

MEASLES

Also known as: Rubeola, Hard measles, Red measles, Morbilli

Responsibilities:

Hospital: Report by phone immediately

Lab: Report by phone immediately

Physician: Report by phone immediately

Local Public Health (LPHA): Report by phone immediately. Follow-up required

Iowa Department of Public Health

Disease Reporting Hotline: (800) 362-2736

Secure Fax: (515) 281-5698

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Agent

Measles is caused by the measles virus (genus *Morbillivirus*, family *Paramyxoviridae*).

B. Clinical Description

Measles is an acute, highly communicable viral disease characterized by fever (generally as high as 104°-105°F), cough, coryza, conjunctivitis, and maculopapular rash (the 3 C's plus rash). Koplik spots (small spots with white or bluish-white centers on an erythematous base) may be present on the buccal mucosa. The rash is red and blotchy and appears on the third to seventh day; the rash begins on the face (hairline) proceeding downward and outward, reaching the hands and feet. Complications can include diarrhea, otitis media, pneumonia, encephalitis (1 per 1,000 cases), and death (1–3 per 1,000 cases), in the United States. Serious complications occur mostly from pneumonia and occasionally from encephalitis. Immune compromised individuals are at increased risk for pneumonitis, encephalitis, and death. These complications can occur in 20–80% of HIV-infected and patients receiving chemotherapy. The characteristic rash sometimes does not develop in these patients. Asymptomatic carriage has not been documented.

C. Reservoirs

Humans are the only host.

D. Modes of Transmission

Measles is transmitted airborne by droplet spread, direct contact with nasal or throat secretions of an infected person, and, less commonly by articles freshly soiled with nose and throat secretions. Measles is one of the most highly infectious diseases.

E. Incubation Period

The time from exposure to symptom onset is about 10 days with a usual range of 7 - 18 days. Occasionally onset is as long as 19 - 21 days from exposure. The rash usually appears about 14 days after exposure. Immune globulin given later than the third day of the incubation period, may extend the incubation period

F. Period of Communicability or Infectious Period

From 1 day before the beginning of the prodromal period (this is usually about 4 days before rash onset) to 4 days after the first appearance of the rash; (this is calculated by counting the day of rash onset as day zero). Immunocompromised patients may have prolonged excretion of the virus in their secretions and can be infectious for the entire duration of their illness. Measles is highly infectious, with up to 5,000 infectious particles excreted per hour. Infectious particles may remain suspended in

the air for up to 2 hours, this is dependent upon the room's ventilation, sunlight exposure and relative humidity. Thus someone may contract the disease without ever being in the same room with an infected person. There is >90% secondary attack rate in susceptible persons.

G. Epidemiology

Measles occurs worldwide. In the temperate zones, peak incidence is in late winter and early spring. One dose of MMR vaccine induces measles immunity in about 95% of people who receive it; however, due to measles' extreme infectiousness, two doses, resulting in 99% immunity, are necessary to prevent outbreaks. Two doses, administered one month apart with the first dose being after 12 months of age, are recommended.

In developing countries, case fatality rates average 3% – 5% but can range as high as 10% – 30% in some localities, and measles is the eighth leading cause of death worldwide. Since 1995, the incidence of measles in the United States has been very low, with only a few hundred cases reported each year. Indigenous transmission has been interrupted, thus almost all U.S. cases are imported, often from Europe and Asia. (Cases are considered imported from another country if the rash occurs within 18 days of entering the U.S. and the illness cannot be linked to local transmission.)

In the spring of 2004 Iowa had 3 cases of measles, the first from exposure in a foreign country and 2 cases from the first case. During 2008, more measles cases were reported in the US than in any other year since 1997. Since 2004, Iowa has had occasional individual cases reported, but not every year.

H. Bioterrorism Potential

None.

2) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify all cases and susceptible exposed people rapidly and to prevent additional cases and further transmission of this highly contagious disease.
- To identify the source of infection so as to better understand how and why the case(s) occurred.
- To help in the international effort to eliminate indigenous transmission of measles from the Western Hemisphere.

B. Laboratory and Healthcare Provider Reporting Requirements

Iowa Administrative Code 641-1.3(139) stipulates that the laboratory and the healthcare provider immediately report any suspected or confirmed case. The reporting number for IDPH Center for Acute Disease Epidemiology (CADE) is (800) 362-2736. After business hours, call the Iowa State Patrol Office at (515) 323-4360 and they will page a member of the on-call CADE staff.

