

Measles: Vaccine, Case, and Contact Management Recommendations

A. MMR Use and Evidence of Immunity. Recommendations for routine measles vaccination or post-exposure prophylaxis for measles depend on an individual's immune status. When measles are circulating in a community, persons are considered immune if they meet the following criteria:

Table 1 – Evidence of Immunity

Age / Risk Category	Acceptable Evidence of Immunity
Under 12 months	only laboratory evidence of immunity is acceptable in this age group (too young for valid MMR)
1 – 4 years	1 valid MMR*
5 – 18 years	2 valid MMRs*
Health Care Workers, day-care staff, students and teachers at post-secondary educational institutions, and international travelers	Born in 1957 or later: 2 valid MMRs*
	Born in 1956 or earlier: 1 valid MMR*
Others aged 19 and over	Born in 1957 or later: 1 valid MMR*
	Born in 1956 or earlier: no evidence needed (all in this category are considered immune)

*or laboratory evidence of immunity

Table 2 – Routine MMR Use (no known exposure)

<p>The usual schedule for MMR is:</p> <ul style="list-style-type: none"> • Children: <ul style="list-style-type: none"> ○ dose #1 at age 12-15 months; ○ dose #2 at age 4-5 years • Adults: those needing 2 doses should get them 8 weeks apart 	<p>To be <u>valid</u>, MMR doses must be given:</p> <ul style="list-style-type: none"> • No earlier than 12 months of age, AND • At least 4 weeks from the previous MMR dose <p>MMR is also invalid if given within several months after receipt of immune-globulin-containing products; see CDC recommendations for details (www.cdc.gov/vaccines).</p>
<p>Note: MMR is a live virus vaccine. It is contraindicated in individuals who are: 1) Immuno-compromised, 2) Pregnant, or 3) Allergic to the vaccine or any of its components</p> <p><i>However, mild-moderate illness with or without fever is NOT a contraindication for MMR.</i></p>	

B. Management of ASYMPTOMATIC but Exposed Individuals

Exposure Definition: Sharing the same room or air-handling system with a confirmed or probable case, regardless of duration.

- Immune individuals (i.e., those who meet the criteria in Table 1 above) need no additional vaccination or post-exposure prophylaxis, regardless of their exposure history. They should be counseled to call immediately if they develop fever or rash during the 21 days after last exposure.
- For susceptible individuals (i.e., those do not meet the above criteria in Table 1) but for whom there is only low probability of exposure to measles (e.g., the general public), MMR should be given, if not contraindicated, according to the usual schedule for MMR. An accelerated schedule may be used for dose #2, as long as it is given at least 4 weeks after dose #1. They should be counseled to call immediately if they develop fever or rash during the 21 days after exposure.
- For susceptible individuals with a known exposure or a high probability of exposure to measles, see *Table 3 below* for post-exposure prophylaxis and management recommendations.

Table 3 – For Asymptomatic Susceptibles[†] with Known or Highly Probable Measles Exposure:

Prior Vax History	Special Status	Time since exposure	Recommended Post-exposure Prophylaxis (PEP) and Management [‡]	All susceptible persons with known or highly probable measles exposure must be monitored for onset of fever or rash for 21 days after last exposure. Those susceptibles who had no prior valid doses of MMR must be monitored for fever and rash <i>plus</i> other measles prodromal symptoms (cough, rhinorrhea, and conjunctivitis).
1 valid dose of MMR given <u>at least 4 weeks ago</u>	Health Care Workers born in 1957 or later	Any	Give MMR #2 now.* Exclude from work from the 5 th through the 21 st day of exposure. [§]	
	Others	Any	Give MMR #2 now.*	
1 valid dose of MMR given <u>less than 4 weeks ago</u>	Health Care Workers born in 1957 or later	Any	Exclude from work from the 5 th through the 21 st day of exposure. [§] Give MMR #2* at 4 or more weeks after MMR #1	
	Others	Any	Give MMR #2* at 4 or more weeks after MMR #1	
No valid doses of MMR	Health Care Workers	Any	Give MMR #1 now.* Exclude from work (or full quarantine [¶]) from the 5 th through the 21 st day of exposure. [§]	
	Under 12 months old OR High risk and MMR contraindicated (e.g., Pregnant, Immune Suppressed)	6 days or less since FIRST exposure	Give IG now.**	
		7 days or more since FIRST exposure	Give IG now if within 6 days of LAST exposure. Quarantine [¶] for 21 days after last exposure. If not contraindicated, give MMR#1 after 1 st birthday	
	Over 12 months, not high risk, not Health Care Worker, and MMR not contraindicated	Up to 72 hours since FIRST exposure	Give MMR #1 now*	
		More than 72 hours since FIRST exposure	Give MMR #1 now* Quarantine [¶] for 21 days after last exposure.	

[†]With known exposure, susceptible individuals are defined as those who do not have a record of either TWO MMRs or laboratory evidence of immunity.

[‡]Regardless of PEP given, all susceptible individuals with known or highly probable exposure must be monitored for signs and symptoms of measles for 21 days after last exposure.

*Do not give MMR if contraindicated.

**In the case of a shortage of Immune Globulin (IG), consideration could be given to deferring IG in exposed children under 6 months of age, since many of those (especially the youngest in this group) may be protected by remaining maternal antibodies.

[§]Exclusion is specific to a particular location or activity such as school or work, while quarantine is generally complete confinement at home. The Local Health Department (LHD) in the jurisdiction where the patient works or goes to school or daycare – in cooperation with the LHD in the jurisdiction of the patient’s residence – is responsible for serving Exclusion Orders from work or school or daycare, and for lifting those orders. Students excluded from school can often return after receipt of MMR, regardless of time from exposure to MMR.

