

## MEASLES (Rubeola)

### REPORTING INFORMATION

- **Class A:** *Report immediately via telephone* the case or suspected case and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report immediately via telephone to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism: *Immediately via telephone.*
- [CDC Measles Surveillance Worksheet](#) is available for use to assist in local health department disease investigation and contact tracing activities. Information collected from the form should be entered into the Ohio Disease Reporting System (ODRS) and not sent to the Ohio Department of Health (ODH), unless otherwise requested.
- Additional reporting information, with specifics regarding the key fields for ODRS Reporting can be located in [Section 7](#).

### AGENT

Measles virus, an RNA virus with one antigenic type. It is a paramyxovirus of the genus *Morbillivirus*.

### CASE DEFINITION

#### Clinical Case Definition

An illness characterized by **all** of the following:

- Generalized rash lasting  $\geq 3$  days,
- Temperature  $\geq 101.0^{\circ}$  F ( $\geq 38.3^{\circ}$  C),
- Cough, coryza or conjunctivitis.

#### Laboratory Criteria for Diagnosis

- Positive serologic test for measles immunoglobulin M (IgM) antibody
- Significant rise in measles antibody level by any standard serologic assay
- Isolation of measles virus from a clinical specimen *or*
- Detection of measles-specific nucleic acid by polymerase chain reaction.

#### Case Classification

Suspect: any febrile illness accompanied by generalized maculopapular rash.

Probable: a case that meets the clinical case definition, has non-contributory or no serologic or virologic testing, *and* is not epidemiologically linked to a confirmed case.

Confirmed: a case that is laboratory confirmed *or* that meets the clinical case definition and is epidemiologically linked to a confirmed case. A laboratory-confirmed case does not need to meet the clinical case definition.

Not a Case: This status will not generally be used when reporting a case, but may be used to reclassify a report if investigation revealed that it was not a case.

**Note:** [applies in Ohio]: Two probable cases that are epidemiologically linked but not serologically confirmed would be considered to be confirmed. However, at

least one case should be confirmed by culture in each documented chain of transmission.

### **Epidemiologic Classification for Measles of Internationally-Imported and U.S.-Acquired**

*Internationally imported case:* An internationally imported case is defined as a case in which measles results from exposure to measles virus outside the United States as evidenced by at least some of the exposure period (7-21 days before rash onset) occurring outside the United States and rash onset occurring within 21 days of entering the United States and there is no known exposure to measles in the U.S. during that time. All other cases are considered U.S.-acquired.

*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 21 days before rash onset or was known to have been exposed to measles within the United States.

U.S.-acquired cases are sub-classified 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:** a case for which an epidemiologic link to an internationally imported case was not identified, but for which viral genetic evidence indicates an imported measles genotype (i.e. a genotype that is not occurring within the United States in a pattern indicative of endemic transmission). An endemic genotype is the genotype of any measles virus that occurs in an endemic chain of transmission (i.e. lasting  $\geq 12$  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 measles virus transmission that is continuous for  $\geq 12$  months within the United States.

**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.

**Note 1:** Internationally imported, import-linked, and imported-virus cases are considered collectively to be import-associated cases.

**Note 2:** States may also choose to classify cases as "out-of-state-imported" when imported from another state in the United States. For national reporting, however, cases will be classified as either internationally imported or U.S.-acquired.

### **SIGNS AND SYMPTOMS**

Measles infections classically are described as having a prodromal period with a fever of 103-104° F, coryza, conjunctivitis, cough and photophobia for 2-4 days. Then a

maculopapular rash appears on the face which spreads to the trunk and finally to the extremities. The rash and other symptoms normally subside in 7-9 days. Koplik spots may be observed on the buccal mucosa just prior to and on the first day of the rash. Complications of measles include otitis media, pneumonia, cardiac manifestations, encephalitis and occasionally death. A slow virus disease associated with the measles virus is subacute sclerosing panencephalitis (SSPE).

Atypical measles syndrome (AMS) occurs in individuals who have received two or more doses of inactivated measles vaccine and is characterized by a rash on the extremities, high fever and frequently pneumonia.

Modified measles occurs in infants who still have maternal antibodies and in those who received measles vaccine or immune globulin soon after exposure.

## **DIAGNOSIS**

IgM obtained four days after the onset of rash is the preferred laboratory diagnostic procedure. If the titer is negative at that time, it can be repeated at seven days, or paired acute and convalescent sera can be tested for an increase in IgG antibody. The acute specimen should be taken as close to rash onset as possible and the convalescent specimen drawn two weeks after the acute. The latter method is less desirable because of the delay in definitive diagnosis.

## **EPIDEMIOLOGY**

### **Source**

Humans are the only natural host of the measles virus.

### **Occurrence**

Prior to the licensure of measles vaccine, the disease was widespread and common in childhood with over 90% of individuals having the disease by 20 years of age. Recently measles has been seen most frequently in preschool children and in young adults attending high schools or colleges. Measles occurs primarily in late winter and early spring.

### **Mode of Transmission**

By droplet spread or direct contact with nasal or throat secretions of infected persons. Tiny droplets can be suspended in the air for up to two hours or more. Measles virus is highly communicable.

### **Period of Communicability**

Communicability is greatest from four days before the onset of rash until four days after the onset of rash.