What to Report to the Iowa Department of Public Health

- A case of rash illness accompanied by fever, or
- A suspect case of measles (with or without fever), as diagnosed by a healthcare provider, or
- Positive IgM serologic test for measles (this is the preferred method), or
- Significant rise between acute- and convalescent-phase titers in serum measles IgG, *or*
- Total antibody level by any standard serologic assay, or Isolation of measles virus from a clinical specimen.

Case investigation

Iowa Administrative Code 641-1.3(139) stipulates that the laboratory and the healthcare provider report. Measles is an immediately reportable disease. Call the reporting number for IDPH Center for

Acute Disease Epidemiology (CADE) at (800) 362-2736 immediately upon identifying a suspect measles case.

After completing the investigation and gathering case information, enter the information into the Iowa Disease Surveillance System (IDSS), or FAX the report form with supporting laboratory documentation to (515) 281-5698 or mail (in an envelope marked "Confidential") to the IDPH/CADE, mailing address:

IDPH, CADE
Lucas State Office Building, 5th Floor
321 E. 12th St.
Des Moines, IA 50319-0075

Laboratory Testing Services Available

Suspect measles cases should be reported immediately to the Iowa Department of Public Health, Center for Acute Disease Epidemiology (CADE) at (800) 362-2736 or after hours, 515-323-4360. At that time, CADE will consult on appropriate testing to be ordered and specimen transport to the State Hygienic Laboratory (SHL). Public health response should not be delayed pending the return of laboratory results.

By using the Iowa SHL, transport time is significantly less, and results can be obtained more quickly. When submitting specimens to SHL, check the box in the demographics section of the order form directly below the clinician's phone number and signature. This indicates the testing is being completed because of an imminent public health threat and the test will be performed without charge to the patient. Three specimens are needed (serum and two swabs):

1. Blood Specimen for Serologic Testing

- *Measles IgM test*—obtain testing when patient first presents, do not wait. Ideally, the specimen should be drawn at least 3 days after onset of rash to minimize the possibility of false negative results. Tests that are negative in the first 72 hours after rash onset should be repeated. IgM is detectable for at least 28 days after rash onset.
- *Measles total antibody paired-titer test*—the measles IgM test above is greatly preferred because it provides an earlier result. SHL will run both an IgM and IgG if appropriate.
- Often it is appropriate to also request a serologic test for rubella IgM, since the signs and symptoms of rubella infection may mimic measles.
- Serology-collection for adults, 7 to 10 ml of blood in a red top or serum separator tube (SST), for infants, 2 to 3 ml of blood in a red top or serum separator tube (SST). Send to SHL on a cold pack, (not frozen) with a completed virus "[Serology](#)" test request form.

2. Nasopharyngeal Swab and Throat Swab:

These specimens should also be obtained when the suspect case first presents to the health care provider.

- RT-PCR for measles and virus culture requires a nasopharyngeal swab and a throat swab collected and placed in separate M4 viral transport media (VTM). The VTM is kept cold and should be sent on a cold pack, (not frozen) with a completed "[Viral and Chlamydia Detection and Bacterial PCR](#)". Measles RT-PCR will be sent to CDC for testing as appropriate.
- *Virus culture* for further characterization of the virus
 - Viral isolates will be sent to CDC for genotyping. Viral genotyping is an important component of measles surveillance and can help determine the source of the virus. (i.e. country of origin)

Shipment of specimens— SHL will conduct testing for suspect measles cases at no charge. Please request serologic testing for IgM and IgG antibodies as appropriate, RT-PCR for measles (to be sent to CDC), and virus culture for measles. Contact the SHL virus-serology laboratory at (319) 335-4277 or (319) 335-4500.

Ship using overnight, express mail, on ice packs to

State Hygienic Lab
Virus-Serology Laboratory
102 Oakdale Campus, # H102
Iowa City, IA 52242-5002

For assistance with courier service, please contact SHL (319)335-4500 or IDPH (800)362- 2736.

