



California Department of Public Health – March 2019

Measles Investigation Quicksheet



MEASLES BASICS

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 left the area. 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 certain types of exposures (longer in duration, face to face) 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).

The course of measles infection

Measles typically begins with a mild to moderate fever accompanied by cough, coryza, and conjunctivitis. Some cases also report diarrhea, nausea and vomiting. Two to three days later, Koplik's spots, a characteristic sign of measles, may appear. At this time the fever spikes, often to $\geq 104^{\circ}\text{F}$. 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 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 serologic testing if venous blood cannot be obtained.

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

More information on measles testing, including capillary blood collection, is available at the CDPH Measles web page:

<https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Immunization/measles.aspx>

ASSESSING SUSPECT MEASLES CASES

- Consider measles in patients of any age who have a fever AND a rash
- In measles cases there must be some fever, even subjective fever, and the rash must start on the head or neck.
- Patients with measles usually have at least 1 or 2 of the “3 Cs” – cough, coryza and conjunctivitis.
- If measles is being considered, please contact your local health department immediately, see https://www.cdph.ca.gov/Programs/CCLHO/CDPH%20Document%20Library/LHD_CD_Contact_Info_A DA.pdf
- Detailed measles clinical guidance is available here: <https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/Immunization/Measles-ClinicalGuidance.pdf>

ASSESSING MEASLES IMMUNITY IN CONTACTS

(refer to Table for more detail)

Immunity to measles

Contacts who are not classified as high-risk† 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., infant care 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.

High-risk contact

A high-risk contact is a person who may experience severe illness if they become infected with measles or from whom the transmission potential is high (large number of susceptible contacts or high intensity/duration of exposure). Examples of high-risk contacts include: infants <12 months, immunocompromised persons, pregnant women, household contacts and healthcare workers.

High-risk setting

A high-risk setting is one in which transmission risk is high (e.g., setting with a large number of measles-susceptible persons), particularly persons who could experience severe disease if infected with measles.

POSTEXPOSURE PROPHYLAXIS (PEP)

The administration of MMR or IG as PEP to exposed contacts depends primarily upon time since exposure, age of the contact, and risk status of the contact (pregnant or immunocompromised). If you have questions about which type of PEP is appropriate please contact CDPH.

MMR vaccine for PEP

MMR vaccine may be given <72 hours after last exposure to exposed susceptible persons ≥ 6 months of age (although administration of IG is preferred in infants 6-11 months of age) with 1 or no documented doses of MMR, if not contraindicated. However, only MMR administered <72 hours after first exposure is considered PEP. In some studies MMR PEP effectiveness is low (even though protection against future exposures is high) and likely depends upon the nature of the exposure, among other things. Therefore, even exposed persons who have received appropriate MMR PEP should be excluded from high-risk settings (see Table).

Immune globulin (IG) for PEP

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

Because the effectiveness of IG PEP at preventing measles varies based upon a number of factors including the nature of the measles exposure, dosage and type of IG administered, etc. it is also recommended that persons who receive IG PEP ≤ 6 days be excluded from high-risk settings even though they are not quarantined (see Table).

Important points to consider regarding IG PEP:

- Infants <12 months of age should receive 0.5 mL/kg of body weight of intramuscular IG (IGIM); maximum dose = 15 mL.
- Unvaccinated children <30 kg (66 lbs) who are not eligible for MMR PEP should receive 0.5 mL/kg of body weight of 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 of body weight at least one time in the 3 weeks before first measles exposure should be sufficient to prevent measles infection.
- For patients receiving subcutaneous IG (IGSC) therapy, administration of ≥ 200 mg/kg of body weight once weekly for 2 consecutive weeks before first measles exposure should be sufficient.
- Persons weighing >30 kg (66 lbs) will not receive an adequate dose of measles antibodies from IGIM. Therefore, there is no recommendation to administer IGIM to such persons.
- Nonimmune persons who receive IG should not receive MMR vaccine earlier than 6 months after IGIM or 8 months after IGIV administration.
- Information on IG administration is available at: <https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/Immunization/Measles-IGPEPQuicksheet.pdf>
- One source of IG is FFF Enterprises in Temecula CA, which can be reached 24/7 at: 1-800-843-7477.



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§Per CDC and IDSA guidance: Patients with high-level immunosuppression include those:

- with combined primary immunodeficiency disorder (e.g., severe combined immunodeficiency);
- who are receiving cancer chemotherapy;
- on treatment for ALL within and until at least 6 months after completion of immunosuppressive chemotherapy;
- within 2 months after solid organ transplantation;
- 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;
- with HIV infection with a CD4 T-lymphocyte count <200 cells/mm³ (age >5 years) and percentage <15 (all ages) (some experts include HIV-infected persons who lack recent confirmation of immunologic status or measles immunity);
- receiving daily corticosteroid therapy with a dose ≥ 20 mg (or >2 mg/kg/day for patients who weigh <10 kg) of prednisone or equivalent for ≥ 14 days; and
- receiving certain biologic immune modulators, such as a tumor necrosis factor-alpha (TNF- α) blocker or rituximab.

