

Rubella (German Measles)

Summary

Rubella is an infectious viral disease characterized by mild clinical disease, where cases are often subclinical, when symptomatic individuals may present with an erythematous maculopapular rash, lymphadenopathy and a low-grade fever. Infection with the rubella virus causes two distinct illnesses: congenital rubella syndrome (CRS) and postnatal rubella. Rubella virus occurs worldwide. It is most prevalent in winter and spring. In the United States, rubella has been largely controlled after the advent of immunization. The incidence of rubella in the U.S. has decreased by approximately 99% from the pre-vaccine era. Epidemic rubella in the U.S. last occurred in 1964.

Agent

Rubella virus is in the *Togaviridae* family, genus *Rubivirus*.

Transmission

Reservoir:

Humans.

Mode of transmission:

For postnatal rubella, direct or droplet contact with nasopharyngeal secretions of infected persons. Infants with CRS may shed virus in nasopharyngeal secretions and urine for one year or more and can transmit infection to susceptible contacts.

Period of communicability:

A few days to 7 days after the onset of rash. Infants with CRS may shed virus in nasopharyngeal secretions and urine for one year or more and can transmit infection to susceptible contacts.

Clinical Disease

Incubation period:

For postnatally acquired rubella, usually 16-18 days; range 14-21 days.

Illness:

Postnatal rubella is usually a mild disease with diffuse erythematous maculopapular rash, lymphadenopathy (commonly sub-occipital, postauricular and cervical) and fever. Adults sometimes have a prodromal illness of headache, malaise, coryza, and conjunctivitis. Arthralgias and arthritis can frequently complicate postnatal rubella, especially in females. Leukopenia and thrombocytopenia can occur, but hemorrhagic complications are rare. Encephalitis occurs more often in adult cases.

The most common anomalies in Congenital Rubella Syndrome are ophthalmologic (cataracts, retinopathy and congenital glaucoma), cardiac, auditory (sensorineural deafness) and neurologic (behavioral disorders, mental retardation, and meningoencephalitis). Infants often suffer from growth retardation and acutely after birth may have hepatosplenomegaly, thrombocytopenia, purpuric skin lesions (blueberry muffin syndrome), and radiolucent bone disease. Occurrence of congenital defects is 50% or greater if infection occurs during the first month of gestation, 20-30% if during the second month and 5% if during the 3rd or 4th month.

Laboratory Diagnosis

Serology is usually used for diagnosis. A positive rubella-specific IgM antibody or a significant rise in rubella-specific IgG antibody is indicative of infection. Sera should be collected as early as possible, but within 7-10 days of illness onset and then 2-3 weeks later for convalescent titers. Serum rubella IgM test results can be falsely positive in persons with other viral infections (e.g., acute infection with Epstein-Barr virus [infectious mononucleosis], recent cytomegalovirus infection, and parvovirus infection) or in the presence of rheumatoid factor.

Congenital infection can be confirmed by rubella-specific IgM in a newborn infant, but also by stable or rising rubella-specific IgG over several months.

Rubella virus can be detected using appropriate cell culture from nasal specimens, throat swabs, blood, urine, or cerebrospinal fluid (particularly in CRS).

Polymerase chain reaction (PCR) for rubella virus may be available from some laboratories.

Treatment

Supportive.

Surveillance

Case Definition:

Laboratory criteria- rubella infection confirmed by one or more of the following laboratory tests:

- Isolation of rubella virus;
- Detection of rubella-virus specific nucleic acid by polymerase chain reaction or
- IgG seroconversion or a significant rise between acute- and convalescent-phase titers in serum rubella IgG antibody level by any standard serologic assay or
- Positive serologic test for rubella IgM antibody (not explained by MMR vaccination during the previous 6-45 days and not otherwise ruled out by more specific testing in a public health laboratory).

Serum rubella IgM test results that are false positives have been reported in persons with other viral infections (e.g., acute infection with Epstein-Barr virus (infectious mononucleosis), recent cytomegalovirus infection, and parvovirus infection) or in the presence of rheumatoid factor.

Confirmed-A laboratory confirmed case with or without symptoms, or a person epi-linked to a laboratory confirmed case of rubella, or a case with illness characterized by all of the following:

- Acute onset of generalized maculopapular rash;
- Temperature greater than 99.0°F or 37.2°C;
- Arthralgia, arthritis, lymphadenopathy, or conjunctivitis;

Probable - In the absence of a more likely diagnosis, an illness characterized by all of the following:

- Acute onset of generalized maculopapular rash; and

- Temperature greater than 99.0° F or 37.2° C, if measured; and
- Arthralgia, arthritis, lymphadenopathy, or conjunctivitis; and
- Lack of epidemiologic linkage to a laboratory confirmed case of rubella; and
- Noncontributory or no serologic or virologic testing.

