

Measles (Rubeola)

Healthcare Provider Information & Frequently Asked Questions (FAQ)

MEASLES OVERVIEW

What is measles?

Measles (Rubeola) is caused by a highly communicable paramyxovirus that has only one antigenic type. It is an acute, viral, systemic infection, primarily of the respiratory epithelium of the nasopharynx. The virus invades and replicates in the respiratory epithelium and regional lymph nodes. Measles is characterized by prodromal symptoms of slowly increasing fever (peaking up to 105°F), followed by cough, coryza, or conjunctivitis occurring 10 to 12 days after exposure; the prodrome lasts for 2-4 days (range 1-7 days). Koplik spots appear as punctate blue-white spots on the bright red background of the oral buccal (cheek) mucosa and occur 1-2 days before to 1-2 days after the skin rash. It is considered pathognomonic for measles and. A maculopapular eruption usually appears 14 days after exposure (range 7-21 days). The rash begins at the hairline and spreads downward and outward from head to trunk to the extremities and lasts 5-6 days. The rash appears discrete but may become confluent. Rash fades in the same order that it appears.

Other symptoms and/or complications of measles can include ear infections, diarrhea, otitis media, pneumonia, hepatitis, encephalitis, and death. Children younger than 5 years and adults older than 20 years are more likely to suffer from measles complications. Measles may also cause spontaneous abortion, premature birth, or low birthweight if a woman is infected while pregnant.

Measles diagnosis should be made in consideration of the patient's clinical presentation (see above), laboratory results (see laboratory testing section), and risk of exposure.

What is the treatment for measles?

There is no specific treatment for measles. Supportive care can be provided to relieve symptoms and address complications.

TRANSMISSION & PREVENTION

How common is measles?

Measles was officially eliminated from the United States in 2000, meaning there is no measles spreading within the country and new cases are only found when someone contracts measles abroad and returns to the country and has contact with at-risk populations (unvaccinated or undervaccinated against measles). As of April 2024, a total of 126 measles cases were reported by 19 jurisdictions: Arizona, California, Florida, Georgia, Illinois, Indiana, Louisiana, Maryland, Michigan, Minnesota, Missouri, New Jersey, New York City, New York State, Ohio, Pennsylvania, Virginia, Washington, and West Virginia. There have been 7 outbreaks (defined as 3 or more related cases) reported in 2024. The last reported case of measles in West Virginia was in April 2024 following international travel. Prior to 2024, the last case of measles in WV was reported in 2009.

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How does the measles virus spread?

Transmission of measles occurs person to person by contact with infectious respiratory droplets or through airborne spread. Measles virus can live for up to 2 hours on a contaminated surface or in an airspace where an infected person coughed or sneezed.

If a patient presents to a healthcare facility with a fever and rash?

Consider measles in patients with a fever, rash, and cough, coryza or conjunctivitis—the three “C”s. Ask if they are vaccinated against measles, have recently traveled internationally, or if there is measles in the community. Patients presenting with fever and rash should be quickly assessed. If measles is suspected, the patient should immediately be placed in airborne isolation, ideally in a negative pressure room. If a negative pressure room is not available, the patient should be placed in an exam room with a mask and the door closed. The room should not be used for 2 hours after the patient has left. While this will reduce the risk of exposure, it is important to recognize that this will not eliminate the risk of exposure or be as effective as a negative pressure room and airborne isolation. All suspected cases of measles should be immediately reported to the local health department (see reporting section).

If measles cannot be ruled out, the healthcare facility will need to identify potentially exposed patients and staff in areas where the infected person has stayed. This will include anywhere the infected patient was from arrival until 2 hours after they left the area.

Who is at risk for contracting measles?

Non-immune people of any age can get measles.

Could someone still get measles if they are fully vaccinated?

Very few people—about three out of 100—who get two doses of measles vaccine will still get measles if exposed to the virus. Fully vaccinated people are much more likely to have a milder illness and less likely to spread the disease to others.

How long can a person with measles be contagious to others?

Patients are infectious from 4 days before to 4 days after the rash onset. Immunocompromised patients may have prolonged excretion of the virus and can be contagious for the duration of illness.

How long does it take to show signs of measles after being exposed?

An average of 8-12 days from exposure to the first symptom, which is usually fever followed by cough, coryza, and/or conjunctivitis and approximately 14 days (range of 7-21 days) for rash onset.