C. Initial Questions to Ask Healthcare Provider and Patient

In order to assess the likelihood that a suspect case is a true case prior to laboratory testing, IDPH and/or other public health staff helping in the investigation should ask about: 1) symptoms (rash onset, other clinical findings cough, coryza, conjunctivitis other) 2) measles immunization history, 3) country of origin and length of residence in US, 4) recent history of travel (to where and dates), 5) whether there were any recent out-of-town visitors (from where and dates), and 6) whether there was any recent contact with anyone with similar symptoms.

3) CONTROLLING FURTHER SPREAD

Minimum Period of Isolation of Patient

Through the 4th day after the onset of rash (counting the day of rash onset as day zero).

Minimum Period of Quarantine of Contacts

Students and staff born in or after 1957, who are not appropriately immunized and do not have serologic evidence of immunity, will be excluded from school from the 5th through the 21st day after their exposure. If exposure was continuous and/or if multiple cases occur, susceptibles will be excluded through the 21st day after rash onset in the last case. **Healthcare workers** who are not appropriately immunized and do not have serologic evidence of immunity will be excluded from work from the 5th day after their first exposure through the 21st day after their last exposure. These restrictions for students, school staff, and healthcare workers apply even if they had received IG.

A. Protection of Contacts of a Case

1. Implement control measures *before* serologic confirmation.
2. Inquire about contact with a known or suspected case or travel during the measles exposure period (8–18 days prior to onset).
3. Isolate the case during his/her infectious period, as defined above.
4. Identify all those exposed. Think in terms of the “zones of exposure” and consider members of the following groups, if they were in contact with the case during his/her infectious period.
 - Household members
 - School/child care contacts (students and staff)
 - Staff and patients at medical facility where patient was seen (including staff with and without direct patient contact)
 - Individuals at workplace of case (especially child care centers, schools, and medical settings)
 - Members of the same religious/social groups
 - Members of sports teams, or other extracurricular groups
 - Bus or carpool associates
 - Close friends
 - Persons potentially exposed at social events, travel sites, etc.

Note: Measles is so contagious that sometimes everyone at an *entire* institution is considered exposed.

5. **Identify high-risk susceptibles** with whom the case had contact during his/her infectious period. Pregnant women, immunocompromised individuals, and infants < 12 months old should be referred to their healthcare provider.

6. **Identify all other susceptibles, that is, individuals *without proof of immunity*** as defined below:

- Born in the United States before January 1, 1957 (Year of birth as proof of immunity does not apply in healthcare settings); or
- Two doses of measles containing vaccine, given at least 4 weeks apart, with both doses administered at ≥ 12 months of age; or
- Serologic proof of immunity.
- Documentation of physician-diagnosed measles

Note:

- Foreign-born individuals must have documentation of immunization or serologic proof of immunity. "Born before 1957" is not acceptable (see below for explanation).
- Susceptibles include those with medical and religious exemptions to immunization.

Year of Birth as Proof of Immunity—Epidemiologic data indicate that most individuals born in the United States before January 1, 1957 are immune to measles. This has not been found to apply to those born in other countries, where the epidemiology of measles is not well known and where measles immunization may not have been routine.

Exceptions to the "1957 Rule" are employees in healthcare settings. Because persons born before 1957 have acquired measles in healthcare settings, vaccination of these older employees, including those who are United States-born, with 1 dose of measles, mumps, rubella (MMR) vaccine is recommended. Data suggest that healthcare personnel have a risk of acquiring measles that is 13-fold greater than that of the general population. Measles is highly transmissible and frequently misdiagnosed during the prodromal stage. It is essential that all healthcare personnel have documentation of measles immunity, regardless of their length of employment or whether they are involved in patient care. Although persons born before 1957 are generally considered to be immune to measles, serologic studies indicate that 5% - 9% of healthcare personnel born before 1957 may not be immune.

7. Immunize all susceptibles. All susceptibles ≥ 12 months of age, for whom vaccine is not contraindicated, must be immunized, keeping in mind the following:

- **MEASLES VACCINE GIVEN WITHIN 72 HOURS OF EXPOSURE CAN PREVENT DISEASE.**

- The combined MMR vaccine is the preferred formulation for all those ≥ 12 months of age. It will provide additional protection against mumps and rubella.
- Vaccinating an individual who may be incubating measles is **NOT** harmful.
- Vaccinate susceptibles even if it is >72 hours post-exposure. It will protect against exposure to the next potential generation of cases. In addition, the situation should be viewed as an opportunity to vaccinate.
- Immunization during an outbreak. During an outbreak, MMR may be given. However, seroconversion rates after MMR immunization are significantly lower in children immunized before the first birthday than are seroconversion rates in children immunized after the first birthday. Therefore, children immunized before their first birthday should be reimmunized with MMR at 12-15 months old (at least 4 weeks after initial measles immunization) and again at school entry (4-6years).

