

IN THIS ISSUE: MEASLES

Measles: Clinical Presentation, Testing, Vaccine and Travel

Introduction

Vaccine preventable diseases are among the leading causes of morbidity and mortality worldwide.<sup>1</sup> Among these diseases is measles, which remains common in many countries throughout the world. Approximately 140,000 people died from measles worldwide in 2018.<sup>1</sup> By the end of 2019, only 83 (43%) individual countries had been verified to achieve measles elimination.<sup>2</sup>

Measles was declared eliminated in the United States (U.S.) in the year 2000. However, travelers continue to bring measles into the United States, and it can sometimes spread among people who are not vaccinated, which puts the U.S. at risk of losing its measles elimination status per the World Health Organization.<sup>3</sup> Despite the availability of safe and effective vaccines, measles continues to be a public health concern.

Epidemiology

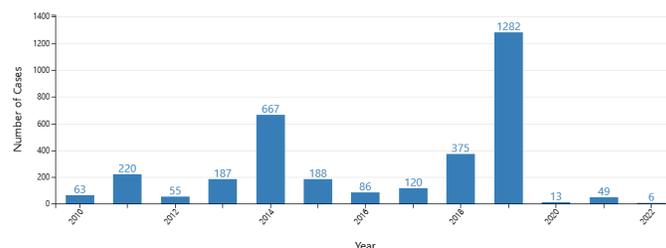
Measles is a highly contagious disease caused by a paramyxovirus of the genus *Morbillivirus* with no known animal reservoir.<sup>4</sup> Transmission occurs person-to-person via large respiratory droplets. The contagious period ranges from about four days before through four days after onset of rash. Aerosolized droplets in enclosed areas can remain airborne for up to two hours after a person with measles occupies the area (e.g., examination rooms).<sup>4</sup> Up to 90% of people who are not immune will become infected if in close proximity to a person who has measles.<sup>5</sup>

In the U.S., cases of measles are imported when travelers acquire it while abroad then return to the U.S. and spread it predominately to unvaccinated or partially vaccinated individuals.<sup>6</sup> Common settings of measles transmission in the United States have included households, educational institutions (e.g., schools, day care), churches, health care facilities, homeless shelters, and other congregate settings. Lack of adherence to existing recommendations for measles prevention among groups at high risk (e.g., individuals who travel internationally), can spread measles to susceptible populations, including infants

too young to be vaccinated and persons who are unvaccinated by choice.<sup>7, 8</sup>

In the past decade, the highest number of reported cases was 1,282 in 2019 [Figure 1]. According to the CDC, most of the cases were among people who were not vaccinated against measles.<sup>6</sup>

Figure 1: Number of measles cases in the United States reported by year 2010-2022 as of August 4, 2022



\*Case count is preliminary and subject to change. 2010-2022\* (as of August 4, 2022)

Source: <https://www.cdc.gov/measles/cases-outbreaks.html>

In Washoe County, the last measles case was reported and investigated in 2018, which was the first in nearly two decades. This case was a fully vaccinated male who traveled out of state and came into contact with a case at an event, no further transmission occurred in Washoe County.

Clinical Presentation

Acute phase of infection is characterized by a prodrome of fever (as high as 105°F), a pathognomonic enanthema or Koplik's spots [Figure 2], and the "3C's":

- Cough
- Conjunctivitis
- Coryza (runny nose)

A maculopapular rash typically presents about 14 days after exposure [Figure 3], and spreads from the head to the trunk to lower extremities. It is important to note that immunocompromised patients may not develop a rash.<sup>9</sup>

Common complications include otitis media, diarrhea, bronchopneumonia, and laryngotracheobronchitis. Severe complications can occur and can include acute encephalitis, hospitalization, complications during pregnancy and death. Long-term complications can include the rare but fatal subacute sclerosing

panencephalitis (SSPE), which can develop 7-10 years after a person has had measles and is higher among unvaccinated individuals.<sup>9</sup>

Risk factors for infection and severe complications can include:<sup>10</sup>

- Children with immunodeficiencies like leukemia and HIV, regardless of vaccination status
- Travel to endemic areas or contact with travelers to endemic areas
- Pregnant women
- Infants who lose passive antibodies before they are eligible for the vaccine

**Figure 2: Koplik's Spots on Palate**



Source: CDC/PHIL <https://phil.cdc.gov/Details.aspx?pid=3187>

**Figure 3: Child with Classic Measles (Maculopapular) Rash**



Source: CDC/PHIL <https://phil.cdc.gov/Details.aspx?pid=13322>

## Testing

A throat swab and blood specimen should be collected from all patients with clinical features compatible with measles. A serum sample should be collected upon suspicion of measles or during the acute phase characterized under Clinical Presentation. If a serum sample is negative and was collected  $\leq 3$  days after rash onset, a second serum sample should be collected 3-10 days after symptom onset because, in some cases, the IgM response is not detectable until three days after symptom onset.<sup>11</sup>

As many healthcare providers may have never seen a measles case, CDC offers a video for providers to assist in identification and diagnosis:

