



**New Jersey Department of Health
Vaccine Preventable Disease Program**

MEASLES LABORATORY TESTING FAQs

Date: December 2016

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. What specimens should be collected from patients meeting the clinical case definition?

The Centers for Disease Control and Prevention (CDC) recommends that a nasopharyngeal/throat swab and blood specimen 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.

3. What are the preferred specimens for viral isolation of measles?

Throat or nasopharyngeal (NP) swabs are the **preferred** specimen for virus isolation or reverse transcriptase polymerase chain reaction (RT-PCR) detection. Collect all specimens as soon as possible after rash onset. The specimens should be collected at the first contact with a suspected case of measles.

4. When is the best time to collect clinical specimens?

All specimens (throat/NP swabs, urine, and blood) should be collected from patients with clinical features compatible with measles as soon as possible after onset of symptoms. 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.*

5. 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.

6. 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.

7. How should specimens be collected and managed?

NP or throat swab: the **preferred** specimen for RT-PCR detection or culture.

- 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. Brands include Dacron® and Copan (those products without charcoal). This is the same type of swab used for influenza PCR testing.
- Place swabs in 1-3 ml of standard, commercially available viral transport medium (VTM). Transport media with charcoal should *not* be used. If VTM is not available, use sterile isotonic solution (e.g. phosphate buffered saline) in a sterile urine collection container or a blood collection tube that contains no gels or other agents.
- Keep specimens cold (4°C) and ship using cold packs.

Serologic testing:

- 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 7-10 ml of blood in a red top or serum separator tube (red-speckled or gold).
- Keep specimens cold (4°C) and ship using cold packs.

Urine:

- Urine should be collected as soon as possible after rash onset.
- Collect 10-50 ml of urine in a sterile container.
- Keep specimens cold (4°C) and ship using cold packs.

A detailed protocol for collection of specimens for viral isolation is available on the CDC website at: <http://www.cdc.gov/measles/lab-tools/rt-pcr.html>

8. Where can specimens be sent for testing?

Each specimen must be clearly labelled with the patient's name, date of birth, and date of collection. Measles serologic testing (IgM/IgG) can be performed by commercial laboratories. At this time, commercial laboratories do not perform RT-PCR testing. However, when there is a high index of suspicion, the preferred laboratory for measles testing (serology, RT-PCR, culture) is CDC or Wadsworth (CDC viral reference laboratory), sent through the NJDOH Public Health and Environmental Laboratory (PHEL), as they are able to genotype the specimen and use a more sensitive cell line.

For specimens submitted to PHEL for testing at CDC/Wadsworth:

- Approval for submission to PHEL can be coordinated through the LHD. Once submission is approved, the LHD can also assist with coordination of transport to PHEL.
- Any specimen submitted to PHEL must be accompanied by a NJDOH SRD-1 form (<http://web.doh.state.nj.us/apps2/forms/> - write "Attention: Virology for forwarding to CDC/Wadsworth" on the form). Incorrectly labeled specimens submitted to PHEL will be rejected and discarded.

9. 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. For example, some labs have a 1-5 day turnaround for serology and a turnaround of approximately 2 weeks for culture. Turnaround from CDC/Wadsworth also depends on collection timing and transportation, but generally takes around 2 weeks.

Note: results from CDC/Wadsworth are not intended to guide the patient's clinical management, but are for public health surveillance purposes.

LABORATORY RESULTS

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

No. 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.

11. 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 public health purposes.

Vaccinated Persons

- Measles should not be ruled out in someone with negative IgM who is vaccinated if they have symptoms consistent with measles.
- 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.

12. 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.

13. 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.

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.

14. 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
 - Directory of Local Health Departments in New Jersey, available at: <http://www.state.nj.us/health/lh/community/index.shtml#1>
 - Directory of After Hour Emergency Contact Phone Numbers for Local Health Departments in New Jersey, available at: http://www.nj.gov/health/lh/documents/lhd_after_hours_emerg_contact_numbers.pdf
- NJDOH Vaccine Preventable Disease Program, 609-826-5964, <http://www.state.nj.us/health/cd/measles/>
- Centers for Disease Control & Prevention www.cdc.gov/

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