New Jersey Department of Health
Vaccine Preventable Disease Program

MEASLES LABORATORY TESTING FAQS

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SPECIMEN COLLECTION AND MANAGEMENT

1. **Who should be tested for suspected measles infection?**
   Any person with clinical features compatible with measles should be tested. As with any disease, lab work should be used in conjunction with clinical presentation (signs and symptoms).

2. **Should I do serologic tests (IgG and IgM) on asymptomatic people to document immunity?**
   Persons without evidence of immunity and no contraindications to measles, mumps, rubella (MMR) vaccine can be vaccinated without testing. Persons without evidence of immunity might be considered for testing for measles-specific IgG antibody, but testing is not needed prior to vaccination. The Centers for Disease Control and Prevention (CDC) does not recommend measles antibody testing after MMR vaccination to verify the patient's immune response to vaccination if patient has documentation of two apropriately spaced doses of MMR. Documentation of appropriate vaccination supersedes the results of serologic testing.
   IgM testing should **ONLY** be used for patients suspected to have measles.

3. **What specimens should be collected from patients meeting the clinical case definition?**
   The CDC recommends that a nasopharyngeal (NP) or throat swab and blood specimens be collected from all patients with clinical features compatible with measles. Urine specimens may also contain virus and, when feasible to do so, collection of both respiratory and urine specimens can increase the likelihood of detecting virus.

4. **What are the preferred specimens for viral isolation of measles?**
   NP or throat swabs are the **preferred** specimen for virus isolation or real-time reverse transcriptase-polymerase chain reaction (rRT-PCR) detection. Urine specimens may also contain virus. Urine specimens should only be collected if a NP or throat swab is not able to be collected. At this time, rRT-PCR testing on urine is not available at NJDOH PHEL but can be sent to Wadsworth (VPD Reference Laboratory), if necessary. Collect specimens as soon as possible **after** rash onset.

5. **When is the best time to collect clinical specimens?**
   All specimens (NP or throat swabs, urine, and blood) should be collected from patients with clinical features compatible with measles as soon as possible **after** onset of rash. Depending on the type and timing of initial specimens collected, additional specimens may be requested for testing.

***NOTE**: please refer to Laboratory Results section for additional information on how vaccination status and timing of collection can affect results.*

6. **How long would you be able to detect measles in specimens?**
   This depends on the type of specimen and vaccination status of the person. It is recommended that specimens be collected as close to rash onset as possible (but preferably within 3 days):

- Swabs may be positive in unvaccinated persons up to 10 days post onset, however among suspected cases that have received 1 or more doses of measles-containing vaccine, virus may be cleared much earlier.
- IgM can be positive for up to 1 month in unvaccinated persons. However, vaccinated persons, regardless of timing of collection, may not have detectable IgM.

7. Should any specimens be collected from a suspected case that is outside the recommended time period for a swab?

Yes. Serum can be collected as IgM can remain elevated for up to 1 month in unvaccinated persons. You can also collect serum specimens 2-3 weeks apart to measure acute and convalescent IgG titers, although this might not be helpful in vaccinated persons.

8. How should specimens be collected and managed?

NP or throat swab: the **preferred** specimen for rRT-PCR detection. A detailed protocol for NP or throat collection is available on the CDC website.

- Collect swab as soon as possible after rash onset. Most successful when specimens are collected within 3 days of rash onset; however, clinical specimens should be obtained within 7 days, and not more than 10 days, after rash onset.
- Use synthetic (non-cotton) swabs. These are commercial swab products designed for the collection of NP or throat specimens or flocked polyester fiber swabs which are the same type of swab used for influenza PCR testing.
- Place swabs in 1-3 ml of standard, commercially available viral transport medium (VTM) or universal transport media (UTM). Transport media with charcoal should *not* be used (e.g., agar-gel media is not acceptable).
- Keep specimens cold (2-8°C) and transport either via same-day courier or overnight shipping for delivery within 24 hours of collection.
    - Ship refrigerated specimens on frozen cold packs to maintain 2-8°C.
    - Specimens being stored longer than 24 hours after collection should be frozen at -70°C. Specimens frozen at -20°C will be accepted if -70°C is not available. Ship frozen specimens on dry ice.
    - Storage temperature must be maintained during specimen transport (via courier or overnight shipping). If not able to maintain frozen temperature during entire transport (i.e. on dry ice), keeping specimen refrigerated (2-8°C) for up to 72 hours and shipping on frozen cold packs is acceptable.
    - Avoid freeze-thaw cycles.
- Measles rRT-PCR testing on NP or throat swab is performed by the NJDOH Public Health and Environmental Laboratory (PHEL).

