

Risk Assessment

Measles virus (including human samples and other materials)

Background

Measles is one of the most easily transmitted diseases. Transmission is primarily by large droplet spread or direct contact with nasal or throat secretions from an infected person. Less commonly, it is spread by airborne aerosolised droplet nuclei or by indirect contact with freshly contaminated articles. Measles is highly communicable, with a secondary attack rate among susceptible persons of more than 90%.

After infection, the measles virus invades the respiratory epithelium of the nasopharynx and spreads to the regional lymph nodes. After 2-3 days of replication in these sites, a primary viraemia widens the infection to the reticuloendothelial system. Following further replication, a secondary viraemia occurs 5-7 days after infection and lasts 4-7 days. During this viraemia, there may be infection and further virus replication in the skin, conjunctivae, respiratory tract and other organs, including the spleen, thymus, lung, liver, and kidney. The viraemia peaks 11-14 days after infection, and then declines rapidly over a few days.

Both IgM and IgG antibodies are produced during the primary immune response and can be detected in the serum within a few days of rash onset. Using sensitive ELISA IgM assays, 90% of measles cases are IgM positive at 3 days post rash onset. IgM antibody levels peak after about 7-10 days and then decline rapidly, being rarely detectable after 6-8 weeks. IgG antibody levels peak within about 4 weeks and persist long after infection. Serum IgA and secretory IgA antibodies are also produced.

Measles virus is viable for less than 2 hours at ambient temperatures on surfaces and objects, while the aerosolized virus remains infective for 30 minutes or more. It is very sensitive to heat and is inactivated after 30 minutes at 56°C. However, the virus appears to survive freeze-drying relatively well and, when freeze-dried with a protein stabilizer, can survive storage for decades at -70°C. The virus is inactivated by solvents, such as ether and chloroform, by acids (pH10), and by UV and visible light. It is also susceptible to many disinfectants, including 1% sodium hypochlorite, 70% alcohol and formalin.

Risk Considerations

- (1) Measles is highly contagious and materials containing and human samples suspected of containing measles virus should be handled in a biosafety containment level 2 safety cabinet.
- (2) Most people are vaccinated and, thus, immunized against measles virus. All laboratory personnel working with human samples suspected of containing measles virus must have evidence of vaccination.
- (3) Measles virus is viable on surfaces for up to 2 hours and remains infective for 30 minutes in aerosolized form.

Exposure Risk

There is some risk of infection from exposure to measles virus to workers in the laboratory. All laboratory personnel working with materials containing measles virus must have evidence of vaccination. All work with materials containing or suspected of containing measles virus must be done in

a biosafety containment level 2 safety cabinet. Protocols that produce aerosols should be performed in a BSC2 safety cabinet. Personal protective equipment such as gowns and gloves must be worn at all times when in the laboratory.

Decontamination

The virus is inactivated by solvents, such as ether and chloroform, by acids (pH10), and by UV and visible light. It is also susceptible to many disinfectants, including 1% sodium hypochlorite, 70% alcohol and formalin. It is recommended to wipe down all work surfaces with 70% alcohol after work.

Tentative Assessment: BIOSAFETY LEVEL II