

# MORBILLIVIRUSES (NON-HUMAN PRIMATE)

Aetiology Epidemiology Diagnosis Prevention and Control  
Potential Impacts of Disease Agent Beyond Clinical Illness References

## AETIOLOGY

### **Classification of the causative agent**

Morbilliviruses belong to the family *Paramyxoviridae*, and are enveloped, negative-sense single-stranded RNA viruses. Members of the genus *Morbillivirus* are able to infect a wide range of hosts to cause varied types of disease, many of which are severe.

Measles (MV), often called rubeola or rubella, is a highly contagious morbillivirus primarily found in humans, but has the capacity to infect non-human primates (NHPs). Natural infections in wild free-ranging primates are uncommon, and the severity of disease varies with host species.

### **Resistance to physical and chemical action**

Temperature:	Steam cleaning is effective.
pH:	Not determined
Chemicals/Disinfectants:	Susceptible to a 1:30 bleach dilution, potassium peroxymonosulfate, accelerated hydrogen peroxide, and aldehydes with contact times over 10 minutes
Survival:	Environmental survival depends on ambient temperatures; colder temperatures prolong viability.

## EPIDEMIOLOGY

### **Hosts**

- All species of NHPs are considered susceptible.
  - Colobus monkeys (*Colobus guereza*) and marmosets (*Saguinus* spp. and *Callithrix* spp.) experience higher mortality rates than other primates.
  - Macaques (*Macaca* spp.) experience high morbidity rates and low mortality rates when outbreaks occur.
- Humans are the natural host for MV.

### **Transmission**

- Droplet and aerosol transmission (respiratory route)

### **Sources**

- Respiratory secretions

### **Occurrence**

Measles virus is present worldwide, but disease often occurs more frequently in areas with no vaccination programmes and high human population densities. There is some genetic variation in the virus geographically, but it is not significant enough to impact control or diagnostic measures.

Laboratory NHP colonies have a higher incidence of disease due to their close association with humans.

**For more recent, detailed information on the occurrence of this disease worldwide, see the OIE World Animal Health Information System - Wild (WAHIS-Wild) Interface [[http://www.oie.int/wahis\\_2/public/wahidwild.php/Index](http://www.oie.int/wahis_2/public/wahidwild.php/Index)].**

## **DIAGNOSIS**

Clinical signs develop 9-19 days post-infection, and the virus is secreted very early during the course of disease. Factors such as poor nutritional status, young age, stress, and concurrent infection increase an individual's susceptibility to MV.

### ***Clinical diagnosis***

The first clinical signs occur during the "prodromal phase" and consist primarily of cough, facial erythaema and oedema, fever, malaise, and inappetence. Conjunctivitis may be observed. Koplik spots - a consistent prodromal finding in humans - only occasionally develop on the buccal mucosa of NHPs.

These signs are followed by a maculopapular skin rash on the face, chest, and abdomen. MV may also cause metritis and abortions in pregnant females. The virus is immunosuppressive and causes lymphopenia; immunosuppression may persist up to two years post-infection. Rarely, a purported autoimmune reaction induced by the measles virus can cause encephalitis.

Humans can develop neurologic complications (termed subacute sclerosing encephalitis) years after recovering from disease, and the mechanism is believed to involve infected lymphocytes entering the CNS. Macaques are capable of developing the same pathology.

Infection yielding successful antibody production provides lifelong immunity to disease.

### ***Lesions***

- Facial oedema and erythaema
- Conjunctivitis
- Maculopapular rash on face, chest, and abdomen
- Koplik spots (small, white spots surrounded by an area of erythaema; occur on the oral mucosa)
- Lymphadenopathy
- Lymphoid necrosis and depletion
- Consolidation of the lungs
  - Giant cell pneumonia
  - Type-II pneumocyte hyperplasia
- Ballooned and degenerated epithelial cells
- Syncytia and/or inclusion bodies
  - Most common in the uterus, urinary bladder, pancreatic ducts, and biliary epithelium
- Haemorrhagic and necrotising gastritis, enteritis, and/or colitis occurs in New World primates, particularly marmosets.