Can measles be prevented?

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Yes. There are vaccines to prevent measles infection. Vaccination for measles is available and routinely recommended in the United States. The measles virus vaccine is available combined with mumps and rubella vaccines as MMR, or combined with mumps, rubella, and varicella vaccine as MMRV.

Can someone get measles more than once?

No. Measles infection produces lifelong immunity to the virus in the absence of severe immune deficiency.

A patient was exposed to a person with measles. What should they do?

First determine if the patient is immune to measles either through documentation of age-appropriate MMR vaccination or other acceptable documentation of immunity. If they are immune, discuss signs and symptoms with the patient so they are made aware. If a patient who was exposed to measles develops signs or symptoms of measles advise patient to stay at home unless for medical emergency and notify their PCP immediately.

I suspect measles in a patient. What are the recommendations for isolation?

Patients suspected to have measles should be isolated from four days prior to rash onset until four days after rash onset as they are considered infectious. Infectious persons should not leave their home or isolation except in a medical emergency. They should avoid having visitors.

In healthcare settings, patients should be under airborne isolation precautions, preferably in a single-patient airborne infection isolation room (AIIR) with negative pressure airflow.

Regardless of immunity status, all healthcare personnel entering the patient room should use respiratory protection consistent with airborne infection control precautions (N95 respirator or a respirator with similar effectiveness in preventing airborne transmission).

If a healthcare worker (HCW) develops a rash and low-grade fever after MMR vaccination, are they infectious?

No. The HCW is not infectious, and no special precautions need to be taken. Low-grade fever and/or mild rash is common in approximately 5 to 15% of susceptible people who receive the MMR vaccine.

MEASLES VACCINATION INFORMATION

How effective is the measles vaccine?

One dose of MMR vaccine is about 93% effective at preventing measles; two doses of the MMR vaccine are about 97% effective.

Why hasn't the MMR vaccine formula changed over the years?

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The MMR vaccine is very effective at protecting people against measles, mumps, and rubella, and preventing the complications caused by these diseases. The Edmonston-Enders vaccine strain has been the only measles virus vaccine used in the United States since 1968. People who receive MMR vaccination are usually considered protected for life against measles and rubella. The MMR vaccine is very safe and most people who get the MMR vaccine do not have any serious problems with the vaccine. MMR vaccine is much safer than getting measles, mumps, or rubella. Some common side effects of the MMR vaccine include sore arm from the shot, mild fever, mild rash, temporary pain, and stiffness in the joints.

Can the measles virus mutate and make the vaccine ineffective?

Unlike other viruses (such as SARS CoV-2), the measles virus does not mutate in the same way. Measles is not likely to evade vaccine-induced immunity because surface proteins needed for measles to infect cells do not tolerate mutations. Mutations render the proteins ineffective and make it unable to infect host cells. A person who is fully vaccinated against the measles virus will usually be protected for life.

Who should get the MMR vaccine?

- Children should get 2 doses of the MMR vaccine, the first dose at 12-15 months of age and the second dose at 4-6 years of age.
- Adults born after 1957 with no evidence of immunity should receive at least one dose of the MMR vaccine.
- Students at post-high school educational institutions and healthcare workers with no evidence of immunity should receive two doses separated by at least 28 days.

What are the contraindications and precautions for the MMR vaccine?

- History of anaphylactic reactions to neomycin
- History of severe allergic reaction to any component of the vaccine
- Pregnancy
- Immunosuppression, including:
 - Primary or acquired immunodeficiency, including persons with immunosuppression associated with cellular immunodeficiencies, hypogammaglobulinemia, dysgammaglobulinemia and AIDS or severe immunosuppression associated with HIV infection.
 - Blood dyscrasias, leukemia, lymphomas of any type, or other malignant neoplasms affecting the bone marrow or lymphatic system.
 - Patients who have a family history of congenital or hereditary immunodeficiency in first-degree relatives, unless the immune competence of the potential vaccine recipient has been substantiated clinically or verified by a laboratory.
 - Patients who are receiving systemic immunosuppressive therapy, including corticosteroids ≥ 2 mg/kg of body weight or ≥ 20 mg/day of prednisone or equivalent for person who weigh >10 kg,

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when administered for ≥ 2 weeks.