8. Consider recommending **immune globulin (IG)** for susceptibles with contraindications to measles vaccine if it is within 6 days of exposure. IG may be used within 6 days of exposure for susceptible household or other contacts for whom risk of complications is very high (particularly contacts under 1 year old, pregnant women or immunocompromised persons), or for whom measles vaccine is contraindicated.
- **The dose is 0.25ml/kg (0.11ml/lb) up to a maximum of 15 ml.**
 - **For immunocompromised persons 0.5 ml/kg is given, up to a maximum of 15 ml.**

Live measles vaccine should be given 5-6 months later to those for whom vaccine is not contraindicated.

9. Isolation/exclusion (non-healthcare settings):

a. **Case**

Isolate and exclude the case during his/her infectious period (**from 4 days before through 4 days after rash onset, counting the day of rash onset as day zero**). He/she may return to normal activities on the 5th day.

Criteria for isolation/exclusion of cases are more rigorous for immunocompromised individuals and for others in healthcare settings.

b. **Contacts**

- **Susceptibles include all unvaccinated individuals without proof of immunity** as specified in sections 5 and 6 above, including:
 - Medical/religious exemptions
 - Individuals who have other contraindications to MMR vaccine
 - Those vaccinated >72 hours post exposure.
 - Those that received IG will be assessed on an individual basis
- **Quarantine susceptibles on days 5–21 post exposure.**
- Several criteria are used to determine when to quarantine susceptible contacts, and when they can return to normal activities, as outlined below.
 - **If there was a discrete (one-time) exposure**— quarantine on days 5 through 21 from that exposure. They may return to normal activities on the 22nd day.
 - **If there was continuous exposure**— quarantine on days 5 through 21 from the day of rash onset in the case. (However, in healthcare settings, exclusion must begin 5 days after the *earliest* exposure and extend through 21 days from the *last* exposure.) They may return to normal activities on the 22nd day.
 - **If there is more than one case of measles**—susceptibles will need to be quarantined until 21 days after the onset of rash in the last reported case in the outbreak setting. They may return to normal activities on the 22nd day.

Summary of Measles Exclusion Requirements

Case and Symptomatic Contacts	Asymptomatic Contacts
Isolate through the 4 th day after rash onset (count day of rash onset as day zero). They may return to normal activities on the 5 th day.	<p>One case: Quarantine susceptibles for 5–21 days post-exposure.</p> <p>Multiple cases: Quarantine susceptibles for 21 days from date of rash onset in last case.</p> <p>Healthcare settings: Exclude or quarantine susceptibles from 5 days after the earliest exposure through 21 days after the last exposure.</p>

10. Conduct surveillance for 2 incubation periods after rash onset in the last case or the last exposure in the setting, whichever is later.

B. Managing Special Situations

1. School Settings

Remember to determine if there are any:

- Pregnant teachers, staff (including those without direct contact with students) and students (do not forget about student teachers) anywhere in the school.
- Immunocompromised individuals among the students, teachers and staff anywhere in the school.
- Medical/religious exemptions anywhere in the school, among both students and staff. It is particularly important to identify these individuals in the classroom and grade of cases. Remember, **these susceptible individuals must be excluded from attending school until 2 incubation periods after the last case.**

Exclusion criteria:

- Susceptible contacts, including those in classrooms, extracurricular activities, and other settings, who **have already received one dose of MMR and receive a second dose of measles vaccine within 72 hours of exposure, can be readily readmitted**; otherwise, they should be excluded as discussed above.
- In some settings, individuals who have received their first or second dose >72 hours post exposure, **but within a specified time period (as determined by the Iowa Department of Public Health and with the local board of health)**, may be allowed to continue to attend classes.

If multiple cases occur, guidelines may be revised to include other classrooms and their teachers.