After hematopoietic stem cell transplantation (HSCT), duration of high-level immunosuppression is highly variable and depends on type of transplant (longer for allogeneic than for autologous), type of donor and stem cell source, and post-transplant complications such as graft vs. host disease (GVHD) and their treatments.

Please contact CDPH for consultation.

QUARANTINE OF MEASLES CONTACTS

- If quarantine implemented, it should begin on day 7 (CDC recommends day 5 for healthcare workers) after first exposure through day 21 after last exposure (day of exposure is day 0).
- When there are multiple exposure dates, exclusion or quarantine should begin at day 7 after first exposure and is recommended through day 21 of the last exposure.
- 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.
- CDPH does not recommend extending quarantine or exclusion beyond 21 days after exposure in persons who received IG PEP. It is unknown if IG prolongs the incubation period. 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.

MEASLES TREATMENT

No specific antiviral therapy is available for measles. 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 U.S. Food and Drug Administration for treatment of measles.

IV ribavirin (Virazole®) is available in the U.S. under an emergency investigational new drug protocol. Please contact CDPH if this product is requested.

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 have also been found in U.S. children, 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 like the United States where measles usually is not severe, vitamin A should be given to all children with severe measles (e.g., those requiring hospitalization).

Aquasol A™ appears to be the only parenteral vitamin A product currently available in the United States.

MEASLES FLIGHT INVESTIGATIONS

If a suspect measles case reports air travel during their infectious period, please do the following:

- Collect as much information about the flight as possible such as the flight date and time, departure and arrival cities, flight number, and seat number.
- Collect information on whether there were traveling companions.

TABLE. RECOMMENDED FOLLOW-UP OF MEASLES CONTACTS

<i>Measles immunity assessment for low-risk contacts (NOT immunocompromised, infant <12 months, pregnant, healthcare worker or household contact)</i>	IgG testing	MMR PEP^{1,2}	IG PEP³	Quarantine if no PEP	Exclusion⁵	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
Born before 1957 (5% will be susceptible)	If desired	If desired	No	No	Yes	Passive
Have 1 documented dose of MMR vaccine (5% will be susceptible)	If desired	If desired	No	No	Yes	Passive
Self-reported history of measles disease (not documented)	Yes	Yes	No	Yes ⁴	Yes	Active
Measles IgG negative ⁶ or known to be unvaccinated	-	Yes	Yes ⁷	Yes ⁴	Yes	Active
Unknown or no documentation of vaccination or immune status, <u>with</u> presumption of immunity ⁸	If desired	If desired	No	No	Yes	Passive
Unknown or no documentation of vaccination or immune status, <u>without</u> presumption of immunity ⁸	Yes	Yes	No	Yes ⁴	Yes	Active
<i>Measles immunity assessment for high-risk contacts (immunocompromised, infant <12 months, pregnant, healthcare worker or household contact)</i>	IgG testing	MMR PEP^{1,2}	IG PEP³	Quarantine if no PEP	Exclusion⁵	Symptom watch
Unvaccinated infants <12 months of age	No	No	Yes	Yes ⁴	Yes	Active
Pregnant women without 2 documented MMR vaccine doses or serologic evidence of immunity	Yes	No	Yes ⁹	Yes ⁴	Yes	Active
Severely immunocompromised people (see page 2)	No	No	Yes	See footnote ¹⁰	Yes	Active
Household or other contact with prolonged exposure without 2 documented MMR vaccine doses or serologic evidence of immunity	Yes	Yes	Yes ⁷	Yes	Yes	Active

Footnotes

1. Postexposure prophylaxis (PEP) with MMR vaccine can be given <72 hours of exposure to persons without contraindications for MMR vaccine.
2. 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.
3. 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.
4. Implement quarantine from day 7 (day 5 for healthcare workers) after first exposure through day 21 after last exposure unless the exposed person: is measles IgG positive, meets a presumption of immunity, has received IG (IM or IV) PEP ≤ 6 days of first exposure, or MMR<72 hours of first exposure. If symptoms consistent with measles develop, exposed person should be isolated. If 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. Exclude from high-risk settings (e.g., childcare facilities with infants and healthcare facilities) from day 7 (day 5 for healthcare workers) after first exposure through day 21 day after last exposure unless the exposed person is found to be measles IgG positive or to have two documented MMR doses. Some jurisdictions may choose to exclude from other settings with large numbers of unvaccinated persons.
6. If patient has two documented MMR doses and an IgG negative result, base public health decisions on the two documented doses of MMR vaccine, i.e., presume immunity.
7. IGIM can be considered for persons in this category weighing <30 kg (66 lbs). There is no public health recommendation for IGIM administration in susceptible persons >30 kg (66 lbs). If patient is ≥12 months of age, MMR PEP is preferred if <72 hours.
8. 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.
9. If patient is IgG negative, or has unknown status and testing cannot be completed by day 6 after exposure, administer IGIV.
10. CDPH should be consulted about severely immunocompromised measles contacts to assess the need for quarantine.