COLORADO
Disease Control & Environmental Epidemiology Division
Department of Public Health & Environment

# Measles

## Colorado Communicable Disease Manual

Issued: 05/15/2015 Revised:

**24-Hour Reportable Disease**

## The Disease and Its Epidemiology

### A. Etiologic Agent

Measles virus is an RNA virus with one serotype, classified as a member of the genus Morbillivirus in the Paramyxoviridae family.

### B. Clinical Description

Measles is an acute illness characterized by fever, cough, coryza, conjunctivitis, a maculopapular rash, and Koplik spots (koplik spots are punctuate blue-white spots on the buccal mucosa that appear 1 to 2 days before rash onset). The prodrome lasts 2 to 4 days (range 1 to 7 days) and is characterized by fever, often as high as 103 to 105 degrees F. This is followed by the onset of cough, coryza (runny nose), and/or conjunctivitis. The measles rash is maculopapular and lasts 5 to 6 days. A typical measles rash begins at the hairline then spreads to the face. During the next 3 days, the rash spreads downward and outward towards the hands and feet.

Approximately 30% of reported measles cases have one or more complications. Complications are more common among children less than 5 years of age and adults greater than 20 years of age. Diarrhea, otitis media, croup, and pneumonia commonly occur in young children. Acute encephalitis, which may result in permanent brain damage, occurs in approximately one out of every 1000 cases. Death, predominately due to respiratory and neurological complications, occurs in one to three out of every 1000 cases reported in the United States.

### C. Reservoirs

Humans are the only known host. An asymptomatic carrier state has not been documented.

### D. Modes of Transmission

Measles is transmitted primarily via large respiratory droplets. Airborne transmission via aerosolized droplet nuclei has been documented in closed areas (e.g., office examination room) for up to 2 hours after a person with measles occupied the area.

### E. Incubation Period

The incubation period is usually 8 to 14 days (range of 7 to 21 days).

### F. Period of Communicability or Infectious Period

Measles is highly communicable with greater than 90% secondary attack rates among susceptible persons. Typically, a person is infectious for 3 to 5 days before to 4 days after rash onset. For disease control purposes, consider measles cases infectious 4 days prior to rash onset through 5 days of rash (4 days after rash onset with the day of onset counted as day 0).

Maximum communicability occurs from onset of prodrome through the first 3 to 4 days of rash. Persons with T-cell deficiencies (particularly persons with leukemia, lymphoma, and AIDS may shed virus for several weeks after the acute illness.

### G. Epidemiology

Before the introduction of measles vaccine in 1963, infection with measles virus was nearly universal during childhood and more than 90% of persons were immune by age 15 years. The highest incidence was among 5 to 9 year olds, who generally accounted for more than 50% of reported cases. Following the licensure of vaccine in 1963, the incidence of measles decreased by more than 98%. Fewer than 150 cases were reported each year during 1997–2004 and measles incidence decreased to a record low of 37 reported cases in 2004. However, the disease is still common throughout the world, including some countries in Europe, Asia, the Pacific, and Africa. In 2011, there were 222 cases of measles in the US and 17 outbreaks. Nearly 40% of these cases were imported, and the remainder was the result of secondary spread. In 2012, the number of measles cases declined to 55 cases, which is closer to the average number of U.S. cases.

However, in 2014 the U.S. experienced 23 measles outbreaks totaling 668 cases, including one large outbreak of 383 cases, occurring primarily among unvaccinated Amish communities in Ohio. Many of the cases in the U.S. in 2014 were associated with cases brought in from the Philippines, which experienced a large measles outbreak. During Jan. 4 – April 2, 2015, a total of 159 measles cases (155 U.S. residents and four foreign visitors) from 18 states and the District of Columbia were reported to CDC. One hundred eleven cases have been associated with an outbreak that originated in late December 2014 in Disney theme parks in Orange County, California. In 2015, Colorado had one measles case associated with the Disney theme park outbreak.

