

## INFORMATION PAPER

Military Vaccine Agency  
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SUBJECT: Measles Infection and Measles Vaccine

1. Purpose. To describe measles and the vaccines to prevent it.

2. Facts.

a. Microbiology. Measles (rubeola) virus is a single stranded RNA paramyxovirus. Two surface antigens on the virus are responsible for fusion of the virus to host cell membranes, allowing viral penetration and hemolysis. Viral replication occurs in the epithelium of the nasopharynx within about 24 hours. There is only one antigenic type of measles virus but lineages of wild-type virus have been identified.

b. Disease. The average incubation period is 10-12 days, with the rash occurring at about 14 days after the initial exposure. The prodrome is marked by high fever followed by the onset of cough runny nose, or red, watery eyes (conjunctivitis). Koplik spots are a rash of mucous membranes of the mouth. The lesions present as blue and white spots on bright red background and appear a few days before and after the measles rash. The characteristic measles rash appears as a maculopapular rash that starts on the head and gradually proceeds down the body over 5-6 days. Approximately 30% of measles cases will develop complications, which are most common in children younger than 5 years and adults 20 years and older. Complications include ear infection, diarrhea, pneumonia, or encephalitis (brain inflammation) and rarely death. Pneumonia occurs in up to 6% of cases and accounts for 60% of deaths attributed to measles.

c. Epidemiology. Measles occurs throughout the world and humans are the only known reservoir of the virus. Measles is transmitted person to person via large respiratory droplets and by direct contact with nasal or throat secretions. The disease is highly communicable and may be transmitted from 4 days before to 4 days after rash onset. Decreased vaccination rates in Europe and the US has resulted in resurgence in measles outbreaks. In the US cases are primarily associated with residents traveling internationally. In 2011, the US reported the highest number of measles cases since 1996

d. Vaccine.

1) Merck's, MMR® II, is an attenuated, live virus vaccine containing measles, mumps and rubella viruses. The vaccine is propagated in chick embryo cells and human diploid cells. In addition a dose of the vaccine contains sorbitol, gelatin, MSG, and neomycin. The vaccine is preservative free.

2) Merck's, ProQuad® (MMRV), is a combined, attenuated, live virus vaccine containing measles, mumps, rubella and varicella viruses. The vaccine is propagated in chick embryo cells and human diploid cells. In addition a dose of the vaccine contains gelatin, MSG, and neomycin. The vaccine is preservative free.

e. Cautions. The MMR vaccines should not be administered to people with severe hypersensitivity to the vaccine or its components, pregnant women, individuals who are

immunosuppressed, or who have moderate to severe acute illnesses. Hypersensitivity to egg antigens is no longer a contraindication. Receipt of antibody containing blood products may interfere with seroconversion after vaccinations and the delay in vaccination should be in accordance with guidelines. Persons with a history of thrombocytopenia should be evaluated for risk and benefit of vaccination. Tuberculin skin test (TST) should be delayed if measles vaccine has been administered in the last 4 weeks in order to prevent suppression of TST reactivity.

f. Immunization. Two doses of vaccine separated by at least 4 weeks will provide protection. Each 0.5-mL dose is administered subcutaneously. ProQuad® is licensed for children 12 months through 12 years of age. MMR® II is licensed for persons 12 months and older.

1) Pediatric Schedule: The first dose of MMR containing vaccine should be administered at 12-15 months of age. The second dose should be administered at 4 to 6 years of age. The first and second dose must be separated by at least 4 weeks. Any dose of MMR vaccine administered before 12 months should not be counted as part of series.

2) Adult schedule: All adults born in 1957 or later should receive at least 1 dose of MMR unless they have documentation of 1 dose or other acceptable evidence of immunity. Adults born before 1957 are assumed to be immune to measles by natural infection. A second dose of MMR is also recommended for adults who have been recently exposed to measles or who are in an outbreak setting, were previously vaccinated with killed measles vaccine, were vaccinated with an unspecified measles vaccine between 1963 and 1967, or plan to travel internationally.

g. Adverse Events. The most common adverse reactions after MMR vaccine are fever and rash in children and joint pain in adults. Rarely, the vaccines cause thrombocytopenia within 2 months of vaccination. Swollen lymph nodes and parotid glands have also been reported.

h. DoD Policy. MMR is administered to all accessions, unless they have documented evidence of two prior vaccinations or positive serological testing..

### 3. References.

a. Centers for Disease Control and Prevention. Use of Combination Measles, Mumps, Rubella and Varicella Vaccine. Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2010; 59(RR-3):1-12.

b. Centers for Disease Control and Prevention. Measles, mumps, and rubella: Vaccine use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps. Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1998; 47(RR-8):1-57.

c. Multiple resources (e.g., product insert, Vaccine Information Statements) assembled by Military Vaccine Agency: [www.vaccines.mil/measles](http://www.vaccines.mil/measles)

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