

Georgia Division of Public Health

Epidemiology Branch

Measles (Rubeola) Protocol

Epidemiology of Measles:

Infectious Agent: Measles virus (paramyxovirus)

Occurrence: Prior to the introduction of vaccine in 1963 measles was common childhood illness, so few people remained susceptible by age 20. As a result, persons born prior to 1957 in the United States are considered immune. Since the 2 dose immunization schedules with MMR was adopted in 1989, measles incidence has declined to record low levels and in 2000, measles was declared no longer endemic in the U.S. Cases of measles continue to occur in the U.S. as a result of importation of the virus from other countries, with occasional secondary spread most often among unvaccinated or partially vaccinated persons. Vaccination rates must remain high if an absence of endemic transmission of measles is to be maintained. In addition, prompt recognition, reporting, and investigation of cases and contacts is essential to halt the spread of imported disease.

Incubation: 14 days (range 7 - 21 days) from exposure to onset of symptoms.

Period of communicability: Measles is a highly communicable viral infection. Patients are contagious from 4 days before rash onset to 4 days after the appearance of the rash.

Signs and symptoms: Prodromal fever (early symptom), malaise, and conjunctivitis (eye inflammation and redness), coryza (runny nose and watery eyes), and/or cough are characteristic. Small spots with white or bluish white centers on an erythematous (red) base in the mouth (buccal mucosa or soft palate) called Koplik spots are specific for measles and may be seen on oral exam. A characteristic red, blotchy, palpable rash appears on the third to the seventh day and typically begins on the face (at the hairline) and spreads over the body, becoming generalized. The rash lasts 4 to 7 days. Complications that may result include otitis media (middle ear infection), pneumonia, croup, diarrhea and encephalitis (inflammation of the brain and/or spinal cord).

Transmission: Airborne by droplet nuclei spread and direct contact with nasal and throat secretions or items freshly soiled with these secretions. Measles is one of the most highly communicable infectious diseases.

Susceptibility and resistance: All persons who have not had the disease or who have not been successfully immunized are susceptible. Primary vaccine failure occurs in up to 5% of persons after one dose. Acquired immunity after illness is permanent.

Immunization of Contacts: Live virus vaccine, if given within 72 hours of measles exposure, may prevent disease among susceptibles. Susceptible household or other contacts for whom risk of complications is very high (particularly contacts under 1 year of age, susceptible pregnant

women or immunocompromised persons), for whom measles vaccine is contraindicated, should receive IV immunoglobulin (IG) within 6 days of exposure.

Quarantine and Isolation: In hospitals, in addition to standard precautions, airborne transmission precautions are indicated from onset of symptoms through 4th day of the rash in otherwise healthy children and for the duration of illness in immunocompromised patients. Children with measles should be kept out of childcare or school for 4 days after appearance of rash; strict segregation of infants in institutions should occur if a measles case is present.

Steps in Investigation*:

- I. Obtain the following information immediately in order to perform a risk assessment:
 - 1) Obtain a detailed description and timeline of the clinical presentation to determine if consistent with clinical case definition:
 - Rash characteristics (appearance, onset and progression)
 - History of cough, coryza or conjunctivitis including onset dates
 - Documentation of Koplik's spots
 - Fever, including onset and maximum documented temperature
 - 2) Immunization history (MMR - # of doses and dates), date of birth or history of measles
 - 3) Travel history (airline, especially any international travel) in the past 21 days
 - Obtain the specific flight information including dates of travel, seat numbers and flight numbers
 - 4) Exposure history (any possibility the suspect case was around a confirmed or suspect case in the 21 days before becoming ill)
 - 5) Nationality of suspect case (foreign born?)

- II. Collaborate with the GA Public Health Acute Disease Epidemiology Unit to collect the appropriate specimens to confirm diagnosis. These should include serology (measles IgG and IgM) as well nasopharyngeal and/or urine specimens for virus isolation and PCR, and should be submitted to the GA Public Health Laboratory. Refer to *Measles: Specimen Collection and Shipping Instructions* included.