Serologic testing:

- Measles serologic testing (IgM/IgG) is performed by commercial laboratories.
- Blood should be collected as soon as possible after rash onset. Please see Q11 for additional information regarding requests for additional specimens depending on timing of collection.
- Collect minimum of 2 ml of blood in a red top or serum separator tube (red-speckled or gold).
- Keep specimens cold (2-8°C) and ship overnight on frozen cold packs or follow commercial laboratory guidance.

Urine: Urine specimens should only be collected if an NP or throat swab is not able to be collected

- Urine should be collected as soon as possible after rash onset.
- Collect minimum of 5-10 ml of urine in a sterile, leakproof container.
- Keep specimens cold (2-8°C) and ship overnight on frozen cold packs.

- At this time, rRT-PCR testing on urine is not available at PHEL, but can be sent to Wadsworth (VPD Reference Laboratory) for testing.

9. Where can specimens be sent for testing?

Measles serologic testing (IgM/IgG) is performed by commercial laboratories. Measles rRT-PCR testing on NP or throat swabs is the preferred testing methodology, and is performed by PHEL. At this time, rRT-PCR testing on urine is not available at PHEL but can be sent to Wadsworth (VPD Reference Laboratory), if necessary. Therefore, urine specimens should only be collected if a NP or throat swab is not able to be collected.

While PCR testing is available commercially, results will not be received in a timely manner and is not recommended when there is a high index of suspicion.

Approval for measles rRT-PCR testing at PHEL is required by NJDOH prior to submission and should be **coordinated through the Local Health Department (LHD)**. Providers may collect and hold specimens pending approval. Upon approval, the LHD can assist with coordination of transport to PHEL. Each specimen must be clearly labelled with the patient's name, date of birth, and date of collection.

For specimens submitted to PHEL:

- Once submission is approved by NJDOH, facility should create an order via PHEL's Online Ordering Portal:
  - Search for "Measles RT-PCR" as the test order and select specimen type.
  - Include requisition form in shipment to PHEL. Incorrectly labeled specimens will be rejected.
- If online ordering is not available, a completed SRD-1 form must accompany the specimens sent to PHEL. In "Tests Requested" section of the form, select "Other" and write in "Measles PCR".

10. What is the turnaround time for lab results?

Many factors can affect turnaround time. These factors include a) differing turnaround times for tests at laboratories; b) differing test methodologies used; c) timing of specimen collection and transportation of specimens to laboratories; d) timing of submission of specimens. For example, some labs have a 1-5 day turnaround for serology and a turnaround of approximately 2 weeks for culture. Turnaround from NJDOH PHEL also depends on collection timing and transportation, but generally takes about 1-2 business days once it arrives at the laboratory.

Note: results from NJDOH PHEL are not intended to guide the patient's clinical management but are for public health surveillance purposes.

LABORATORY RESULTS

11. A specimen tests negative for measles RNA by rRT-PCR or negative for measles virus by isolation. Do these results rule out measles infection?

Not necessarily. These specimens could be negative because the amount of virus shed at the time of specimen collection was very low. Other factors can also significantly reduce the likelihood of detecting measles virus such as inadequate specimen collection, processing, shipping or storage. An example of this is symptomatic persons who have received 1 or more doses of measles-containing vaccine, as they may clear the virus more rapidly.

