

Mouse Parvoviruses (MPV-1, MPV-2, MPV-3, MVM)

Classification

DNA virus, nonenveloped

Family

Parvoviridae

Affected species

Wild and laboratory mice

Frequency

Common among both laboratory and wild mice.

Transmission

The various parvoviruses are frequently present in laboratory and wild mice due to their persistence in infected animals and their persistence in the environment. Animals shed virus in urine, feces, and oronasal secretions, with transmission through urine or feces the most common mode of transmission. The parvoviruses' ability to persist in the environment means that exposure to fomites such as contaminated feed, bedding, and materials are an important means of transmission. Exposure to wild mice or contaminated laboratory mice can be the source of an outbreak. Contaminated murine biological products may also cause parvoviral infections.

Clinical Signs and Lesions

Mouse parvoviral infections do not elicit clinical signs, even in immunodeficient animals. Minute virus of mice (MVM) is a self-limiting infection that is cleared 4 weeks after infection in immunocompetent animals. MVM appears to be more pathogenic for hematopoietic cells than the mouse parvoviruses (MPVs). The MPVs cause no histologic lesions.

Diagnosis

Diagnosis of mouse parvoviral infection is usually made with serology, either by MFIA™/ELISA or IFA. There are specific assays for the structural antigens (VP) specific to each parvovirus as well as for the non-structural (NS) antigens, which are common to all parvoviridae. Parvovirus infection may also be diagnosed using PCR on tissue or

feces. The preferred tissue for testing is mesenteric lymph nodes, but the PCR may be performed on spleen, tissue culture cells, or transplantable tumor cells.

Interference with Research

Mouse parvoviruses can only replicate in cells undergoing active division. This translates into a modification of biological responses, especially those that depend on cell multiplication. More generally, MPV-1 infection affects immunology research in the mouse by causing derangement of immune function. Mouse parvoviruses have also been explored as anti-cancer agents due to their oncotropic and oncolytic characteristics.

Prevention and Treatment

Parvoviruses often contaminate animal biological products, and regular testing of tumors, cell lines, and infectious disease stocks are necessary. Cell lines, transplantable tumors, and other biological products should be tested with PCR or by the mouse antibody production test (MAP) before being inoculated into animals. Wild mice may also serve as a reservoir of parvoviral infection and controlling access of wild rodents to the animal house is of paramount importance. Regular serologic testing of resident animals and quarantine of incoming animals is advised. If a parvoviral infection is diagnosed, measures should be taken to prevent its propagation via material or contacts between animals. The persistence and stability of parvoviruses in the environment should be a primary consideration. 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. The infectious power of parvovirus is retained after heating for 2 hours at 80°C and for at least 60 days at 40°C. Parvovirus resists drying, a range of pH from 2 to 11, chloroform, ether, and alcohol.

In regards to infected animals, appropriate measures will depend on their value and the possibility of replacing them. In general, total depopulation, thorough cleaning of all aspects of the animal room, and

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restocking are recommended. Hysterectomy rederivation and embryo transfer have proven successful in parvoviral eradication, and should be pursued whenever possible. The transmission of the virus can be limited by the use of cages with filter covers, by reduction of staff movements, and by strict measures of housing and care. Parvoviruses can survive in dust and debris found in ventilation systems and these should not be overlooked in cleaning animal housing and experimental areas. Staff who work in the animal houses must not have rodents as pets.

References

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