Epidemiology of measles
Measles, also called rubeola, is no longer considered endemic in the United States. However, continued success depends upon maintaining high vaccination rates, because 80% of the cases of measles continue to be imported into the United States. Measles disease can occur anytime of the year, but is most frequently seen during late winter and spring.

Worldwide, an estimated 30 million cases and 700,000 deaths occur each year. More than half of the deaths occur in Africa. During 1997-1998, approximately 100 deaths were attributed to a large outbreak of measles in Argentina and Brazil.

Measles is an acute viral illness characterized by:
- A prodrome of fever and malaise
- Cough, coryza, and conjunctivitis
- A maculopapular rash
- Koplik’s spots (exanthem present on mucous membranes) are considered to be indicative of measles and occur 1–2 days before the rash and persist for to 1–2 days after the rash. Other rash-causing diseases often confused with measles include roseola (Roseola infantum) and rubella (German measles), among others.

Atypical measles occurs only in persons who received inactivated (“killed”) measles vaccine (KMV) and are subsequently exposed to wild type measles virus. Modified measles occurs primarily in patients who received immune globulin (IG) as post-exposure prophylaxis and in young infants who have some residual maternal antibody.

Measles is usually a mild or moderately severe illness; however, complications can occur.
- Residual neurological impairment occurs from encephalitis in approximately 5–10 cases per 10,000 reported cases.
- Hospitalization occurs in 19% of measles cases in the United States.
- Pneumonia occurs in 6% of measles cases.
- Death occurs in approximately 1–3 cases per 1,000 reported cases.

Diagnosing measles
Rash illnesses are difficult to distinguish without laboratory testing.

In diagnosing measles, clinicians should consider:
- Including both rubella and measles in the differential diagnosis of patients presenting with an acute generalized rash and fever.
- Ordering serology tests only if the clinical case definition is met; otherwise, false positive results may be detected.
- Collecting specimens for both culture and serology.

Acute measles infection is lab confirmed by the presence of one or more of the following:
- A positive measles-specific IgM antibody,
- A significant rise in IgG antibody from paired acute and convalescent sera,
- A positive viral culture for measles, or
- Detection of the virus by reverse transcription-polymerase chain reaction (RT-PCR).

Refer to MDH “Lab Testing for Measles” fact sheet.

Treating measles
Treatment is supportive and focused on relieving symptoms and or treating complications.

Communicability of measles
Measles is highly communicable. Secondary attack rates exceed 90% among susceptible persons.
- Measles is infectious from 4 days prior to 4 days after rash onset.
- Maximum infectiousness occurs between onset of prodrome through the first 3–4 days of rash.
- Immunocompromised persons may shed virus for several weeks after the acute illness.
- There are no asymptomatic infectious carriers.
- The incubation period for measles averages 10-12 days from exposure to prodrome and 14 days (range 7-18) from exposure to rash onset.

The measles virus is found in respiratory secretions. Measles transmission can be person-to-person via contact with secretions or by contact with large respiratory droplets that are aerosolized during coughing and sneezing. Airborne transmission via aerosolized droplet nuclei is the primary route of transmission and has been documented in closed areas (e.g., office examination room) for up to 2 hours after a person with measles occupied the area.
Preventing transmission of measles
Vaccination is the primary means to prevent disease.

Healthcare settings
- Patients suspected to have measles should be placed in a negative pressure room in Airborne Infection Isolation (AI). Precautions. Susceptible persons should not enter the isolation room.
- Susceptible patients who have been exposed to an individual with measles (contagious) should be placed in Airborne Infection Isolation (AI). Precautions from the 5th to the 21st day after exposure (regardless of whether they received measles vaccine or immunoglobulin for this specific exposure) or from the onset of symptoms until 4 days after the onset of the rash if the patient becomes ill.
- 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, regardless of whether they received vaccine or immunoglobulin after the exposure. Personnel who become ill should be relieved from all patient contact and excluded from the facility for at least 4 days after they develop the rash.