12. How do I interpret serology results?

Note: Serologic tests should be interpreted with caution, as false-positive and false-negative results are possible with IgM tests.

Unvaccinated Persons

- A positive IgM test result indicates current/very recent infection or reinfection. As with any lab test, there can be false-positive test results (refer to question 13).
- Approximately 23% of serum specimens obtained in the first 72 hours after rash onset in a susceptible individual may give false-negative results. If an acute IgM is collected within 72 hours of rash onset and the IgM is negative, a second serum should be collected ≥72 hours after rash onset if clinically indicated, as a delayed IgM response has been reported.
- IgG: IgG alone is not diagnostic unless you obtain both an acute (can be done as soon after onset as the patient is seen, but ideally 4-5 days after onset of symptoms) and convalescent (from 10-30 days after onset) blood specimen for serologic tests to determine if a four-fold rise in IgG antibody titer has occurred (e.g., from 1:40 to 1:320). Although acute and convalescent titers might be useful for clinicians, this test will not help classify cases for timely public health response.

Vaccinated Persons

- Measles should not be ruled out in someone with negative IgM who is vaccinated if they have symptoms consistent with measles. In addition.
- A detailed investigation should be conducted for each case with emphasis on accurate and complete immunization history. Recent outbreaks have included cases who had already received at least 1 dose of measles-containing vaccine.
- In vaccinated persons, the existing IgG will begin to rise soon after exposure and infection. At the time of onset of symptoms and collection of the acute serum, the IgG may already be quite elevated, which would obviate the 4-fold rise in titer expected when comparing acute and convalescent specimens.

13. If the suspected case has a positive IgG and negative IgM result, can measles infection be ruled out?

Absence of a measles IgM response in a vaccinated or previously infected individual presenting with clinically compatible measles *does not rule out measles* as a diagnosis. A positive IgG result is expected among previously vaccinated persons. Older persons or foreign nationals with no history of measles illness or vaccination may have detectable measles IgG due to a previous subclinical infection.

14. What can cause a false-positive measles IgM result?

Because measles is a rare disease in the United States, even with the excellent laboratory tests available, false-positive results for measles IgM will occur. To minimize the problem of false-positive laboratory results, it is important to restrict case investigation and laboratory tests to patients most likely to have measles (i.e., those who meet the clinical case definition, especially if they have risk factors for measles, such as being unvaccinated, recent history of travel abroad, without an alternative explanation for symptoms, for example epi-linked to known parvovirus case) or those with fever and generalized maculopapular rash with strong suspicion of measles. ***An IgM should never be ordered for asymptomatic persons to assess for immunity, this should be IgG only.***

False-positive IgM results for measles may be due to the presence of rheumatoid factor in serum specimens. Serum specimens from patients with other rash illness, such as parvovirus B19, rubella, and roseola, have been observed to yield false-positive reactions in some IgM tests for measles. Additionally, when a patient with suspected measles has been recently vaccinated (6-45 days prior to rash onset), neither IgM nor IgG antibody responses can distinguish measles disease from the response to vaccination. In this instance, a viral specimen should be obtained so CDC can attempt to distinguish between vaccine virus and wild-type virus.

15. **Is it possible to demonstrate a 4-fold rise in titer between paired serum specimens (acute and convalescent) among cases of measles with a history of 1 or 2 doses of measles-containing vaccine?**
    It may not be possible. In vaccinated persons, the existing IgG will begin to rise soon after exposure and infection. At the time of onset of symptoms and collection of the acute serum, the IgG may already be quite elevated, and obviate the 4-fold rise observed in convalescent serum specimen. Although acute and convalescent titers might be useful for clinicians, this test will not help classify cases for public health purposes.

FOR MORE INFORMATION

Where can I get more information on measles?

- Your local health department via Directory of Local Health Departments in New Jersey
- NJDOH Communicable Disease Service Measles Website
- Centers for Disease Control & Prevention Measles Website

This information is intended for educational purposes only and is not intended to replace consultation with a health care professional.