Interactions in sports and other extracurricular activities facilitate the spread of measles.

Additional recommendations to prevent the spread of measles between schools can be found in the table below, "Control Guidelines for Sports Teams and Extracurricular Groups."

Iowa Department of Public Health

Control Guidelines for Sports Teams and Extracurricular Groups

Control guidelines DIFFER and are dependent on whether measles is currently occurring at your institution. **Schools without cases, but that will be involved with an institution that is experiencing cases, also need to follow control guidelines.** Please refer to the appropriate category below for the recommendations for your facility.

A. At the School where Measles Cases Are Reported:

1. All students, staff, supporters and media personnel leaving to attend activities at other schools or participating in sports or other group activities at your school must have proof of immunity as defined below:

- Born in the United States before January 1, 1957, or
- Two doses of measles vaccine with both doses administered at ≥ 12 months of age, given at least 4 weeks apart (**the second dose must have been given before the rash onset of the first case, or within 72 hours of exposure to the known case**), or
- Serologic proof of immunity
- Documentation of physician-diagnosed measles

If the second dose of measles-containing vaccine is given >72 hours after the onset of the first case, the student **must wait 21 days** before participating in sporting events or traveling to another school. If multiple cases occur, the student must wait until 21 days after the onset of rash in the last reported case in the outbreak setting.

2. Notify the schools to which students are traveling and inform them of:

- The cases or suspected cases at your school
- The immune status of your students and staff who will be traveling to the other school

B. Schools without Measles Cases Receiving Students from or Traveling to a School with Measles Cases:

All students, staff, supporters and media personnel, participating in activities with students from a school with cases, **must have proof of immunity** as defined below.

- Born in the United States before January 1, 1957, or
- Documentation of physician-diagnosed measles
- Two doses of measles vaccine with both doses administered at ≥ 12 months of age, given at least 4 weeks apart (as outlined above), or
- Serologic proof of immunity

2. Healthcare Settings

Recommendations for healthcare facilities are *more rigorous*.

- a. **Proof of immunity**—The risk of acquiring measles in medical settings is up to 13-fold higher than in other settings. Therefore, documentation of immunity is extremely important.
 - All staff born on or after January 1, 1957 should have proof of two doses of measles vaccine or serologic proof of immunity, with a second dose having been given ≤ 72 hours after exposure.
 - Medical personnel born before January 1, 1957 have acquired measles from cases in medical facilities. Therefore, strong consideration should be given to requiring at least one dose of measles vaccine for staff born before 1957. Vaccinating immune persons is not harmful.
 - In special high-risk healthcare settings such as transplant, oncology, neonatal units, etc., exclusion criteria should be even more rigorous. Infection prevention personnel may wish to exclude all susceptible personnel even if they have been immunized within 72 hours.
- b. **Initial management of patients with febrile rash illness**—Assess and screen all patients with febrile rash illness, either prior to or immediately on arrival at the intake area.
 - Escort patients to a separate waiting area or place immediately in a private room.
 - Both patients and staff should wear appropriate masks/respirators (masks for patients to prevent generation of particles, and respirators for staff, if possible, to filter airborne particles).
 - If not admitted, maintain airborne precautions (including while patient is exiting the facility, *e.g.*, separate exit). Patients should be instructed to remain in isolation at home, through 4 days after rash onset (with onset of rash being day zero).

- Measles virus can remain suspended in the air for up to 2 hours. Therefore, we recommend that susceptible patients **NOT** be placed in a room, which has been occupied by a suspect case for 2 hours following the case's exit from that room.
- c. **Infectious period**
- **Cases** are considered to be infectious from **4 days** before rash onset through 4 days after rash onset, counting the day of rash onset as day zero. Therefore, **cases are considered infectious for a total of 9 days.**
 - **Immunocompromised patients** may have prolonged excretion of viral particles in their secretions, and should be **considered infectious for the duration of their illness.**
- d. **Exclusion/isolation of cases**
- **Personnel** who become sick should be excluded from work for 4 days after they develop a rash consistent with measles. They may return on the 5th day.
 - If **admitted, patients** should be on airborne precautions (in addition to standard precautions) while infectious (4 days before rash onset through 4 days after rash onset) in a negative pressure room. They may be taken off isolation on the 5th day.
 - If **not admitted, patients** should maintain respiratory isolation while exiting the facility, *e.g.*, mask, separate exit, and remain in isolation at home through 4 days after rash onset. They may return to normal activities on the 5th day.
- e. **Exclusion/isolation of contacts**—The exclusion periods are extended in the healthcare setting.
- **Susceptible staff contacts** should be excluded from the 5th day after the earliest exposure through the 21st day after the last exposure to the case during his/her potential infectious period (as defined above). They may return on the 22nd day.
 - **Susceptible hospitalized patient contacts** should be placed in airborne infection isolation, includes negative pressure room, from day 5 after the earliest exposure through day 21 after the last exposure to the case during his/her potential infectious period (as defined above). They may be taken off isolation on the 22nd day.

