



When should measles vaccine be given? What is interval between doses?

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Editor's note: This is the first of three articles on the safety of measles vaccine.

Before vaccines became available, infection with measles virus was nearly universal among U.S. children and adolescents. More than 50% of children had measles by age 6, and more than 90% had measles by age 15. Encephalitis or death occurred in as many as 0.2% of infected children, resulting in more than 500 deaths annually.

The first live attenuated vaccine was licensed in the U.S. in 1963 (Edmonston B strain). By the late 1960s, the U.S. experienced more than a 99% reduction in reported measles cases. In 2000, measles was declared eliminated from this country.

Elimination does not mean the absence of cases. Rather, it refers to the absence of measles transmission among the general population for at least 12 months after an infectious case is imported. Since measles was declared eliminated, the annual number of reported cases in this country has ranged from a low of 37 in 2004 to a high of 667 in 2014. However, as of April 11, 555 cases of measles have been reported.

In February 1998, *The Lancet* published a report by Andrew Wakefield and co-workers at the Royal Free College in London proposing a link between measles, mumps and rubella (MMR) vaccine and a newly described syndrome of autism and bowel disease. Six years later, the editors of *The Lancet* described allegations of serious misconduct by the authors of the paper, including a failure to disclose that Wakefield had a significant financial conflict. The paper was retracted in 2010, and Wakefield lost his license to practice medicine in the United Kingdom for unethical behavior, misconduct and dishonesty for authoring a fraudulent research paper.

Wakefield's work is now recognized as an "elaborate fraud," but the damage has been done. Wakefield's erroneous claim that the MMR vaccine might be associated with autism led to a decline in vaccination rates in many countries, including the United States. Wakefield's continuing claim that the vaccine is harmful has resulted in a rise in measles. It also has contributed to a climate of distrust of all vaccines and the re-emergence of previously controlled diseases, resulting in harm to many children.

Which of the following statements are true?

- a) Administration of the second dose of measles-containing vaccine should be administered only at 4 to 6 years of age.
- b) Between 2% and 5% of people do not develop measles immunity after the first dose of MMR.
- c) In 1954, Enders and Peebles isolated a measles virus from the blood of a 13-year-old boy named David Edmonston during a measles outbreak in Boston, and the isolate was transformed into the vaccine strain.
- d) Some people have a memory of measles vaccination but no longer have written documentation, and this can be accepted as evidence of measles immunity.

Answer: b and c are true

The only measles virus vaccine available in the U.S. is a live, more attenuated Edmonston-Enders strain. Only one antigenic type of measles virus has been identified. Antigenic changes on one surface protein (H



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glycoprotein) have been documented, but this change has no impact on vaccine efficacy. The vaccine is available combined with mumps and rubella vaccines or with mumps, rubella and varicella vaccines. Single valent measles vaccine is not available in the U.S. The Academy and the Centers for Disease Control and Prevention recommend that MMR be used when any of the individual components is indicated.

The first dose of MMR should be administered routinely on or after the first birthday. A dose of measles vaccine given before 12 months of age should not be counted as part of the two-dose series. Children who receive measles vaccine at 6 through 11 months of age because of travel outside the U.S. or because of potential measles exposure in the U.S. should be revaccinated with two doses of MMR vaccine, the first of which should be administered when the child is at least 12 months of age (total three doses).

The second dose of MMR is recommended to produce immunity in those who fail to respond to the first dose. The second dose should be administered routinely at age 4-6 years, before a child enters kindergarten or first grade. The recommended visit at age 11 or 12 years serves as a catch-up opportunity to verify vaccination status and administer MMR vaccine to children who have not yet received two doses.

If desired, the second dose of MMR may be administered as soon as four weeks (28 days) after the first dose. Children who already have received two doses of MMR vaccine at least four weeks apart, with the first dose administered no earlier than the first birthday, do not need an additional dose when they enter school (unless required by state law).

Administration of a routine second dose at least 28 days after the first dose (rather than at 4-6 years) is appropriate for children who may be exposed to measles in the U.S.

Children without documentation of adequate vaccination against measles, mumps and rubella or other acceptable evidence of immunity to these diseases can be re-admitted to school after receipt of the first dose of MMR. A second dose should be administered as soon as possible, but no less than four weeks after the first dose.

Only doses of vaccine with written documentation of the date of receipt should be accepted as valid. Self-reported doses or a parental report of vaccination is not considered adequate documentation. A health care professional should not provide an immunization record for a patient unless the provider has administered the vaccine or has seen a record that documents vaccination. People who lack adequate documentation of vaccination or other acceptable evidence of immunity should be vaccinated.

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