Precautions for MMR and MMRV vaccines include recent (≤ 11 months) receipt of an antibody-containing blood product, concurrent moderate or severe illness with or without fever, history of thrombocytopenia or thrombocytopenic purpura, and tuberculin skin testing. Measles and other live-virus vaccines may interfere with the response to tuberculin skin testing and the interferon- γ release assay. Tuberculin testing, if otherwise indicated, can be done either on the day that live-virus vaccines are administered or 4–6 weeks later.

More information is available at <https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html>

What is considered as evidence of immunity?

FOR THE GENERAL POPULATION: Only written documentation of age-appropriate vaccination, laboratory evidence of immunity (equivocal IgG results should be considered negative), laboratory confirmation of disease, or birth before 1957. Adults born before 1957 most likely had measles as a child and are generally considered to be immune and not need vaccination.

Verbal report of vaccination without written documentation should not be accepted as presumptive evidence of immunity.

FOR HEALTHCARE WORKERS: Verbal report of vaccination without written documentation should not be accepted as presumptive evidence of immunity. Evidence of immunity to measles for healthcare workers includes any of the following:

- Written documentation of vaccination with 2 doses of the MMR vaccine administered at least 28 days apart.
- Laboratory evidence of immunity (IgG positive). Equivocal IgG results should be considered negative.
- Laboratory confirmation of disease.

Healthcare workers born before 1957 who lack laboratory evidence of immunity or laboratory evidence confirmation of previous disease should receive the MMR vaccine. During an outbreak, healthcare facilities should vaccinate healthcare personnel with the MMR vaccine, regardless of birth date.

Do people who received the killed measles vaccine in the 1960s need to be revaccinated with the current, live measles vaccine?

Yes, patients who received the killed measles vaccine should be revaccinated with the current, live measles-mumps-rubella (MMR) vaccine. If it is uncertain which vaccine the patient received, you could test the patient's blood to determine whether they're immune, or they can get a dose of the MMR vaccine. There is no harm in getting another dose of the MMR vaccine.

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Do adults need one or two doses of the MMR vaccine?

Adults who are not considered high-risk and born after 1957 need at least one dose of measles vaccine or documentation of immunity.

Adults in high-risk settings should make sure they have had two doses separated by at least 28 days. These high-risk settings include students at post-high school education institutions, healthcare personnel, international travelers, and people who public health authorities determine are at increased risk for getting measles during a measles outbreak.

How long does it take for the MMR vaccine to provide protection?

People are usually fully protected 2 or 3 weeks after they receive the vaccine.

Do patients ever need a booster?

No. People who received two doses of measles vaccine as children according to the U.S. vaccination schedule are protected for life. Currently, there is not a catch-up schedule or recommendation from the CDC or ACIP for adults not at high-risk to receive a second dose. However, if the patient and provider decide an additional dose is appropriate, it is not harmful.

What if the patient is unsure of their immunity to measles?

If the patient does not have written documentation of measles immunity, they should seek advice from their medical provider to check for immunity and discuss receiving the MMR vaccine.

Does the West Virginia Department of Health provide immunoglobulin?

The healthcare provider can contact the WV Division of Immunization at (304) 558-2188 or (800) 642-3634 to request immune globulin intramuscular (IGIM) for measles post-exposure prophylaxis.

Can people who were given Immunoglobulin (IG) also get the MMR vaccine?

If a patient is given IG, they should wait at least 6 months to get an MMR vaccine or any other live vaccine. The IG may interfere with immune response to doses of live vaccines given within 6 months.

LABORATORY TESTING

Detection of measles-specific IgM antibody in serum and measles RNA by real-time polymerase chain reaction (RT-PCR) in respiratory and urine specimens are the most common methods for confirming measles infection.

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What laboratory testing should be done and when?

Immediately contact the local health department (LHD) if you suspect measles infection. The LHD will coordinate appropriate laboratory testing and will ensure that specimens are submitted to the appropriate laboratories for confirmation.

A **serum** sample, **nasopharyngeal (NP) or throat** swab, and **urine** sample should be obtained from any patient suspected with measles infection. Specimens should be collected as close to rash onset as possible, ideally within 3 days of rash onset and not more than 10 days after rash onset.

A nasopharyngeal (NP) swab (preferred) or throat swab AND urine specimens should be submitted for PCR testing. The LHD can coordinate testing with the West Virginia Office of Laboratory Services (OLS). Testing is done at no cost to the patient or testing facility. For laboratory questions, WV OLS can be reached at (304) 558-3530.

