



California Department of Public Health – March 2015

Measles Investigation Quicksheet



Measles infectious period

From four days before rash onset through four days after rash onset (day of rash onset is day 0).

Measles exposure

Sharing the same airspace with a person infectious with measles (during the 4 days prior through the 4 days after their rash onset), e.g., same classroom, home, clinic waiting room, airplane etc., or were in these areas up to 1 hour after the infectious person was present. Although CDC recommends using a 2 hour window, there is only one report in the literature of measles transmission >60 minutes after an infectious person has left the setting.

No minimum time period has been established for exposure, but it is presumed that longer exposures are more likely to result in measles transmission than brief, transient exposures.

When exposures have occurred in venues in which it is not possible to identify individuals, it is helpful to notify local health care providers so that they can be on the alert for possible cases. In addition, some local health jurisdictions issue press releases to notify the public.

Measles incubation period

The period from exposure to onset of prodrome is generally 8–12 days. In family studies, the average interval between the appearance of rash in the index case and in subsequent cases is 14 days (range 7–21 days).

Measles clinical case definition

- A generalized rash lasting ≥ 3 days; and
- a temperature $\geq 101^\circ\text{F}$ ($\geq 38.3^\circ\text{C}$); and
- cough, coryza, or conjunctivitis.

Measles laboratory criteria for diagnosis

- **Preferred:** Detection of viral RNA by reverse transcription polymerase chain reaction (RT-PCR); or
- **Acceptable:** Serum* measles IgM antibody positive
- **Acceptable:** Isolation of measles virus; or
- **Acceptable:** Significant rise in serum* measles IgG antibody between acute and convalescent titers.

*Capillary blood (finger or heel stick) can be used for serology if venous blood cannot be obtained.

Please send specimens to a public health lab; use of commercial labs may delay testing.

More information on testing, including capillary blood collection, is available at:

<http://www.cdph.ca.gov/HealthInfo/discond/Documents/CDPHMeaslesLabTesting2011-01.pdf>

Case classification

- **Suspected:** Any febrile rash illness.
- **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 a case 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.

Immunity to measles

Non high-risk people[†] can be presumed to be immune to measles for the purposes of measles case investigations if they:

- were born prior to 1957; or
- have written documentation with dates of receipt of at least one dose of measles-containing vaccine given on or after their first birthday in 1968 or later; or
- have documented IgG+ test for measles; or
- laboratory confirmation of previous disease; or
- served in the U.S. armed forces; or
- were born in the U.S. in 1970 or later and attended a U.S. elementary school;[‡] or
- entered the U.S. in 1996 or later with an immigrant visa or have a green card.[‡]

[†]Additional evidence of immunity is required for exposed high-risk persons, e.g., healthcare personnel of any age, pregnant women, immunocompromised people, household contacts of a case, or persons in settings with known unvaccinated persons (e.g., childcare settings). Additional evidence of immunity may also be required during an outbreak. Immunity can be presumed if the exposed person:

- has documentation of a positive measles IgG test; or
- has documentation of two doses of measles vaccine given in 1968 or later, separated by at least 28 days, with the first dose on or after the first birthday

[‡]Unless known to be unvaccinated for measles, e.g., having a medical contraindication to vaccination or being philosophically or religiously opposed to vaccinations.

MMR vaccine for postexposure prophylaxis

MMR vaccine may be given <72 hours of last exposure to persons ≥6 months of age (although giving IG is preferred in infants 6-11 months of age) with 1 or no documented doses of MMR, if not contraindicated.

Immune globulin (IG) for postexposure prophylaxis

IG may be given to exposed susceptible people ≤6 days of last exposure to prevent infection.§ However, susceptible persons who receive IG >6 days after the first exposure (when there are multiple exposure dates), should still be placed on quarantine.

- Infants <12 months of age should receive 0.5 mL/kg of body weight of intramuscular IG (IGIM); maximum dose = 15 mL.
- Pregnant women without evidence of measles immunity should receive 400 mg/kg of intravenous IG (IGIV).
- Severely immunocompromised persons,|| irrespective of evidence of measles immunity, should receive 400 mg/kg of IGIV.
- For persons already receiving IGIV therapy, administration of ≥400 mg/kg body weight <3 weeks before measles exposure should be sufficient to prevent measles infection.
- For patients receiving subcutaneous IG (IGSC) therapy, administration of at ≥200 mg/kg body weight for 2 consecutive weeks before measles exposure should be sufficient.
- Persons weighing >30 kg (66 lbs) are unlikely to receive an adequate measles antibody from IGIM. Other persons who do not have evidence of measles immunity can be given IGIM (0.5 mL/kg of body weight; maximum dose = 15 mL), but priority should be given to susceptible persons <65 lbs. exposed in settings with intense, prolonged, close contact (e.g., household, childcare, classroom, etc.).§