### **Incubation Period**

12-17 days, but usually 14 days, before the rash appears.

## **PUBLIC HEALTH MANAGEMENT**

### **Case**

#### Investigation

Local health agencies should screen suspect cases to see if they meet the case definition. Cases meeting the definition should be called immediately to the ODH Immunization Program. Acute and convalescent blood specimens should also be obtained when possible.

### Isolation

The Ohio Administrative Code (3701-3-13, (M)) states that "a person with measles shall be isolated, including exclusion from school or child care center, for four days following the onset of rash. Contagiousness may be prolonged in patients with altered immunity."

### **Contact**

All contacts should provide proof of a live measles immunization on or after their first birthday or previously physician diagnosed measles disease. In an outbreak situation involving child care or schools, demonstration of two doses of MMR will be required. Generally those born prior to 1957 are considered immune. Contacts who might be susceptible should be immunized with measles vaccine as soon after exposure as possible. Measles vaccine given within 72 hours after exposure may prevent or modify the disease. Immune globulin (IG) can prevent or modify measles in a susceptible person if given within six days of exposure. IG may be especially indicated for susceptible household contacts <1 year of age, pregnant women or immunocompromised persons, for whom the risk of complications is increased. Subsequent immunization should then be delayed for five months (to allow passive antibody to disappear) and until the individual is at least 12 months old.

### **Prevention and Control**

Susceptible persons who refuse immunization should be excluded from contact in schools and child care centers until two weeks after the last case has occurred.

IG should not be used in an attempt to control measles outbreaks.

### **Special Information**

Children attending licensed day care centers and schools accredited by the Ohio Department of Education are required to have a live measles vaccination on or after their first birthday. Starting in September 1999, all children entering kindergarten and all students in grades 7-12 are required to have received two doses of MMR (measles, mumps, and rubella) vaccine.

**What is measles?**

Measles is an acute, highly contagious respiratory disease caused by a virus. The virus normally grows in the back of the throat and in the cells that line the lungs. Since the introduction of the measles vaccination in 1963, the number of measles cases has decreased to about 100 cases reported annually in the United States.

**Who gets measles?**

Although measles is usually considered a childhood disease, it can be contracted at any age. In recent years, outbreaks have mainly involved high school and college students who are unvaccinated or have received only one dose of measles vaccine.

**How is measles spread?**

The virus resides in the mucus in the nose and throat of the infected person. When that person sneezes or coughs, droplets with virus spray into the air. The virus can land in other people's noses or throats when they breathe or put their fingers in their mouth or nose after handling an infected surface. The virus remains active and contagious on infected surfaces for up to 2 hours. Measles spreads so easily that anyone who is not immunized will probably eventually get it.

The disease is highly contagious, and can be transmitted from 4 days prior to the onset of the rash to 4 days after the onset. If one person has it, 90% of their susceptible close contacts will also become infected with the measles virus.

**What are the symptoms of measles?**

An individual's symptoms begin to appear about 10 to 12 days after exposure to the virus. The infected person first experiences a fever greater than or equal to 101 °F that lasts about 2 to 4 days. The fever can peak as high as 103 to 105 °F. This is followed by the onset of cough, runny nose, and/or conjunctivitis (pink eye). A red blotchy rash usually appears about 14 days after exposure and lasts 5 to 6 days. It begins at the hairline, then involves the face and upper neck. Over the next 3 days, the rash gradually proceeds downward and outward, reaching the hands and feet. Koplik spots (little white spots) may also appear on the gums and inside of the cheeks.

**How soon do symptoms appear?**

Symptoms usually appear in 10-12 days, although they may occur as early as seven or as late as 18 days after exposure.

**When and for how long is a person able to spread measles?**

An individual is able to transmit measles from four days prior to and four days after rash onset.

**Does past infection make a person immune?**

Yes. Permanent immunity is acquired after contracting the disease.

**What is the treatment for measles?**

There is no specific treatment for measles.

**What are the complications associated with measles?**

Approximately 20% of reported measles cases experience one or more complications. These complications are more common among children under 5 years of age and adults over 20 years old. As many as one out of 20 children with measles gets pneumonia, and about one child in every 1,000 who gets measles develops encephalitis. (This is an inflammation of the brain that can lead to convulsions, and can leave a child deaf or mentally retarded.) For every 1,000 children who get measles, one or two will die from it. In developing countries, where malnutrition and vitamin A deficiency are prevalent, measles has been known to kill as many as one out of four people. It is the leading cause of blindness among African children. Measles kills almost 1 million children in the world each year.

**How can measles be prevented?**

Adults born in 1957 or later who do not have a medical contraindication should receive at least one dose of MMR vaccine unless they have documentation of vaccination with at least one dose of measles-containing vaccine or a history of physician-diagnosed measles or laboratory confirmation of measles immunity. With the exception of women who might become pregnant and persons who work in medical facilities, birth before 1957 generally can be considered acceptable evidence of immunity to measles, mumps, and rubella. Children should receive two doses of MMR vaccine: the first dose should be given at 12 to 15 months of age and the second dose at four to six years of age (school entry). MMR vaccine is recommended for all measles vaccine doses to provide increased protection against all three vaccine-preventable diseases: measles, mumps and rubella. Measles immunization is required of all children enrolled in daycares and schools in Ohio.