Serum samples for measles serology testing (IgM and IgG) will need to be sent to a commercial or clinical laboratory. Measles IgM serology can be falsely negative and may need to be repeated before excluding the diagnosis. Please be sure to specify **measles (rubeola) IgM and IgG** on the commercial laboratory order.

How should the specimens be stored and shipped?

- NP and throat swabs: Should be frozen and shipped at -70° C on dry ice.
- Urine: If shipping within 24 hours, ship on cold packs. If shipping is delayed, freeze at -70°C and ship frozen on dry ice.
- Serum: Refrigerate at 4°C. Do not freeze. Ship the serum on cold packs.

REPORTING

When is measles reportable?

Measles is a Category I reportable disease and is **reportable immediately to the local health department**. Healthcare Providers and laboratories should report via telephone any suspected cases of measles as soon as the disease is suspected. Reporting should not be delayed and should not wait for laboratory confirmation. The West Virginia reportable disease rule and reporting information can be found at <https://oeps.wv.gov/reporting/Pages/default.aspx>.

Physicians should be prepared to provide demographic, exposure, and detailed clinical information to the local health department to expedite public health investigation.

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POST-EXPOSURE PROPHYLAXIS (PEP)

Measles-containing vaccine (MMR) and/or immune globulin (IG) may prevent disease development or lessen the severity of disease if given in a timely manner to an exposed person.

What is the procedure for prophylaxis?

Post-exposure prophylaxis should be offered to anyone who cannot show proof of immunity, absent contraindications. Either the MMR vaccine (preferred), if administered within 72 hours of initial exposure, or immunoglobulin (IG), if administered within 6 days of exposure, may provide some protection or modify the clinical course of disease. Do not administer the MMR vaccine and IG simultaneously, as this practice invalidates the vaccine.

The MMR vaccine can prevent or lessen the severity of disease if given as post-exposure prophylaxis within 72 hours of first exposure. The MMR vaccine given to infants aged 6 to 11 months will not count as a valid dose and the infant will need to be revaccinated according to ACIP recommendations. People who had received one dose of MMR before exposure should receive a second dose, as long as it has been at least 28 days since the first dose.

Immune globulin (IG) should be given as PEP as soon as possible and no later than 6 days after the first exposure to the following groups of people:

- Infants aged less than 6 months old (intramuscular IG or IGIM)
- Infants aged 6 to 12 months who did not receive the MMR vaccine within 72 hours of exposure (IGIM)
- Pregnant women who are not immune to measles (intravenous IG or IGIV)
- Severely immunocompromised persons regardless of prior immunity to measles (IGIV)

TRAVEL RECOMMENDATIONS

What are the international travel recommendations?

Infants aged 6-11 months should receive 1 dose of the MMR vaccine before international travel, ideally at least two weeks prior to travel. Infants who receive the MMR vaccine before their first birthday should receive 2 additional doses (1 dose at age 12–15 months and another dose at least 28 days after the first dose) according to the routine recommended schedule.

Adults should have two doses of the MMR vaccine before international travel.

What are the domestic travel recommendations?

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When considering domestic travel, providers should advise patients to carefully consider the risk of exposure while visiting another area. Consideration should also be given to the epidemiology of measles in the destination state or community.

Health departments in states or communities experiencing outbreaks with sustained, community-wide transmission affecting preschool-aged children or adults and with ongoing risk of exposure may consider a second dose for children aged 1 through 4 years or adults in the affected areas (including visitors) who have received 1 dose; the second dose given at least 28 days after the first dose.

Health departments in states or communities experiencing sustained, community-wide transmission affecting infants <12 months of age and with ongoing risk of exposures to infants may consider vaccination of infants aged 6-11 months in the affected areas (including visitors) with 1 dose of the MMR vaccine. This recommendation should be made following careful assessment of the benefit of early protection against measles during a period of increased transmission and exposure, and risk of decreased immune response following subsequent MMR doses in infants vaccinated at <12 months of age compared with infants vaccinated at ≥12 months of age. Decisions to vaccinate infant visitors <12 months of age should follow local health department guidance of the affected area (e.g., if no recommendation was made to vaccinate infant residents, vaccination of infant visitors is not recommended). This dose does not count as one of the two recommended doses; infants who receive one dose of the MMR vaccine before their first birthday should receive two more doses according to the routinely recommended schedule (one dose at 12 through 15 months of age and another dose at 4 through 6 years of age or at least 28 days later).