§Patients with severe primary immunodeficiency; patients who have received a bone marrow transplant until at least 12 months after finishing all immunosuppressive treatment, or longer in patients who have developed graft-versus-host disease; patients on treatment for ALL within and until at least 6 months after completion of immunosuppressive chemotherapy; and patients with a diagnosis of AIDS or HIV-infected persons with severe immunosuppression defined as CD4 percent <15% (all ages) or CD4 count <200 lymphocytes/mm³ (aged >5 years) and those who have not received MMR vaccine since receiving effective ART. Some experts include HIV-infected persons who lack recent confirmation of immunologic status or measles immunity.

One source of IG is FFF Enterprises in Temecula CA, which can be reached 24/7 at: 1-800-843-7477.

Information on IG administration is available at: <http://www.cdph.ca.gov/HealthInfo/discond/Documents/CDPHIGforMeaslesPEP.pdf>

It is unknown if IG prolongs the incubation period, but if a contact who received IG is quarantined or excluded from a high-risk setting, CDPH does not recommend extending exclusion beyond 21 days. However, symptoms should be monitored for an additional 7 days and if symptoms occur ≤28 days of exposure, persons who received IG should self-isolate and contact their local health department.

Nonimmune persons who received IG should receive MMR vaccine no earlier than 6 months after IGIM administration or 8 months after IGIV administration.

Home quarantine/symptom watch period

Day 7 (CDC recommends day 5 for healthcare workers) after first exposure through day 21 after last exposure (day of exposure is day 0).

If symptoms consistent with measles develop, patient should be immediately isolated through day 4 after rash onset (day of rash onset is day 0). Exposed people should be instructed to isolate themselves and notify their local health department if symptoms occur.

The course of measles infection

Measles typically begins with a mild to moderate fever accompanied by cough, coryza, and conjunctivitis. Two to three days later, Koplik's spots, a characteristic sign of measles, may appear. At this time the fever spikes, often ≥104°F. At the same time, a red blotchy maculopapular rash appears, usually first on the face, along the hairline and behind the ears. This rash rapidly spreads downward to the chest and back and finally, to the thighs and feet. In approximately one week, the rash fades in the same sequence that it appeared.

Measles exposure that occurs in a childcare setting with infants

Childcare settings with infants are considered high risk settings because unvaccinated infants can develop severe measles. When there is a measles case in such a setting, CDPH recommends consideration of the following:

Unvaccinated infants <12 months of age:

Administer IGIM if ≤6 days of last exposure to measles.

- Infants who receive IG ≤6 days of first exposure should be protected against that exposure and have ongoing protection for some time and do not need to be excluded from childcare or quarantined, but should not visit other settings with high-risk persons.
- Infants who receive IGIM >6 days after first exposure should be excluded from childcare and quarantined from day 7 after first exposure through day 21 after last exposure.



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Unvaccinated children ≥ 12 months of age:

Administer MMR vaccine if < 72 hours of last exposure to measles or administer IGIM to children < 66 lbs if ≥ 72 hours until ≤ 6 days of last exposure to measles.

- Children who receive MMR < 72 hours of first exposure or IGIM ≤ 6 days of first exposure should be protected against that exposure and have ongoing protection for some time and do not need to be excluded from childcare or quarantined, but should not visit other settings with high-risk persons.
- Children who receive MMR vaccine ≥ 72 hours or IGIM > 6 days after first exposure should be excluded from childcare and quarantined from day 7 after first exposure through day 21 after last exposure.

Children with 1 dose of MMR vaccine:

Children who have received 1 dose of MMR vaccine ≥ 2 weeks of first exposure may attend the childcare setting, but should not visit other settings with high-risk persons. Performing measles IgG testing on such children to determine immunity can also be considered.

Other recommendations:

- To prevent the possibility of sustained transmission, new enrollees who are susceptible to measles and have not yet attended should not start until after the end of the incubation period.

Please consult CDPH at 510-620-3737 for additional discussion on measles exposures in childcare settings.

