplantation;
- who have received a bone marrow transplant until at least 12 months after finishing all immunosuppressive treatment, or longer in patients who have developed graft-versus-host disease;
- with HIV infection with a CD4 T-lymphocyte count <200cells/mm^3 (age >5 years) and percentage <15 (all ages) (some experts include HIV-infected persons who lack recent confirmation of immunologic status or measles immunity);
- receiving daily corticosteroid therapy with a dose ≥20 mg (or >2 mg/kg/day for patients who weigh <10kg) of prednisone or equivalent for ≥14 days; and
- receiving certain biologic immune modulators, that is, a tumor necrosis factor-alpha (TNF-α) blocker or rituximab.

After HSCT, duration of high-level immunosuppression is highly variable and depends on type of transplant (longer for allogeneic than for autologous), type of donor and stem cell source, and post-transplant complications such as graft vs host disease (GVHD) and their treatments. **Also see Section VI of IG Measles PEP Quicksheet.**

Vaccine Procurement Plan

First line of procurement will come from what is available in the health departments. In the event of a large response TDH will collaborate with CDC for additional vaccine doses.

Contact Monitoring

Close contacts without evidence of immunity and not receiving an MMR vaccine within 72 hours of their initial exposure should receive daily symptom monitoring by public health staff and comply with quarantine guidance for 21 days following their last exposure. If the contact receives IG, they should be monitored for 28 days following their last exposure.

Contacts with evidence of immunity or receiving the MMR vaccine within 72 hours of their initial exposure should be educated on signs and symptoms of measles and instructed to isolate and notify the health department by phone should any develop.

Documentation of contact monitoring will be completed using a REDCap project, "Measles Contact Monitoring". Local health departments can contact Central Office VPD staff for access to REDCap, if needed.

Guidelines for quarantine, isolation, and furlough can be found here.

Instructions for people exposed to measles can be found here.

Closing an Outbreak

A measles outbreak may be closed following two incubation periods, 42 total days, with no newly identified measles cases upon declaring an end to the outbreak, the data and investigation should be reviewed and summarized in an after-action report that includes the following elements:

- Context/background
- Initiation of investigation
- Investigation methods
- Investigation findings
- Discussion and conclusions
- Recommendations for controlling disease and/or preventing or mitigating exposure
- Key investigators and report authors

Additional Resources

CDC's Interim Infection Prevention and Control Recommendations for Measles in Healthcare Settings: Interim Infection Prevention and Control Recommendations for Measles in Healthcare Settings (cdc.gov)

CDC Outbreak Letter Templates: https://www.cdc.gov/measles/toolkit/state-health-departments.html

CDC Tools for Laboratories: Measles Lab Tools | CDC