## Case Definition

### Clinical Description

An acute illness characterized by all the following:

- A generalized maculopapular rash lasting greater than or equal to 3 days; and
- A temperature greater than or equal to 101.0°F (greater than or equal to 38.3°C); and
- Cough, coryza, or conjunctivitis

### Laboratory Criteria for Diagnosis

- Isolation of measles virus from a clinical specimen; not explained by MMR vaccination during the previous 6 to 45 days; or
- Detection of measles-virus specific nucleic acid from a clinical specimen using polymerase chain reaction; not explained by MMR vaccination during the previous 6 to 45 days; or
- IgG seroconversion or a significant rise in measles immunoglobulin G antibody using any evaluated and validated method; not explained by MMR vaccination during the previous 6 to 45 days; or
- A positive serologic test for measles IgM antibody not explained by MMR vaccination during the previous 6 to 45 days and not otherwise ruled out by other confirmatory testing or more specific measles testing in a public health laboratory.

## Case Classification (new in 2013)

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| Confirmed: | An acute febrile rash illness (temperature does not need to reach ≥101°F/38.3°C and rash does not need to last ≥3 days) with:<br>• Isolation of measles virus from a clinical specimen; not explained by MMR vaccination during the previous 6 to 45 days; or<br>• Detection of measles-virus specific nucleic acid from a clinical specimen using polymerase chain reaction; not explained by MMR vaccination during the previous 6 to 45 days; or<br>• IgG seroconversion or a significant rise in measles immunoglobulin G antibody using any evaluated and validated method; not explained by MMR vaccination during the previous 6 to 45 days; or<br>• A positive serologic test for measles IgM antibody not explained by MMR vaccination during the previous 6 to 45 days and not otherwise ruled out by other confirmatory testing or more specific measles testing in a public health laboratory; or<br>• Direct epidemiologic linkage to a case confirmed by one of the methods above. |
| Probable: | In the absence of a more likely diagnosis, a case that meets the clinical description, with noncontributory or no measles lab testing, and is not epidemiologically linked to a laboratory-confirmed case. |

Note: CDC does not request or accept reports of suspect cases so this category is no longer needed for national reporting purposes.

Epidemiologic Classification: All confirmed cases should be classified as Internationally imported cases or U.S. acquired cases. A detailed travel history including dates of travel and locations are needed to classify measles cases.

For epidemiologic classification definitions see:
http://wwwn.cdc.gov/NNDSS/script/casedef.aspx?CondYrID=908&DatePub=1/1/2013

# Reporting Criteria

## What to Report to the Colorado Department of Public Health and Environment (CDPHE) or local health agency

- All persons suspected of having measles whether or not supporting laboratory data are available.
- Measles cases should be reported within 24 hours of a positive laboratory test or clinical diagnosis.
- Cases should be reported using telephone, fax or the Colorado Electronic Disease Reporting System (CEDRS) to CDPHE or local health departments. See below for phone and fax numbers.

## Purpose of Surveillance and Reporting

- To identify cases for investigation.
- To identify sources and sites of transmission, and any additional cases.
- To identify exposed persons, assure timely administration of prophylactic vaccination, and prevent further spread of the disease.
- To promptly identify clusters and potential outbreaks of disease.
- To monitor trends in disease incidence.
- To monitor vaccine coverage of at risk populations.

## Important Telephone and Fax Numbers

CDPHE Communicable Disease Epidemiology Branch

- Phone: 303-692-2700 or 800-866-2759
- Fax: 303-782-0338
- After hours: 303-370-9395

CDPHE Microbiology laboratory: 303-692-3480

Communicable Disease (CD) Manual website: https://www.colorado.gov/pacific/cdphe/communicable-disease-manual

## State Laboratory Services

Even with the excellent laboratory tests available, some false-positive results will occur. To minimize the problem of false-positive laboratory results, case investigation and laboratory tests should be restricted to patients most likely to have measles, *i.e.*, those with fever *and* generalized maculopapular rash. Testing for measles in patients with no rash, no fever, a vesicular rash, or a rash limited to the diaper area might lead to false-positive results.

