STANDARD TREATMENT GUIDELINES 2022

Measles

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Measles is a highly contagious viral illness that occurs worldwide. The causative agent, measles virus (MV), is a member of the family Paramyxoviridae, genus Morbillivirus, and is spread via the respiratory route. The infection is characterized by fever, malaise, cough, coryza, and conjunctivitis, followed by exanthem.

- Following exposure, approximately 90% of susceptible individuals will develop measles.
- The period of contagiousness is estimated to be from 5 days before the appearance of the rash to 4 days afterward.

Measles occurs worldwide and remains a leading cause of mortality especially among children ≤5 years of age. Measles occurs predominantly in areas with low vaccination rates, particularly resource-limited settings.

- Availability of measles vaccination beginning in the 1960s immediately impacted disease incidence, reduced associated mortality rates, and altered the global distribution.
- In resource-rich settings, outbreaks of measles have occurred in settings where vaccination uptake has declined, allowing for transmission of imported measles virus from unvaccinated and infected travelers.
Two membrane envelope proteins are important in pathogenesis. They are the **F (fusion) protein**, which is responsible for fusion of virus and host cell membranes, viral penetration, and hemolysis, and the **H (hemagglutinin) protein**, which is responsible for binding of virus to receptors on host cells.

Measles virus is highly infectious, and is transmitted by aerosols generated during coughing or by direct contact with contaminated respiratory secretions.

The dissemination of measles virus due to viremia, with associated infection of endothelial, epithelial, monocyte, and macrophage cells, may explain the variety of clinical manifestations and complications that can occur with measles virus infection.

After an incubation time of almost 2 weeks, disease starts with a prodromal phase of fever, cough, and coryza.

Approximately 48 hours prior to onset of the exanthem, patients may develop an enanthem characterized by Koplik spots; these are 1–3 mm whitish, grayish, or bluish elevations with an erythematous base, typically seen on the buccal mucosa opposite the molar teeth.

The exanthem of measles arises approximately 2–4 days after onset of fever; it consists of an erythematous, maculopapular, blanching rash, which classically begins on the face and spreads cephalocaudally and centrifugally to involve the neck, upper trunk, lower trunk, and extremities.

Other characteristic findings during the exanthematous phase include lymphadenopathy, high fever (peaking 2–3 days after appearance of rash), pronounced respiratory signs including pharyngitis, and nonpurulent conjunctivitis.

Measles virus infection can cause a variety of clinical syndromes, including:

- **Classic measles infection in immunocompetent individuals**
- **Modified measles infection in patients with preexisting but incompletely protective anti-measles antibody**
- **Atypical measles infection in patients immunized with the killed virus vaccine**
- **Neurologic syndromes following measles infection, including acute disseminated encephalomyelitis and subacute sclerosing panencephalitis**
- **Severe measles infection especially in immunocompromised individuals**
- **Complications of measles including secondary infection, giant cell pneumonia, and measles inclusion body encephalitis.**
Measles is associated with a transient but profound immunosuppression, resulting in an increased susceptibility to opportunistic infections.

This often leads to complications such as pneumonia, otitis media, encephalitis, acute disseminated encephalomyelitis (ADEM), keratitis, pericarditis, myocarditis, subacute sclerosing panencephalitis (SSPE).

Complications

Thrombocytopenia, leukopenia, and T cell cytopenia may be observed during measles infection. Chest radiography may demonstrate interstitial pneumonitis.

Biopsy samples of lymphoid tissues before the appearance of the exanthem may demonstrate reticuloendothelial giant cells.

Positive serologic test for serum measles IgM antibody, significant rise in measles IgG antibody between acute and convalescent titers.

Isolation of measles virus in culture, or detection of measles virus RNA by reverse transcription polymerase chain reaction (RT-PCR) may demonstrate giant cells with inclusions.

Diagnosis

Positive findings include:
- Measles is associated with a transient but profound immunosuppression, resulting in an increased susceptibility to opportunistic infections.
- This often leads to complications such as pneumonia, otitis media, encephalitis, acute disseminated encephalomyelitis (ADEM), keratitis, pericarditis, myocarditis, subacute sclerosing panencephalitis (SSPE).

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Differential Diagnosis

- Drug rash
- Kawasaki disease
- Infectious mononucleosis
- Meningococccemia
- *Mycoplasma*
- Rocky Mountain spotted fever

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The treatment of measles is supportive; there is no specific antiviral therapy approved for treatment of measles.

However, there have been trials with Ribavirin. Isoprinosine has been used in SSPE. There is a role for vitamin A in certain settings.

Supportive therapy includes antipyretics, fluids, and treatment of bacterial superinfections such as bacterial pneumonia and otitis media.

Treatment of other complications, such as seizures and respiratory failure, may also be necessary.

Dosing of vitamin A consists of oral administration once daily for 2 days, as follows:

- **Infants <6 months of age:** 50,000 international units
- **Infants 6–11 months of age:** 100,000 international units
- **Children ≥12 months:** 200,000 international units

Measles, mumps, and rubella vaccination according to the schedule and catch-up vaccination of those children who have missed the doses.

**Infection control:** Isolation of children with suspected measles from 7th day of exposure to 5 days after appearance of rash.

**Measles–Rubella initiative plan:** It aims at ensuring that no child dies of complications due to measles or congenital rubella syndrome.

A sensitive case-based surveillance system is essential to monitor progress toward elimination and to sustain measles elimination and rubella control/elimination.

In settings with a measles elimination goal, such as all 11 SEAR countries, the goal of case-based surveillance is to detect, investigate, and classify all suspected cases; and to respond to confirmed outbreaks (Flowchart 1).

For case confirmation, case-based surveillance includes laboratory testing at an accredited laboratory within the Global Measles and Rubella Laboratory Network. To achieve this measles containing vaccine (MCV) 2 and measles and rubella containing vaccine (MRCV) was introduced in 2010.
**Flowchart 1:** Classification of suspected cases.

- **Suspected case**
  - Adequate specimen
    - Laboratory positive
      - Laboratory confirmed case
    - Laboratory negative
      - *Discarded:* Nonmeasles, nonrubella
  - No/Inadequate specimen
    - Epidemiologically linked to lab confirmed case
      - Epidemiologically linked case
    - No epidemiological linkage
      - *Discarded:* Nonmeasles, nonrubella

**Source:** Surveillance Guide for Vaccine-Preventable Diseases in the WHO South-East Asia Region.

The standard mode of surveillance for elimination strategies is case-based surveillance with detailed case investigation of all suspected cases and the following attributes:

- Detect, confirm and classify cases
- Reporting of suspected cases
- Investigating reported cases
- Laboratory confirmation of cases/outbreaks
- Dealing with large outbreaks
- Surveillance during acute humanitarian emergencies
- Data collection for cases/outbreaks
- Data analysis and interpretation
- Review and monitoring surveillance performance indicators
- Reporting/Feed-forward to higher levels

**Further Reading**