RECOMMENDED FOLLOW-UP MEASLES CONTACTS

<i>Measles immunity assessment</i>	IgG testing	MMR PEP¹	IG PEP²	Quarantine	Exclusion³	Symptom watch
Two documented doses of MMR vaccine (~1% will be susceptible)	No	No	No	No	No	Passive
Known to be measles IgG positive ($< 1\%$ will be susceptible)	No	No	No	No	No	Passive
Have 1 documented dose of MMR vaccine (5% will be susceptible)	If desired	Yes	No	No	Yes	Passive
Born before 1957 (5% will be susceptible)	If desired	Yes	No	No	Yes	Passive
History of measles disease (not documented)	Yes	Yes	No	Yes ⁴	Yes	Active
Measles IgG negative ⁵ or known to be unvaccinated	-	Yes	No ⁶	Yes ⁴	Yes	Active
Received MMR vaccine < 72 hours of first exposure ^{7,8}	-	-	No	No	Yes	Active
Received immune globulin ≤ 6 days of first exposure ⁸	-	-	-	No	Yes	Active
Unknown or no documentation of vaccination or immunity status, without presumption of immunity ⁹	Yes	Yes	No	Yes ⁴	Yes	Active
Unknown or no documentation of vaccination or immune status, with presumption of immunity ⁹	If desired	Yes	No	No	Yes	Passive
Special Populations						
Unvaccinated infants < 12 months of age	No	No	Yes	Yes	Yes	Active
Pregnant women without 2 documented MMR or serologic evidence of immunity	Yes ¹⁰	No	Yes ¹¹	No	Yes	Active
Severely immunocompromised people (see page 2)	No	No	Yes	See footnote ¹²	Yes	Active
Household or other contact with prolonged exposure without 2 documented MMR or serologic evidence of immunity	Yes	Yes	No	Yes	Yes	Active

Please see footnotes on next page.

Measles treatment (per 2015 AAP Red Book)

No specific antiviral therapy is available. Measles virus is susceptible in vitro to ribavirin, which has been given by the intravenous and aerosol routes to treat severely affected and immunocompromised children with measles. However, no controlled trials have been conducted, and ribavirin is not approved by the US Food and Drug Administration for treatment of measles.

Vitamin A. Vitamin A treatment of children with measles in developing countries has been associated with decreased morbidity and mortality rates. Low serum concentrations of vitamin A also have been found in children in the United States, and children with more severe measles illness have lower vitamin A concentrations. The World Health Organization currently recommends vitamin A for all children with acute measles, regardless of their country of residence. Vitamin A for treatment of measles is administered once daily for 2 days, at the following doses:

- 200 000 IU for children 12 months or older;
- 100 000 IU for infants 6 through 11 months of age; and
- 50 000 IU for infants younger than 6 months.
- An additional (i.e., a third) age-specific dose should be given 2 through 4 weeks later to children with clinical signs and symptoms of vitamin A deficiency.

Even in countries where measles usually is not severe, vitamin A should be given to all children with severe measles (e.g., requiring hospitalization).

At this time, Aquasol A™ appears to be the only parenteral vitamin A product available in in the United States.

Footnotes

1. Postexposure prophylaxis (PEP) with MMR vaccine can be given <72 hours of exposure to persons without contraindications for the vaccine.
2. Contacts at high risk of severe infection (severely immunocompromised people, unvaccinated infants, and susceptible pregnant women) should receive IG (IM or IV) PEP ≤6 days of last exposure to measles. If it can be done rapidly, it is recommended that pregnant women be tested for measles IgG prior to administering IGIV if there is a possibility they may have received vaccine or had disease.
3. Unless found to be measles IgG positive or to have two documented MMR, exclude from high-risk settings (e.g., childcare facility with infants or healthcare facility) for 21 days after last exposure. Some jurisdictions may choose to exclude from other settings with large numbers of unvaccinated persons.
4. Quarantine for 21 days after last exposure unless the exposed person: is measles IgG positive, meets a presumption of immunity, has received IGIM ≤6 days of first exposure, or MMR<72 hours of first exposure. If symptoms consistent with measles develop, exposed person should be isolated. If there is concern about whether measles symptoms will be reported or if there will be compliance with quarantine, active monitoring with periodic calls to the exposed person to monitor for development of measles symptoms is recommended.
5. If patient has two documented MMR and an IgG negative result, base public health decisions on the two documented doses of MMR vaccine.
6. IG can be considered for persons in this category weighing <30 kg (66 lbs)
7. If measles IgG status is unknown, persons >12 months of age who may have been vaccinated or had disease and receive MMR vaccine as PEP should have blood drawn and tested for measles IgG at the time of MMR administration.
8. If MMR vaccine is given ≥72 hours of first exposure or IG is given >6 days of first exposure, exclude from high-risk settings.
9. Immunity may be presumed in persons who have served in the U.S. Armed Forces; or were born in the U.S. in 1970 or later and attended a U.S. elementary school; or entered the U.S. in 1996 or later with an immigrant visa or have a green card, unless known to be unvaccinated.
10. If no documentation of 2 doses of MMR vaccine or measles IgG positivity is available.
11. If patient is IgG negative, or if patient has unknown status and testing cannot be completed by day 6 after exposure, administer IGIV.
12. CDPH should be consulted about severely immunocompromised measles contacts to assess the need for quarantine.