### Laboratory Testing Recommendations

#### Serology

- A serologic test for IgM antibody to measles virus in a single serum specimen, obtained at the first contact with the suspected measles patient, is a recommended method for diagnosing acute measles.
- A single-specimen test for IgG antibody is the most commonly used test for immunity to measles because IgG antibody is long lasting.
- It is recommended that persons suspected of having measles are tested for measles immunity and for acute measles disease by testing for both IgG and IgM antibody.
- Paired sera (acute- and convalescent-phase) may be tested for demonstration of a rise in IgG antibody to measles virus to confirm acute measles infection.
- When a patient suspected of having measles has been recently vaccinated (6 to 45 days prior to blood collection), neither IgM nor IgG antibody responses can distinguish between measles disease and the response to vaccination. If a person is highly suspected of having measles and they have been recently vaccinated, a specimen for measles virus detection (PCR or culture) should be collected to send to the Centers for Disease Control and Prevention (CDC) to test for wild –type virus.

#### Virus detection

- Isolation of measles virus in culture or detection of measles virus in clinical specimens confirms the diagnosis of measles, regardless of clinical presentation.
- A negative culture or negative RT–PCR does not rule out measles because both methods are affected by the timing of specimen collection and the quality and handling of the clinical specimens.
- Specimens (urine, nasopharyngeal aspirates or throat swabs) for PCR obtained from persons with clinically suspected cases of measles should be shipped to the state public health laboratory under the direction of a state or regional epidemiologist.
- Clinical specimens for PCR should be collected at the same time as samples taken for serologic testing.
- Because virus is more likely to be isolated when the specimens are collected within 3 days of rash onset, collection of specimens for virus isolation should not be delayed until laboratory confirmation is obtained. Clinical specimens should ideally be obtained within 7 days of rash onset and should not be collected more than 10 days after rash onset.
- Viral specimens should be stored appropriately while awaiting case confirmation through serologic testing unless the case was recently vaccinated. See Measles Specimen Collection https://www.colorado.gov/pacific/sites/default/files/CD_CD_VPD_Measles-Specimens-for-Diagnostic-Testing_1.pdf
- It is important to collect viral specimens if the person suspected of having measles has been exposed to a confirmed measles case or is part of a cluster/outbreak.

### Laboratory Testing Services Available

- CDPHE Microbiology laboratory can perform measles rtPCR testing on respiratory specimens or urine.
- Serologic testing for measles antibodies is widely available through commercial laboratories, and the CDPHE Serology Laboratory can test blood specimens for measles IgM antibodies.

- The CDPHE Serology Laboratory does not perform measles IgG antibody testing or viral isolation, but specimens for measles IgG and viral isolation may be shipped to CDC through the CDPHE laboratory under the direction of your CDPHE Field Epidemiologist.
- The CDPHE laboratory may charge a fee for measles testing.
- Testing may be provided free of charge if the specimen has been approved by CDPHE Communicable Disease Program staff as being part of a public health investigation.
- CDPHE Measles Specimen Collection instructions are available on the CD Manual website and CDC's guidelines for measles PCR, virus isolation and serology are available at the following links:
    - https://www.colorado.gov/pacific/sites/default/files/CD_CD_VPD_Measles-Specimens-for-Diagnostic-Testing_1.pdf
    - http://www.cdc.gov/measles/lab-tools/rt-pcr.html
    - http://www.cdc.gov/measles/lab-tools/serology.html
- Cases with positive measles IgM results at a commercial lab may need to be retested at the CDPHE laboratory if there is concern about the result being a false positive. The possibility of a false-positive IgM test is increased when: the IgM test was not an EIA, the case did not meet the clinical description, the case is an isolated indigenous case (no epidemiologic link to another confirmed case and no international travel) or measles IgG was detected within 7 days of rash onset.

## Case Investigation

Investigate all measles reports including all suspected cases. Cases should be investigated to:

- Determine whether suspected cases meet case definition.
- Identify close contacts and high-risk contacts of the case and if appropriate, provide prophylactic vaccination or appropriately exclude susceptible contacts to prevent secondary cases.
- Provide information about the disease, its transmission, and methods of prevention.
- Promptly identify clusters or outbreaks of disease and initiate appropriate prevention and control measures.
- Larger local health departments have primary responsibility for investigating suspected cases in their jurisdiction.
- Smaller local health departments should consult their CDPHE Field Epidemiologist to establish primary responsibility for investigating suspected cases in their jurisdiction.