Suspected - Any generalized rash illness of acute onset that does not meet the criteria for probable or confirmed rubella or any other illness.

Epidemiologic Classification

Internationally imported case: An internationally imported case is defined as a case in which rubella results from exposure to rubella virus outside the U.S. This is evidenced by at least some of the exposure period (12–23 days before rash onset) occurring outside the U.S. and the onset of rash within 23 days of entering the United States (U.S.) and no known exposure to rubella in the U.S. during that time. All other cases are considered U.S.-acquired cases.

U.S.-acquired case: A U.S.-acquired case is defined as a case in which the patient had not been outside the United States during the 23 days before rash onset or was known to have been exposed to rubella within the U.S. These cases are subclassified into four mutually exclusive groups:

- Import-linked case: Any case in a chain of transmission that is epidemiologically linked to an internationally imported case.
- Imported-virus case: Any case for which an epidemiologic link to an internationally imported case was not identified but for which viral genetic evidence indicates an imported rubella genotype (i.e., a genotype that is not occurring within the U.S. in a pattern indicative of endemic transmission). An endemic genotype is the genotype of any rubella virus that occurs in an endemic chain of transmission (i.e., lasting ≥ 12 months). Any genotype that is found repeatedly in U.S.-acquired cases should be thoroughly investigated as a potential endemic genotype, especially if the cases are closely related in time or location.
- Endemic case: A case for which epidemiological or virological evidence indicates an endemic chain of transmission. Endemic transmission is defined as a chain of rubella virus transmission continuous for ≥ 12 months within the U.S.
- Unknown source case: A case for which an epidemiological or virological link to importation or to endemic transmission within the U.S. cannot be established after a thorough investigation. These cases must be carefully assessed epidemiologically to assure that they do not represent a sustained U.S.-acquired chain of transmission or an endemic chain of transmission within the U.S.

Internationally imported, import-linked, and imported-virus cases are considered collectively to be import-associated cases. States may also choose to classify cases as “out-of-state-imported” when imported from another state in the U.S. For national reporting, however, cases will be classified as either internationally imported or U.S.-acquired.

Congenital Rubella Syndrome Case Definition:

Clinical case definition - An illness, usually manifesting in infancy, resulting from rubella infection *in utero* and characterized by signs or symptoms from the following categories:

- Cataracts/congenital glaucoma, congenital heart disease (most commonly patent ductus arteriosus or peripheral pulmonary artery stenosis), hearing impairment, pigmentary retinopathy.
- Purpura, hepatosplenomegaly, jaundice, microcephaly, developmental delay, meningoencephalitis, radiolucent bone disease.
- Presence of any congenital defect(s) or laboratory data consistent with congenital rubella infection. Infants with congenital rubella syndrome usually present with more than one sign or symptom consistent with congenital rubella infection. However, infants may present with a single defect. Hearing impairment is the most common single defect.

Laboratory criteria - Isolation of rubella virus from clinical specimen, or infant rubella-specific IgG antibody level that persists at a higher level and for a longer period than expected from passive transfer of maternal antibody or positive serologic test for rubella-specific IgM antibody or positive PCR from a clinical specimen.

Confirmed - A clinically consistent case that is laboratory confirmed.

Probable - A case that is not laboratory confirmed and that has any two complications listed in bullet one of the clinical case definition; or one complication from bullet one and one from the second bullet and lacks evidence of any other etiology.

Suspected - A case with some compatible clinical findings but does not meet the criteria for a probable case.

Infection only - A case that demonstrates laboratory evidence of infection, but without any clinical symptoms or signs.

Epidemiologic Classification of Internationally-Imported and U.S.-Acquired

Congenital Rubella Syndrome cases will be classified epidemiologically as internationally imported or U.S.-acquired, according to the source of infection in the mother, using the definitions below, which parallel the classifications for rubella cases.

Internationally imported case: To be classified as an internationally imported CRS case, the mother must have acquired rubella infection outside the U.S. or in the absence of documented rubella infection, if the mother was outside the U.S. during the period when she may have had exposure to rubella that affected her pregnancy (from 21 days before conception and through the first 24 weeks of pregnancy).