The above recommendations are summarized in the table below, "Measles Control in Medical Settings."

**Iowa Department of Public Health
Measles Control in Medical Settings**

This table summarizes additional control measures to decrease nosocomial measles transmission.

1. Assess and screen all patients with rash illness or with other potential airborne diseases, prior to arrival at intake area, i.e. outside.
2. Escort patients to a negative pressure private room.
3. Both patients and staff should wear appropriate masks/respirators (masks for patients to prevent generation of particles, and respirators for staff, if possible, to filter airborne particles).
4. If admitted: maintain on airborne precautions (in addition to standard precautions) while infectious in a negative pressure room. (Patients are considered infectious for 4 days before through 4 days after rash onset, counting the day of rash onset as day zero.)
5. If not admitted: maintain respiratory isolation, including while patient is exiting the facility, (*e.g.*, mask, separate exit). Ideally the patient would be assessed outside of the healthcare facility. Patient should remain in isolation at home through 4 days after rash onset, counting the day of rash onset as day zero. The patient may resume normal activities on the 5th day.

6. Avoid placing susceptibles in a room, which has been occupied by a suspect case for 2 hours following the case's exit.
7. Identify all contacts among patients and staff:
 - This includes patients and families in the waiting and examination rooms up to 2 hours after index case was present;
 - Includes all staff both with and without direct patient contact;
 - Due to airborne route of transmission, those exposed often include everyone at the entire facility.
8. Identify susceptibles (particularly high-risk susceptibles) and offer:
 - MMR as soon as possible but within 72 hours of exposure (will most likely prevent illness if given in this window), or
 - For high-risk susceptibles and those ineligible for vaccination, IG as soon as possible but within ≤ 6 days after exposure (may modify or prevent illness, but a recipient can still be considered infectious)
9. Notify infection prevention, employee health, department heads and the healthcare providers of exposed patients.
 - Post a "Measles Alert."
10. Exclusion of susceptibles:
 - All staff born in or after 1957, who have not received a second dose of measles vaccine ≤ 72 hours post exposure, must be **excluded from 5 days after their earliest exposure through 21 days after their last exposure to the case during his/her potential infectious period.**
 - All staff born before 1957 that have not received 1 dose of MMR ≤ 72 hours post exposure must be excluded 5 through 21 days post exposure.
 - Staff who contract measles should be excluded for 4 days after their first day of rash onset. In special high-risk healthcare settings such as transplant, oncology, neonatal units, etc., exclusion criteria should be even more rigorous. Infection prevention personnel may wish to exclude all susceptible personnel even if they have been immunized within 72 hours.

3. Management and MMR Vaccination of HIV-Infected Individuals and their Contacts

The American Academy of Pediatrics (AAP) and the Advisory Committee on Immunization Practices (ACIP) have recently revised their recommendations regarding the management of HIV-infected individuals exposed to measles, as well as the routine MMR immunization of those with HIV infection, particularly those with severe immunosuppression. These guidelines, applicable to children and adults, are summarized below.

a. Management of HIV-Infected Individuals Exposed to Measles

1) MMR or IG should be given, depending on the situation:

- **Asymptomatic HIV-infected individuals who are not severely immunosuppressed** (*i.e.*, with higher age-specific CD4+ T-lymphocyte counts or percentages than those in the table on the next page), *if susceptible and exposed ≤ 3 days prior* should receive MMR vaccine.
- **Asymptomatic HIV-infected individuals who are not severely immunosuppressed** (*i.e.*, with higher age-specific CD4+ T-lymphocyte counts or percentages than those in the table on the next page), *if susceptible and exposed 3–6 days prior* should receive *0.25cc/kg IM* immune globulin (maximum 15cc). Live measles vaccine should be given 5-6 months later to those for whom vaccine is not contraindicated.
- **Symptomatic HIV-infected individuals who are severely immunosuppressed** (as defined in the table on the next page), *regardless of past history of immunizations or*

disease, unless they have recent serologic proof of immunity should receive IG 0.5cc/kg IM (15cc max).