Top priority should be given to IgM determination, however be aware that IgM can be negative early in the course of disease so repeat testing may be necessary.

- III. Conduct epidemiology investigation.
 - a. Ensure isolation of case and quarantine of immediate contacts until susceptibility is assessed.
 - b. Determine period of communicability (4 days before and 4 days after rash).
 - c. Interview case to identify possible contacts (i.e. household, school, childcare, work, healthcare facilities, airplane)
 - d. Interview contacts to determine susceptibility (obtain age, determine if contact has been immunized with 2 doses of measles vaccine, or has had the disease as diagnosed by a physician).
 - e. Stratify by time of exposure to determine the appropriateness and type of prophylaxis (refer to attached algorithm); be aware of contraindications; IG must be given within 6 days of exposure and MMR within 72 hours.

- f. If period of prophylaxis has passed, counsel susceptible contacts to call their health practitioner if they develop respiratory symptoms and/or a rash, and report their exposure.
 - g. Work with Georgia Division of Public Health and State Pharmacy (district pharmacies in certain districts) to ensure availability of adequate IG.
 - h. Follow-up with individuals to ensure they received prophylaxis (IG or vaccine).
- IV. Following the Infectious Disease Case Management Across Jurisdictions Protocol, notify other districts of contacts in their areas.
- V. Conduct surveillance for secondary cases and contacts.

* Note that the steps are not ordered by priority since several of these steps are conducted simultaneously.

Period of Communicability Timeline

DAY - 4	DAY -3	DAY -2	DAY -1	DAY 0 RASH 1 ST APPEARS	DAY 1	DAY 2	DAY 3	DAY 4
AM	AM	AM	AM	AM	AM	AM	AM	AM
NOON	NOON	NOON	NOON	NOON	NOON	NOON	NOON	NOON
PM	PM	PM	PM	PM	PM	PM	PM	PM
Date_____	Date_____	Date_____	Date_____	Date_____	Date_____	Date_____	Date_____	Date_____

* Ask about the following (not inclusive – use as a guide): work activities, leisure, faith activities, shopping, errands, travel, dining out, childcare, school, household visitors and appointments

Algorithm for Measles Prophylaxis

If born before 1957 = No action required (unless request MMR)

If born after 1957,

AND

If Immunocompromised (HIV, high dose steroids, chemotherapy treatment) = IG *

If Pregnant

Have they had 2 doses of MMR?

Yes = no action required

No = IG *

Unsure = IG *

If less than 12 months old = IG *

If \geq 12 months old

Have they had 2 doses of MMR?

Yes = No action required

No = MMR **

Unsure = MMR **

* IG dose is 0.25 ml/kg or 0.11 ml/lb up to a maximum of 15 ml IM

Immunocompromised dosage is 0.5 ml/kg or 0.22 ml/lb up to a maximum of 15 ml IM

IG must be given within 6 days after exposure for those for whom the vaccine is contraindicated and unimmunized persons who are identified more than 72 hours after exposure.

**MMR must be given within 72 hours after exposure.

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Measles: Specimen Collection and Shipping Instructions

A case of measles is a **public health emergency**. Contact public health **immediately** of any suspect cases. A clinical diagnosis of measles is unreliable; suspect cases of measles must be laboratory confirmed. Confirmation of acute infection can be determined by the presence of serum immunoglobulin M (IgM) and a four-fold rise in serum immunoglobulin G(IgG) titer between acute and convalescent phase specimens.

The Georgia Division of Public Health strongly recommends the **collection of serum for measles IgM/IgG and collection of a throat swab and urine specimen to confirm a measles case**. To coordinate specimen collection and laboratory submission, call your District or County Health Department. **Please do not send specimens directly to the Georgia Public Health Laboratory (GPHL) or the Centers for Disease Control and Prevention (CDC).**

Specimen Collection Instructions:

Serologic Testing : Collect as soon as possible when measles infections is suspected, preferably at the onset of rash.