U.S. -acquired case: A U.S.-acquired case is one in which the mother acquired rubella from an exposure in the U.S. U.S.-acquired cases are subclassified into four mutually exclusive groups:

- **Import-linked case:** Any case in a chain of transmission that is epidemiologically linked to an internationally imported case.
- **Import-virus case:** A case for which an epidemiologic link to an internationally imported case was not identified but for which viral genetic evidence indicates an imported rubella genotype (i.e., a genotype that is not occurring within the U.S. in a pattern indicative of endemic transmission). An endemic genotype is the genotype of any rubella virus that occurs in an endemic chain of transmission (i.e., lasting ≥ 12 months). Any genotype that is found repeatedly in U.S.-acquired cases should be thoroughly investigated as a potential endemic genotype, especially if the cases are closely related in time or location.

- **Endemic case:** A case for which epidemiological or virological evidence indicates an endemic chain of transmission. Endemic transmission is defined as a chain of rubella virus transmission continuous for ≥ 12 months within the U.S.
- **Unknown source case:** A case for which an epidemiological or virological link to importation or to endemic transmission within the U.S. cannot be established after a thorough investigation. These cases must be carefully assessed epidemiologically to assure that they do not represent a sustained U.S.-acquired chain of transmission or an endemic chain of transmission within the U.S.

Internationally imported, import-linked, and imported-virus cases are considered collectively to be import-associated cases.

Reporting: Report all suspected or confirmed cases of rubella or CRS to the Epidemiology and Response Division (ERD) at 505-827-0006. Information needed includes: patient's name, age, sex, race, ethnicity, home address, home phone number, occupation, and health care provider.

Case Investigation:

Complete the CDC Rubella Surveillance Worksheet and mail to the Epidemiology and Response Division, P.O. Box 26110, Santa Fe, New Mexico 87502-6110, or fax to 505-827-0013. Investigation information should also be entered in NM-EDSS per established procedures.

Control Measures

The goal of controlling rubella infections is to prevent birth defects in the fetuses of susceptible mothers.

1. Case management
 - 1.1. Isolation: Standard and droplet precautions are recommended for seven days following the onset of rash. Contact precautions are required for up to one year for children with CRS, unless nasopharyngeal and urine cultures after three months of age are repeatedly negative.
 - 1.2. Prophylaxis: Not applicable.
2. Contact management
 - 2.1. Isolation: None required.
 - 2.2. All contacts should be traced with particular attention to pregnant or potentially pregnant contacts.
 - 2.3. Pregnant contacts should be tested for rubella susceptibility or early infection.
 - 2.4. Prophylaxis: Immune globulin (IG) has been used for post-exposure prophylaxis in early pregnancy for exposed susceptible women in whom termination of pregnancy is not an option. If given early after exposure in the first trimester, IG may modify or suppress signs and symptoms; however, the benefits of using rubella specific IG is unknown.
 - 2.5. Immunization of contacts, while not contraindicated (except during pregnancy when live virus immunization should not be used), may not necessarily prevent infection or illness.
3. Prevention

- 3.1. Routine immunization is the primary mechanism to control rubella infection. Rubella vaccine is a live, attenuated virus vaccine. Typically, it is combined with measles and mumps into the MMR vaccine. The immunization is recommended for children aged 12-15 months, followed by a second immunization preferably at 4-6 years of age or 11-12 years of age. Over 95% of those vaccinated aged 12 months and older develop serologic evidence of rubella immunity after a single dose.
- 3.2. Emphasis should be placed on the immunization of at-risk persons, including health care workers, child care workers, other persons who have contact with young children or congregate at institutions (e.g., colleges, military sites), and foreign-born persons (especially women of reproductive age). Those persons who have not received at least one dose of vaccine or who have no serologic evidence of immunity are considered susceptible and should be immunized with MMR vaccine.
- 3.3. Postnatal rubella cases occurring in the first trimester of pregnancy should be counseled concerning risk to the fetus.

Managing Rubella in Child Care Centers and Schools

Adults or children with postnatal rubella should be excluded from work, school, or child care for seven days following the onset of rash.

All persons having contact with a child with CRS should be assured to be immune to rubella. CRS children can shed virus for prolonged periods (up to one year of age). Children with CRS in child care should be considered contagious until they are at least one year old, unless nasopharyngeal and urine cultures are repeatedly negative for rubella virus.

References

American Academy of Pediatrics. In: Kimberlin, DW, et al eds. Red Book: 2018 Report of the Committee on Infectious Diseases. 31st ed. Itasca, IL: American Academy of Pediatrics; 2018.

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Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. William Atkinson, MD, MPH; Charles (Skip) Wolfe; Jennifer Hamborsky, MPH, CHES, eds. 12th ed. Washington DC: Public Health Foundation, May 2012.

See Rubella Fact Sheets ([English](#)) ([Spanish](#)).