### ***Differential diagnoses***

- Other paramyxoviruses
- Respiratory syncytial viruses
- Herpesviruses
- Adenoviruses
- Simian immunodeficiency virus
- Bacterial enteritis, e.g., salmonellosis

## **Laboratory diagnosis**

### **Samples**

*For isolation of agent*

- Throat/nose swab
- Nasopharyngeal aspirate
- Oral fluid
- Urine
- Peripheral blood mononuclear cells (PBMCs)
- Tissue biopsy

*Serological tests*

- Serum
- Oral fluid
- Dried blood spot samples (DBS) are appropriate if a cold-chain cannot be maintained during sample transport.

### **Procedures**

*Identification of the agent*

- Fluorescent antibody tests
- Immunohistochemistry
- Reverse-transcriptase polymerase chain reaction (RT-PCR)
- Virus isolation

*Serological tests*

- IgM enzyme-linked immunosorbent assay (ELISA)
- Paired sera (acute phase and convalescent) for IgG ELISA
- Plaque-reduction neutralisation assay
  - This method is not often utilised in diagnostic laboratories.

## **PREVENTION AND CONTROL**

### **Sanitary prophylaxis**

- Institute a 90-day quarantine for any new captive primates introduced to a facility.
- Isolate all affected animals in captive facilities until after the resolution of clinical disease.
- Do not allow NHPs to interact with humans who have measles.
- Do not allow breeding colony NHPs to interact with wild free-ranging NHPs (e.g., while in outdoor enclosures).
- Consider the use of additional personal protective equipment (PPE) if fieldwork with wild NHPs is to be performed.
- Adequately disinfect areas in which potentially infected individuals/NHPs are present.

### **Medical prophylaxis**

- Live-attenuated vaccines are effective in most primates over the age of 6 months.
- Human gamma-globulin may be used as a treatment in the event of a colony outbreak.

## **POTENTIAL IMPACTS OF DISEASE AGENT BEYOND CLINICAL ILLNESS**

### **Risks to public health**

- Measles is transmissible between humans and NHPs.
  - Do not allow unvaccinated individuals to interact with NHPs unless the animals have been appropriately vaccinated, and do not allow people with current MV infections to interact with primates.
- Do not allow breeding colony NHPs to interact with wild free-ranging NHPs (e.g., while in outdoor enclosures).
- Isolate/quarantine all affected animals and adequately disinfect their environment to prevent the spread of disease.

### **Risks to agriculture**

- There are no direct risks to agriculture identified.

## **REFERENCES AND OTHER INFORMATION**

- De Vries, R. D., Duprex, W. P., de Swart, R. L. (2015). Morbillivirus Infections: An Introduction. *Viruses*, 7(2), 699-706.
- Fenner, F. J. (2011). Measles Virus. In N. J. MacLachlan and E. J. Dubovi (Eds.), *Fenner's Veterinary Virology* (4th ed., p. 321). Elsevier.
- Hübschen, J. M., Bork, S. M., Brown, K. E., Mankertz, A., Santibanez, S., Mamous, M. B., Mulders, M. N., Muller, C. P. (2017). Challenges of measles and rubella laboratory diagnostic in the era of elimination. *Clinical Microbiology and Infection*, 23(8), 511-515.
- Laksono, B. M., De Vries, R. D., McQuaid, S., Duprex, W. P., Swart, R. L. (2016). Measles virus host invasion and pathogenesis. *Viruses*, 8(8), 210.
- Munson, L. (2001). Measles. In E. S. Williams and I. K. Barker (Eds.), *Infectious Diseases of Wild Mammals* (3rd ed., p. 63). Iowa State Press.

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The OIE will periodically update the OIE Technical Disease Cards. Please send relevant new references and proposed modifications to the OIE Scientific and Technical Department ([scientific.dept@oie.int](mailto:scientific.dept@oie.int)). Last updated 2019. Written by Marie Bucko and Samantha Gieger with assistance from the USGS National Wildlife Health Center.