<https://www.cdc.gov/measles/hcp/index.html>

## Post-exposure prophylaxis (PEP)

Post-exposure prophylaxis (PEP) against measles should be offered to those who cannot readily provide evidence of immunity. The vaccine should be administered within 72 hours of initial exposure **OR** immunoglobulin (IG) within six days of exposure.<sup>9</sup> In addition, CDC advises against simultaneous administration of IG and MMR vaccine, as this practice invalidates the vaccine.<sup>9</sup>

## Vaccine and Travel

Prior to the measles vaccine being introduced in 1963, there were an average of 549,000 cases and 495 deaths reported annually in the United States. Of these, approximately 48,000 were hospitalized and 1,000 developed chronic disabilities from acute encephalitis caused by measles annually.<sup>9</sup>

Two doses of MMR vaccine are recommended (Figure 4) and provides 97% protection against measles, but one dose still provides 93% protection.<sup>9</sup> The MMR vaccine is administered starting with the first dose at 12 to 15 months of age, and the second dose at 4 through 6 years of age.<sup>9</sup> CDC does not recommend measles vaccine for infants younger than six months of age. Those who plan to travel internationally, are six months or older, and are not sure if they are vaccinated or lack evidence of immunity, should obtain an MMR vaccine at least two weeks before departure. Acceptable evidence of immunity against measles includes at least one of the following<sup>12</sup>

- written documentation of adequate vaccination, or
- laboratory evidence of immunity, or
- laboratory confirmation of measles, or
- birth in the United States before 1957

**Figure 4: Regular MMR vaccine schedule for children, teens, and adults**

	First Dose	Second Dose
Children*	Age 12-15 months	Age 4-6 years
Teenagers and adults with no evidence of immunity**	As soon as possible	N/A

Source: <https://www.cdc.gov/measles/vaccination.html>

Measles is nationally notifiable, and cases should be reported to the local health department immediately. Prompt recognition, reporting and investigation is crucial in interrupting the transmission of this highly contagious, vaccine preventable disease.

For more information on vaccine administration before travel visit:

<https://www.cdc.gov/measles/plan-for-travel.html>

## Reporting

The list of reportable communicable diseases and reporting forms can be found at:

<http://tinyurl.com/WashoeDiseaseReporting>

**Report communicable diseases to the Washoe County Health District. To report a communicable disease, please call 775-328-2447 or fax your report to the WCHD at 775-328-3764.**

## Acknowledgement

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## References

- 1 Frenkel L. D. (2021). The global burden of vaccine-preventable infectious diseases in children less than 5 years of age: Implications for COVID-19 vaccination. How can we do better? Allergy and asthma proceedings, 42(5), 378–385. Accessed March 2022 <https://doi.org/10.2500/aap.2021.42.210065>
- 2 Patel MK, Goodson JL, Alexander JP Jr., et al. Progress Toward Regional Measles Elimination — Worldwide, 2000–2019. MMWR Morb Mortal Wkly Rep 2020;69:1700–1705. DOI: Accessed April 2022 from <http://dx.doi.org/10.15585/mmwr.mm6945a6external>
- 3 Centers for Disease Control and Prevention. Measles Elimination. Accessed December 2021 <https://www.cdc.gov/measles/elimination.html>
- 4 Paul Gastanaduy, MD; Penina Haber, MPH; Paul A. Rota, PhD; and Manisha Patel, MD, MS. (2021). *Epidemiology and Prevention of Vaccine-Preventable Diseases*. The Pink Book. Accessed June 2022 <https://www.cdc.gov/vaccines/pubs/pinkbook/meas.html#virus>
- 5 Centers for Disease Control and Prevention. Transmission of Measles. Accessed June 2022 from <https://www.cdc.gov/measles/transmission.html>
- 6 Measles Cases and Outbreaks. Centers for Disease Control and Prevention. Accessed June 2022 from <https://www.cdc.gov/measles/cases-outbreaks.html>
- 7 CDC. Measles—United States, January 4–April 2, 2015. MMWR Morb Mortal Wkly Rep 2015;64(14):373–6.
- 8 CDC. Measles—United States, January 1–May 23, 2014. MMWR Morb Mortal Wkly Rep 2014;63(22):496–9.
- 9 Centers for Disease Control and Prevention. Measles (Rubeola) for Healthcare Providers. Accessed June 2022 from <https://www.cdc.gov/measles/hcp/index.html>
- 10 Fatal measles infection in children with leukemia. Breitfeld V, Hashida Y, Sherman FE, Odagiri K, Yunis EJ. Lab Invest. 1973 Mar; 28(3):279-91.
- 11 Centers for Disease Control and Prevention. Measles. Specimen Collection, Storage and Shipment. Accessed June 2022 from <https://www.cdc.gov/measles/lab-tools/rt-pcr.html>
- 12 Centers for Disease Control and Prevention. Measles. Plan for Travel. Accessed July 2022 from <https://www.cdc.gov/measles/plan-for-travel.html>