### A. Case Investigation / Forms

Establish a diagnosis of measles.

- Interview case or case's guardian and the health care provider to determine demographics (including address, date of birth, gender, ethnicity and race) and a detailed description of symptoms and onset date and time (obtain medical record if possible or visit hospital to review the chart).
- Obtain immunization history as the patient may have a positive IgM test for measles antibody if recently vaccinated.
- Determine probable source of infection by detailing the patient's activities 7-18 days prior to rash onset including travel or visitors from foreign countries or out of state.
- Determine whether the case's symptoms are compatible with measles. If suspect case meets the clinical case definition or had been exposed to someone with measles, arrange and obtain appropriate diagnostic specimens (blood and viral specimens). Because measles is an extremely rare disease Colorado, clinical evidence is not sufficient to confirm a case. Laboratory diagnosis is crucial to confirm the few actual measles cases among the many of patients with suspected measles.
- Specimen collection instructions are available on the CD Manual website and CDC's guidelines for measles PCR, virus isolation and serology are available at the following links:
    - https://www.colorado.gov/pacific/sites/default/files/CD_CD_VPD_Measles-Specimens-for-Diagnostic-Testing_1.pdf
    - http://www.cdc.gov/measles/lab-tools/rt-pcr.html
    - http://www.cdc.gov/measles/lab-tools/serology.html

- Persons suspected of having measles should be excluded from work, school, or childcare and should voluntary self-isolate at home until 4 days after rash onset (day of rash onset is counted as day 0). If the suspect measles case becomes lab confirmed, the case must be isolated until 4 days after rash onset.
- Determine reported case classification; probable or confirmed and update CEDRS record including final case classification. All forms should be mailed or faxed (303-782-0338) to CDPHE. Surveillance forms can be obtained on the "Communicable Disease Guidelines and Manuals" web page at:
  - http://www.cdc.gov/vaccines/pubs/surv-manual/appx/appendix08-2-mea-wrsht.pdf (CDC Worksheet)
  - http://www.cdc.gov/vaccines/pubs/surv-manual/appx/appendix08-1-mea-wrsht-in.pdf (CDC Instructions for Worksheet)
- If multiple attempts to obtain case information are unsuccessful (e.g., the case, case's guardian or healthcare provider does not return your calls, or the person refuses to divulge information), contact a CDPHE epidemiologist to discuss the situation.

## B. Identify and Evaluate Contacts

The main purpose of identifying contacts is to determine which contacts are susceptible to measles and provide information regarding post-exposure prophylaxis with MMR vaccine or for high-risk contacts with Immune Globulin. Evidence of presumptive immunity to measles includes any of the following:

- Documentation of age-appropriate vaccination:
  - For preschool-aged children and adults not at high risk: documentation of at least one dose of measles vaccine administered on or after the first birthday.
  - For children in kindergarten through grade 12 and adults at high risk (i.e., persons working in health care facilities, international travelers, and students at post-high school educational institutions): documentation of two doses of measles vaccine separated by at least 28 days, with the first dose administered no earlier than the first birthday.
- Doses of MMR and other measles-containing vaccines administered before the first birthday should not be counted when determining adequacy of measles vaccination.
- Laboratory evidence of immunity or laboratory confirmation of disease.
- Born in the United States before 1957. Persons born outside the United States should meet one of the other criteria for measles immunity. For health care personnel, birth before 1957 should not be considered evidence of immunity.
- Documentation of physician diagnosed measles.