School, daycare and work settings:
- Persons with suspect measles illness should be excluded from school or work until 4 days after onset of the rash, or until measles has been ruled out.
- Persons who cannot readily provide documentation of measles immunity should be vaccinated or excluded from the school or other institution.
- Persons revaccinated, 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.

Handling exposure to measles
- Live measles vaccine may prevent disease if given within 72 hours of exposure.
- Immune globulin (IG) may prevent or modify disease and provide temporary protection if given within 6 days of exposure. IG may be especially indicated for susceptible household contacts of measles patients, particularly contacts <1 year of age (for whom the risk of complications is highest), susceptible pregnant women and susceptible immunosuppressed persons who are exposed to measles. Some diseases that cause immunosuppression may suppress measles immunity in those with a history of measles immunity. Testing for immunity is recommended for immunosuppressed individuals.
- IG is not indicated for household contacts who have received one dose of vaccine at 12 months of age or older unless they are immunocompromised.

Vaccination following receipt of IG
Administration of live-virus vaccines following receipt of IG may inhibit the immune response. Therefore, it’s recommended to delay the administration of live-virus vaccines as follows:
- Give varicella vaccine no sooner than 5 months following receipt of IG.
- Give rotavirus vaccine 6 weeks following receipt of IG. However, if delaying the vaccination by 6 weeks causes the first dose of rotavirus to be scheduled on or after the child is 15 weeks of age or the final dose after the child is 32 weeks of age, the provider should disregard the deferral and proceed to vaccinate.

Exposure to measles during pregnancy
Measles illness during pregnancy results in a higher risk of premature labor, spontaneous abortion, and low-birth-weight infants.

Measles in immunocompromised individuals
Measles in an immunocompromised person may be severe, with a prolonged course and is reported almost exclusively in persons with T-cell deficiencies (certain leukemias, lymphomas, and AIDS). The rash may be atypical.

Vaccination Recommendations
Two doses of MMR (measles, mumps and rubella) vaccine separated by at least 4 weeks are routinely recommended for all children. All persons born in or after 1957 should have documentation of at least one dose of MMR or other evidence of measles immunity. Certain groups of adults may be at increased risk for exposure to measles. Adults attending colleges or other post high school educational institutions, working in medical facilities, or traveling internationally should be assessed to ensure they are properly immunized. A second dose may be needed.
Healthy susceptible close contacts of severely immunocompromised persons should be vaccinated.

**Vaccination: pregnancy and breastfeeding**

Women known to be pregnant should not receive measles vaccine. Pregnancy should be avoided for 4 weeks following MMR vaccine. Close contact with a pregnant woman is NOT a contraindication to MMR vaccination of the contact. Breastfeeding is NOT a contraindication to vaccination of either the woman or the breastfeeding child.

**Contraindications to vaccine**

Patients who are severely immunocompromised for any reason should not be given MMR vaccine.

Persons receiving large daily doses of corticosteroids (≥2 mg/kg per day or ≥20 mg per day of prednisone) for 14 days or more should not receive MMR vaccine because of concern about vaccine safety.

MMR and its component vaccines should be avoided for at least one month after cessation of high dose therapy.

Administration of blood products and immune globulin require varying intervals before administration of rubella or measles vaccine.

**Vaccine Precautions**

MMR may be administered to egg-allergic children without prior routine skin testing or the use of special protocols. MMR vaccine does not contain penicillin. A history of penicillin allergy is not a contraindication to vaccination with MMR or any other U.S. vaccine.

Persons receiving low dose or short course (<14 days) corticosteroid therapy, alternate-day treatment, maintenance physiologic doses, or topical, aerosol, intra-articular, bursal, or tendon injections may be vaccinated.

Patients with leukemia in remission who have not received chemotherapy for at least 3 months may receive MMR or its component vaccines.