- 2) If an individual has received intravenous immune globulin (IVIG) (400 mg/kg) \leq 3 weeks *before* exposure, no additional IG is required. However, some experts recommend an additional dose of IVIG if \geq 2 weeks have elapsed since last treatment. (Remember, when deciding to vaccinate these individuals, MMR vaccine should be given \geq 2 weeks *before* any IG or other blood products.)

b. Management of Contacts of HIV-Infected Individuals Who Are Themselves Exposed to Measles

- If they are susceptible and exposed < 3 days prior, they should receive MMR vaccine. There is no shedding from the MMR vaccine.
- If they are susceptible and exposed 3–6 days prior, they should receive IG and live measles vaccine should be given 5-6 months later to those for whom the vaccine is not contraindicated.

c. General Guidelines for the Use of MMR Vaccine in HIV-infected and Potentially HIV-infected Individuals

- 1) Prevacination HIV testing is **NOT** recommended.
- 2) MMR vaccine is **recommended** for routine immunization of individuals with asymptomatic HIV infection who do not have evidence of severe immunosuppression.
- 3) MMR vaccine should be **considered** for all symptomatic HIV-infected persons who do not have evidence of severe immunosuppression, as defined in the table below.
- 4) It is now recommended that **severely immunocompromised HIV-infected individuals** (as defined by low CD4+ counts or low percent of CD4+ circulating lymphocytes—see table below) should **NOT** receive MMR or other measles-containing vaccines.

Measles-containing vaccines are *contraindicated* for HIV infected individuals with the following:

Age Group	Total CD4+ Count	<i>or</i>	CD4+ as a % of Total Lymphocytes
< 12 mo.	< 750/mcL	<i>or</i>	< 15%
1-5 years	< 500/mcL	<i>or</i>	< 15%
6-12 years	< 200/mcL	<i>or</i>	< 15%
\geq 13 years	< 200/mcL	<i>or</i>	< 14%

- 5) It is now recommended that **severely immunocompromised HIV-infected individuals** (as defined by low CD4+ counts or low percent of CD4+ circulating lymphocytes—see above table) should **NOT** receive MMR or other measles-containing vaccines.
- 6) Since the immunologic response to vaccines is often poor in HIV-infected patients, the first dose of MMR should be given as early as possible after 12 months old. This will increase the chance of an adequate immune response, before further deterioration of the immune system.
- 7) Give the second dose of MMR 4 weeks after the first. This will increase the likelihood of seroconversion.
- 8) During outbreak situations only, consider giving the first dose of **monovalent** measles vaccine or MMR if monovalent is unavailable at 6–11 months of age to those infants who are not severely immunocompromised. Remember, these children **must be revaccinated** with 2 doses of MMR beginning at 12 months of age.

C. Preventive Measures

Personal Preventive Measures/Education

Vaccination, including routine childhood vaccination, catch-up vaccination of adolescents, and targeted vaccination of high-risk adult groups (including international travelers), is the best preventive measure against measles. It is particularly important to vaccinate susceptible household contacts of high-risk susceptibles who cannot themselves be vaccinated, such as immunocompromised individuals, pregnant women, and infants. Good personal hygiene (which consists of proper handwashing, disposal of used tissues, not sharing eating utensils, etc.) is also important in preventing measles.

Please refer to the most current versions of the Advisory Committee on Immunization Practices (ACIP) statement on measles, rubella, and mumps.

4) ADDITIONAL INFORMATION

The Council of State and Territorial Epidemiologists (CSTE) surveillance case definitions for Measles can be found at: www.cdc.gov/osels/ph_surveillance/nndss/phs/infdis.htm#top

CSTE case definitions should not affect the investigation or reporting of a case that fulfills the criteria in this chapter. (CSTE case definitions are used by the state health department and the CDC to maintain uniform standards for national reporting.)

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