Assessing potential for transmission and identifying contacts

- Identify all contacts (4 days prior and 4 days after rash onset, with the day of rash onset counted as day 0) that had exposure to the case (were in the same room, home, airplane etc.) or were in these areas up to 2 hours after the case was present.
- Ensure only persons who are immune to measles are allowed to come in contact with the case until at least four days after rash onset.
- Symptomatic contacts should be reported immediately and investigated as suspect measles cases.
- Determine measles immunity status of all contacts (including medical personnel). See Case Investigation, section B (Identify and Evaluate Contacts) for presumptive evidence of immunity to measles
- Arrange urgent receipt of measles containing vaccine (MMR) for susceptible contacts age ≥ 6 months who were initially exposed within the past 72 hours, unless vaccine is contraindicated. (Note: receiving measles containing vaccine may abort infection in exposed persons if given within 72 hours of initial exposure). See Disease Control Measures, section B (Post-Exposure Prophylaxis), Post-Exposure Vaccination for vaccination information.
- Non-immune contacts that are unable to receive measles vaccine within 72 hours of exposure may be quarantined at home from the seventh through 21st day following exposure. See Case Investigation, section C (Reported Incidence is Higher than Usual / Outbreak Suspected) for more information on quarantine.

- If a measles exposure occurs within a school, all susceptible students and staff refusing measles containing vaccine or lacking proof of immunity to measles will be excluded from school until the outbreak is over, (i.e., until 21 days after the onset of rash in the last reported case).
- Immune Globulin (IG) should not be used to control measles outbreaks. IG is indicated for certain household contacts of measles patients, particularly those for whom the risk for complications is increased (i.e., infants ≤12 months, pregnant women, or immunocompromised persons).

### C. Reported Incidence Is Higher than Usual/Outbreak Suspected

- The primary strategy for control of measles outbreaks is achieving a high level of immunity (i.e., two doses of measles vaccine) in the population affected by the outbreak. Persons who cannot readily document measles immunity should be vaccinated or excluded from the setting (school, hospital, childcare). Only doses of vaccine with written documentation of the date of receipt should be accepted as valid. Verbal reports of vaccination without written documentation should not be accepted. Persons who have been exempted from measles vaccination for medical, religious, or other reasons should be excluded from affected institutions in the outbreak area until 21 days after the onset of rash in the last case of measles.
- For probable and confirmed cases, intensify surveillance by disseminating measles information to hospitals, emergency rooms, physicians, schools, and day care providers.
- Under special circumstances, such as during outbreaks in schools attended by large numbers of persons who refuse vaccination, restriction of an event or other quarantine measures might be warranted.
- A quarantine template is available at: https://www.colorado.gov/pacific/cdphe/measles
- The quarantine template should only be used in consultation with CDPHE as imposing quarantine measures for outbreak control is both difficult and disruptive to schools and other institutions.
- The quarantine template is not intended as, nor should it be construed as, legal advice; rather, it is meant to assist those preparing to issue an order of quarantine in thinking about the types of issues that one might address in such an order. Prior to finalizing any such public health order, it is recommended that legal advice be sought.

## Disease Control Measures

### A. Treatment

No specific antiviral treatment is available.

### B. Post-Exposure Prophylaxis

Post-Exposure Vaccination

- MMR vaccine is recommended for post-exposure prophylaxis of persons without evidence of measles immunity and who do not have contraindications to vaccination.
- Administration of MMR vaccine to susceptible contacts may abort infection or modify the disease if given within 72 hours of exposure.
- MMR vaccination of non-immune contacts may be recommended even if the time since exposure is >72 hours to provide protection from future exposure, especially if there is ongoing transmission in a particular setting such as a childcare, school or work setting.

Immune Globulin (IG)

- For most contacts, post exposure vaccination is preferable to use of IG.
- IG administered within 6 days of exposure may prevent or modify measles.
- IG is indicated for susceptible household or other close contacts of patients with measles for whom risk of complications is highest, particularly contacts younger than 12 months of age, pregnant women and immunocompromised persons.
- IG is not indicated for household or other close contacts who have received one dose of vaccine at 12 months of age or older unless they are immunocompromised.

