

## Polyoma Viruses

(Polyoma Virus, K Virus [Murine Pneumotropic Virus])

### Classification

DNA virus, nonenveloped

### Family

Polyomaviridae

### Affected species

Mice

### Frequency

Vanishingly rare in laboratory mice, present in wild mice.

### Transmission

The polyoma virus (PyV) is probably transmitted through the respiratory route in the wild. Animals become persistently infected if infected as neonates. There is a large component of strain resistance, with C57BL/6 resistant and AKR and CBA highly susceptible.

The murine pneumotropic virus (MptV) is transmitted via ingestion of contaminated feces. Animals remain persistently infected after infection, regardless of the age at infection.

### Clinical Signs and Lesions

No clinical signs are noted in a natural infection with PyV. In experimental inoculation of naïve newborns, the virus disseminates rapidly, producing lytic lesions in a variety of tissues. Tumors, most commonly of the mammary gland, hair follicles, and salivary glands, develop to a large size within 3-4 months. Immunodeficient mice show a similar syndrome as inoculated newborns if infected as adults.

MptV infection in newborns induces pneumonia 6-15 days after infection. Animals present with a sudden onset of dyspnea and usually die. Animals infected after approximately 18 days of age show no clinical signs. Gross lesions may be seen in the lungs of infected neonates, and histology reveals interstitial pneumonia with hemorrhage, edema, and atelectasis. Intranuclear inclusions are present in a variety of tissues on

histopathologic examination, but may be difficult to see in tissues other than the lung.

### Diagnosis

PyV is highly immunogenic and high titers develop rapidly. Antibodies are protective. Antibodies may be detected via ELISA, IFA, MFIA™, or PCR. If naïve animals are infected within a few hours of birth, the presence of large numbers of tumors in relatively young mice would also be suggestive of polyoma virus infection. Infection of immunodeficient animals results in a wasting disease.

MptV may be suspected if 6-15-day-old mice or immunodeficient mice presented with an interstitial pneumonia. In contrast to PyV, MptV induces low antibody titers. Antibodies may be detected via ELISA, IFA, MFIA™, or PCR.

Because of the extreme rarity of the virus, positive serology results have a very low predictive value, i.e., are likely to be false positives. Re-testing is strongly recommended prior to taking actions that could interrupt ongoing research.

### Interference with Research

In natural PyV infection in immunocompetent adult mice, no interference with research is noted. The infection of newborns from a naïve colony would result in widespread tumor induction in infected animals, which would interfere with studies and shorten lifespan. PyV is widely used as an experimental system in oncology studies. Passive immunity protects newborns from infection in enzootically-infected colonies.

Natural MptV infection in immunocompetent adult mice does not interfere with research. The infection of newborns from a naïve colony would result in litter death between approximately 6 and 18 days of age. Infection of immunodeficient animals would result in signs of pneumonia. Passive immunity protects newborns from infection in enzootically-infected colonies.

# technical sheet

## Prevention and Treatment

Since polyoma viruses may contaminate animal biological products, cell lines, transplantable tumors and other biological products should be tested with PCR or by the MAP test (mouse antibody production) before being inoculated into animals. Since PyV is widely used as an experimental system, care should be taken to avoid transmission to other animals in the facility. Wild mice may also serve as a reservoir of polyoma viral infection and access of wild rodents should be controlled. Regular, albeit infrequent due to the exceedingly low prevalence of this virus, serologic testing of resident animals and quarantine of incoming animals is advised. Aggressive chemical decontamination with the help of detergents and oxidizing disinfectants is advised, as well as autoclaving or cold sterilization of materials in direct contact with animals. Polyoma viruses are stable in the environment and may persist for longer than two months in tissue suspensions. They withstand freeze-thaw cycles, ether, heat to 70°C for three hours, and 0.5% formalin and may be recovered from bedding and, in the case of PyV, aerosols.

## References

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