OCCUPATIONAL HEALTH

Serologic Testing of Healthcare Personnel (HCP) Prior to Vaccination

In non-outbreak settings, the Centers for Disease Control and Prevention (CDC) and the Advisory Committee on Immunization Practices (ACIP) do not recommend screening HCP for immunity (checking titers) prior to vaccination, unless the facility considers it cost effective. If the HCP has 2 documented doses of the MMR vaccine or other acceptable evidence of measles immunity, serologic testing for immunity is not recommended.

In outbreak settings, the CDC and ACIP do not recommend serologic screening for measles immunity prior to vaccination.

If serologic immunity testing is being conducted, please ensure that ONLY IgG testing is requested. IgM testing is for acute disease and false positive IgM results are common when testing healthy people.

What if a healthcare worker has documentation of 2 doses of the MMR vaccine, but their serologic testing is negative or equivocal?

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If the HCW has documentation of 2 doses of the MMR vaccine, the CDC and ACIP do not recommend serologic testing for immunity. If testing is done and results in a negative or equivocal titer, it is not recommended that they receive an additional dose of the MMR vaccine. Documented age-appropriate vaccination supersedes the results of subsequent serologic testing.

If the HCW **does not** have documentation of 2 doses of the MMR vaccine and serologic testing results in negative, indeterminate, or equivocal they should be considered not immune and should receive 2 doses of the MMR vaccine, separated by 28 days. Post-vaccination serologic testing is not recommended.

RESOURCES

WV DHHR Office of Epidemiology & Prevention Services Measles Information:

<https://oeps.wv.gov/measles/pages/default.aspx>

CDC Measles in the U.S. FAQ:

<https://www.cdc.gov/measles/about/faqs.html>

CDC for Healthcare Providers:

<https://www.cdc.gov/measles/hcp/index.html>

CDC Measles Vaccination:

<https://www.cdc.gov/measles/vaccination.html>

CDC for Public Health Professionals:

<https://www.cdc.gov/measles/stats-surv.html>

CDC Outbreak Toolkit for Healthcare Providers: <https://www.cdc.gov/measles/toolkit/healthcare-providers.html>

Measles Vaccine MMWR:

<https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm>

CDC Vaccine Safety Measles, Mumps, Rubella (MMR) Vaccine

[https://www.cdc.gov/vaccinesafety/vaccines/mmr-vaccine.html#:~:text=The%20Measles%2C%20Mumps%2C%20Rubella%20\(,any%20serious%20problems%20with%20it.](https://www.cdc.gov/vaccinesafety/vaccines/mmr-vaccine.html#:~:text=The%20Measles%2C%20Mumps%2C%20Rubella%20(,any%20serious%20problems%20with%20it.)

[https://www.cdc.gov/vaccinesafety/vaccines/mmr-vaccine.html#:~:text=The%20Measles%2C%20Mumps%2C%20Rubella%20\(,any%20serious%20problems%20with%20it.](https://www.cdc.gov/vaccinesafety/vaccines/mmr-vaccine.html#:~:text=The%20Measles%2C%20Mumps%2C%20Rubella%20(,any%20serious%20problems%20with%20it.)

American Society for Microbiology Why Do Some Vaccines Work Better Than Others?

<https://asm.org/articles/2024/march/why-some-vaccines-work-better-than-others#:~:text=Compared%20to%20some%20other%20viruses,other%20ssRNA%20viruses%2C%20it%20does.>

<https://asm.org/articles/2024/march/why-some-vaccines-work-better-than-others#:~:text=Compared%20to%20some%20other%20viruses,other%20ssRNA%20viruses%2C%20it%20does.>

CDC Measles Cases and Outbreaks: [https://www.cdc.gov/measles/cases-](https://www.cdc.gov/measles/cases-outbreaks.html#:~:text=There%20have%20been%207%20outbreaks,58)%20were%20outbreak%2Dassociated)

[outbreaks.html#:~:text=There%20have%20been%207%20outbreaks,58\)%20were%20outbreak%2Dassociated](https://www.cdc.gov/measles/cases-outbreaks.html#:~:text=There%20have%20been%207%20outbreaks,58)%20were%20outbreak%2Dassociated)

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