## C. Vaccination

- Measles vaccine is incorporated with mumps and rubella vaccine as a combined vaccine (MMR). The Advisory Committee on Immunization Practices (ACIP) recommends a first dose at 12 to 15 months of age with a second dose at school entry (4 to 6 years) for routine vaccination.
- Measles vaccine is also now available incorporated with mumps, rubella and varicella vaccines as a combined vaccine (MMRV). ACIP recommends a first dose of MMRV for children aged 12 months to 12 years who need a first dose of measles, mumps, rubella (MMR), and varicella vaccine, or children aged 12 months to 12 years who need a second dose of MMR and either a first or second dose (as indicated) of varicella vaccine.
- During an outbreak, monovalent measles vaccine may be given to infants as young as 6 months of age. If monovalent vaccine is not available, MMR may be given. Children immunized before their first birthday should still be immunized with MMR vaccine at age 12 to 15 months (at least 4 weeks after the initial measles immunization) and again at age 4 to 6 years as seroconversion rates are significantly lower in those immunized before their first birthday.

## D. Education

- Advise contacts of the signs and symptoms of measles.
- A Health Alert Network (HAN) Advisory or Alert about measles may be sent to health care providers and hospitals. Sending a measles HAN should be discussed with CDPHE staff that can assist you in developing the notice.

## E. Managing Special Situations

### Childcare / Preschool

Refer childcare providers to the CDPHE, "Infectious Disease in Child Care and School Settings" https://www.colorado.gov/pacific/cdphe/infectious-disease-guidelines-schools-and-childcare-settings for additional measles information.

- Measles cases should be excluded from childcare and isolate themselves at home for 4 days after rash onset (day of rash onset is counted as day 0).
- Determine the dates the measles case attended childcare or preschool while infectious.
- Recommend that the childcare center or preschool notify parents, staff, and anyone entering the facility of the possible exposure to measles. CDPHE or the local health department can provide a sample letter.
- Childcare and preschool personnel should report all suspected measles cases to CDPHE or their local public health agency.
- Childcare staff and/or health department personnel should review the measles vaccination records of all children and staff at the facility.
- Children and staff who cannot readily document measles immunity should be vaccinated (if not contraindicated) or excluded from the setting. See Case Investigation, section A (Case Investigation / Form) for presumptive proof of measles immunity.
- Only doses of vaccine with written documentation of the date of receipt should be accepted as valid. Verbal reports of vaccination without written documentation should not be accepted.
- Persons who have been exempted from measles vaccination for medical, religious, or other reasons should be excluded from affected facilities in the outbreak area until 21 days after the onset of rash in the last case of measles.

### Schools and Colleges

Refer school personnel to the "Infectious Disease in Child Care and School Settings" at: https://www.colorado.gov/pacific/cdphe/infectious-disease-guidelines-schools-and-childcare-settings

- Measles cases should be excluded from school and isolate themselves at home during their infectious period (through 4 days after rash onset).
- Determine the dates the measles case attended school while infectious.
- Recommend school personnel notify students, parents and staff about a possible measles exposure. CDPHE or the health department can provide a sample letter.

- School personnel should report all suspect measles cases to CDPHE or their local public health agency.
- School and/or health department personnel should review measles immunization records or status of all students and staff.
- Determine whether the college or institution requires students to have two MMR vaccinations or an exemption to vaccination.
- Students attending school and Colorado colleges with residence hall facilities are required to have two MMR vaccinations or an exemption to vaccination if they are traditional college students (as defined by the institution) and born after 1956.
- See Case Investigation, section A (Case Investigation / Form) for presumptive proof of immunity.
- In a school with a measles outbreak, all persons who are not immune to measles should be vaccinated; this includes all students and their siblings and all school personnel born during or after 1957 who cannot provide documentation that they have received two doses of measles-containing vaccine on or after their first birthday or cannot provide other evidence of measles immunity (such as serologic testing).
- Persons who cannot readily provide documentation of measles immunity should be vaccinated or excluded from the school or other institution.
- Persons receiving second doses, as well as previously unvaccinated persons receiving their first dose as part of the outbreak control program may be immediately readmitted to school. Persons who continue to be exempted from or who refuse measles vaccination should be excluded from the school, childcare, or other institution until 21 days after the onset of rash in the last case of measles.
- If a measles exposure occurs within a school, all susceptible students and staff refusing measles containing vaccine or lacking proof of immunity to measles will be excluded from school until the outbreak is over, (i.e., until 21 days after the onset of rash in the last reported case).