[¶]Quarantine is usually utilized only early in large outbreaks. Exclusion can be considered if client won’t or can’t get MMR and quarantine no longer being used in outbreak. The Local Public Health Department in the jurisdiction where the patient lives is responsible for serving Quarantine Orders, for monitoring patients under quarantine, and for lifting those orders. That Local Public Health Department should be informed immediately of all individuals with known or highly probable exposures who have no evidence of immunity and no known prior valid doses of MMR. In Milwaukee County, report to SurvNet at 414-286-3624

C. Management of SYMPTOMATIC Individuals

Clinical case definition: Measles is an illness characterized by all of the following:

- A generalized maculopapular rash lasting 3 days
- A temperature 101°F (38.3°C)
- Cough, rhinorrhea, or conjunctivitis

Laboratory confirmation is made by any one of the following:

- Positive serologic test for measles immunoglobulin M (IgM) antibody (drawn within 30 days of rash onset)
- Significant rise in measles IgG antibody level by any standard serologic assay (convalescent specimen drawn ~6 or more weeks after acute specimen)
- Isolation of measles virus from a clinical specimen by culture or amplified molecular testing (e.g., RT-PCR)

Table 4 – Managing Symptomatic Individuals

Type	Definition	Management
Symptomatic Exposed Individual	Susceptible exposed individual who develops cough, rhinorrhea, or conjunctivitis within 21 days of last measles exposure; OR Any exposed individual who develops fever or rash within 21 days of last measles exposure.	Report immediately to local health department. [†] Isolate** until 4 days after onset of rash. Obtain laboratory testing as indicated on page 4 (below).
Suspected Case	Any febrile illness (regardless of exposure) accompanied by generalized maculopapular rash but not meeting Probable or Confirmed definitions below.	Report immediately to local health department. [†] Obtain laboratory testing as indicated on page 4 (below).
Probable Case	Any case that meets the clinical case definition, has noncontributory or no lab test results, and is not epidemiologically linked to a confirmed case.	Report immediately to local health department. [†] Isolate** until 4 days after onset of rash. If hospitalized, use airborne precautions. Obtain laboratory testing as indicated on page 4 (below). Consider Vitamin A supplementation.
Confirmed Case	A case that is laboratory confirmed OR a case that meets the clinical case definition and is epidemiologically linked* to a confirmed case.	Report immediately to local health department. [†] Isolate** until 4 days after onset of rash. If hospitalized, use airborne precautions. If not already done, obtain laboratory testing as indicated on Page 4. Consider Vitamin A supplementation.

*Local Public Health Departments make the determination as to whether there is a bona fide epidemiologic link or not.

**The Local Public Health Department in the jurisdiction where the patient lives is responsible for serving Isolation Orders, and for lifting those orders. That Local Public Health Department should be contacted immediately and informed of all confirmed, probable, and suspect cases - - including any case on which laboratory tests for measles have been taken. Do not wait for laboratory confirmation to report.

[†]In Milwaukee County, report to SurvNet at 414-286-3624.

D. Laboratory Testing:

Who to test:

- Individuals exposed to measles who have any of the following: cough, rhinorrhea, conjunctivitis, fever, or rash
- Individuals with fever and generalized maculopapular rash, regardless of exposure or vaccination history.

All specimens should be submitted to the Wisconsin State Laboratory of Hygiene. WSLH will perform diagnostic testing free of charge; transport of specimens can also be arranged via Dunham Express at no cost to the submitter. Specimens should only be submitted from individuals who are symptomatic (i.e., not from asymptomatic individuals to determine immune status).

Transport of specimens to the State Laboratory of Hygiene:

Specimens should be packaged according to regulatory requirements. The cost of specimen transport can be billed to the State Laboratory of Hygiene if arrangements are made with Dunham Express, billing to Account # 7263

Specimens to be submitted:

- Nasopharyngeal and throat swabs in viral transport media for PCR testing. Both swabs should be combined in one vial of viral transport medium (e.g., M4, M5, etc.). Order test code # 3214.
- Urine specimen for PCR (in sterile, screw-capped container without additives). Order test code # 3214.
- If the patient has a rash, collect a serum specimen for measles serology. Note: A convalescent serum, collected two or more weeks after onset of rash, should also be submitted. Order test code # 2814.

Interpretation of Serologic Test Results:

Generally, in a susceptible person exposed to measles virus, the IgM response starts around the time of rash onset and is transient, persisting 1–2 months. The IgG response starts more slowly, at about 7 days after rash onset, but typically persists for a lifetime after infection. IgG also remains positive after successful vaccination.

The diagnosis of acute measles infection can be made by detecting IgM antibody to measles in a single serum specimen or by detecting a rise in the titer of IgG antibody in two serum specimens drawn roughly two weeks (or more) apart.

Tests for measles IgM antibodies are often positive on the day of rash onset. However, in the first 72 hours after rash onset, up to 30% of tests for IgM may give 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 and frequently longer.

Interpretation of PCR Test Results:

Specimens for measles PCR should be collected at the same time as the acute serum specimen. Detection of measles virus by reverse transcription polymerase chain reaction (RT-PCR) in clinical specimens confirms the diagnosis of measles.

However, a negative RT-PCR does not rule out measles because test sensitivity is affected by the timing of specimen collection and the quality and handling of the clinical specimens.