- Collect 7-10 ml of blood in a red top or serum separator tube (SST)
Acute serum (IgM and first IgG)
Convalescent serum (second IgG)
- SST tubes must be centrifuged and the serum poured into a transport tube for shipment.
- Keep specimens cold (4° C or 39° F) and ship overnight service. **Do not freeze serum samples.**

Viral Testing: Collect a urine and throat swab at the same time as serology. Virus is most frequently recovered within the first 3 days following rash, but up to 7 days after rash onset is acceptable. If it's been a few days since resolution of the rash collect only a urine specimen.

Throat Swabs

- Use a **viral transport kit** if possible (such as what's used to isolate influenza or herpes simplex virus)
- Collect a throat swab by rubbing the posterior nasal passages with a dry sterile cotton swab
- Place swab in a tube containing 2-3 mls of viral transport medium or other sterile isotonic solution (phosphate buffered saline or cell culture medium).
- Keep samples cold (4° C or 39° F)
- Ship the viral specimens using ice packs or dry ice*. Avoid freeze-thaw cycles.

Urine Specimens

- Collect 10-15 ml of urine in a screw top sterile container
- Keep samples cold (4° C or 39° F)
- Ship the viral specimens using ice packs or dry ice*. Avoid freeze-thaw cycles.

*If shipment contains both serum and viral specimens, ship together by overnight service on cold packs (do not freeze serum)

Laboratory Submission Instructions:

- Notify County or District Public Health Office **immediately** for coordination.
- Label specimen transport tube with the patient name and date of birth
- **UNAPPROVED OR UNLABELED SPECIMENS WILL NOT BE TESTED**

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- Complete Immunology, Molecular Biology and Virology lab forms at:
<http://health.state.ga.us/pdfs/lab/manual/Immunology%20Form%203432.pdf>
<http://health.state.ga.us/pdfs/lab/manual/Molecular%20Form%203409.pdf>
<http://health.state.ga.us/pdfs/lab/manual/Virology%20Form%203595.pdf>
with the following information:
 - Submitter code (if known), address, phone number, and contact name
 - Patient name, address, date of birth, sex, race and ethnicity (if available)
 - Date of specimen collection, type of specimen, reason for testing, date of illness onset
 - Immunology Form: Test requested (NOTE: Be sure to check Rubeola (Measles) IgG and IgM boxes **AND** Rubella IgG and IgM boxes)
 - Molecular Biology Form: Test requested (NOTE: Beside Other be sure to write in Measles PCR)
 - Virology Form: Test requested (NOTE: Beside Viral Culture/Identification (Please Specify) be sure to write Measles Culture.
 - Ship specimen and accompanying lab form to the following address:
Georgia Public Health Laboratory
1749 Clairmont Road
Decatur, GA 30033-4050
ATTN: Immunology and Virology Laboratories

Contact Information:

- For specimen outfit requests call the Georgia Public Health Laboratory at 404-327-7921
- Additional lab forms available at <http://health.state.ga.us/programs/lab/manual.asp> in Appendix B
- For questions related to specimen collection and transport contact local public health or the State Epidemiology Unit, 404-657-2588

Interpretation of Measles Laboratory Test Results:

- Serology
 - IgM: Measles infection is confirmed using measles IgM antibody testing of serum samples collected as soon as possible after symptom onset. A positive IgM test result indicates current/very recent infection or reinfection. As with any lab test, there can be false positive test results.
 - 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 four to five days after onset of symptoms) and convalescent (from two to four weeks 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). In vaccinated persons it may not be possible to detect a four-fold rise in measles IgG antibody titer in paired serum samples (acute and convalescent). In such 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 4fold rise observed in convalescent serum specimen.
- PCR
 - Sequence analysis of a RT-PCR product derived from a virus isolate or from a clinical material confirms the presumptive positive PCR results and provide epidemiologically important information
- Viral Culture
 - Isolation of measles virus from any clinical specimen constitutes laboratory confirmation of measles