### Patients and Staff in Health Care Facilities (Hospitals and Long Term Care Facilities)

Hospitals and long term care facilities generally have written infection control policies and procedures for handling cases of communicable disease among patients and staff members. If a facility does not have such policies in place, provide the following recommendations:

- Identify exposed personnel and patients and determine their immune status.
- If a measles exposure occurs within a health-care facility (e.g., hospital, clinic, physician office), all possibly exposed persons working at the facility without proof of measles immunity should receive a dose of MMR vaccine within 72 hours of exposure if not contraindicated.
- Measles immune globulin should be administered to exposed, susceptible patients and staff at increased risk of developing measles complications if not contraindicated.
- Susceptible personnel who have been exposed to measles should be relieved from patient contact and excluded from the facility from the 5th to the 21st day after exposure or until the facility is declared measles-free, regardless of whether they received vaccine or immune globulin after the exposure.
- Personnel who develop measles should be excluded from work and may not return to the facility until 7 days after rash onset. Health care personnel who develop measles are excluded from work for a longer period of time than other measles cases due to their high- risk occupation.

  a. Health-Care Personnel

    - Persons who work in healthcare facilities (including volunteers, trainees, nurses, physicians, technicians, receptionists, and other clerical and support staff) are at increased risk of exposure to measles, and all persons who work in such facilities in any capacity should be immune to measles to prevent any potential outbreak.
    - If a case is reported from the area served by a hospital, clinic, or other medical or nursing facility, all personnel born during or after 1957 should receive two doses of MMR vaccine, unless they have documentation of measles immunity. Personnel born before 1957 without documentation of measles immunity should receive one dose of MMR.
    - Serologic screening of healthcare workers after exposure to determine measles immunity is not generally recommended, because stopping measles transmission requires the
    - rapid vaccination of susceptible healthcare workers, which can be impeded by the need to screen, wait for results, and then contact and vaccinate susceptible persons. Serologic specimens for immunity testing may be collected at the time of vaccination.
    - Susceptible personnel who have been exposed to measles should be excluded from the

- facility from the fifth to the 21st day after exposure, regardless of whether they received vaccine or immune globulin after the exposure.
- Instruct health-care personnel to report any symptoms immediately.
- Exposed personnel who become ill should be relieved from all patient contact and excluded from the facility during their infectious period.

b. Patients

- Patients who are diagnosed with measles while hospitalized should be isolated using airborne and contact precautions for 4 days after rash onset (with day of rash onset counted as day 0). Immunocompromised patients should be isolated for the duration of their illness because they may shed measles virus for extended periods.
- Hospitalized measles cases should be attended by and visited only by persons who are immune to measles.
- Exposed susceptible patients should receive MMR vaccine within 72 hours of exposure if possible and vaccination is not contraindicated.
- All exposed susceptible patients should be discharged as soon as possible.
- All susceptible exposed patients (including those receiving with their first MMR vaccine dose within 72 hours of exposure) unable to be discharged should be placed in airborne and contact precautions from day 5 to day 21 after exposure.

Jails and Detention Centers

- Measles cases should be isolated from other prisoners and susceptible personnel for 4 days after rash onset (with day of rash onset counted as day 0).
- Determine dates the measles case was infectious and identify exposed prisoners and staff and visitors.
- Determine the measles immunity status of exposed personnel and prisoners.
- Provide MMR immunization to susceptible personnel and prisoners within 72 hours of exposure if possible and vaccination is not contraindicated.
- Measles immune globulin should be administered to exposed susceptible inmates and staff at increased risk of developing measles complications.

Airlines

- Measles cases should not travel by airplane until 4 days after rash onset (with day of rash onset counted as day 0).
- The Federal Quarantine Station will investigate and follow up on measles cases on domestic and international flights. Notify your state or regional epidemiologist if a measles case was on a flight while infectious.
- Obtain detailed flight information including flight numbers, airline, date and time of travel, seat number, and who the case sat next to (i.e., their family member, a friend, or a stranger).

## F. Environmental Measures

No specific environmental measures are recommended.

# References

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