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

Classification
DNA virus, nonenveloped

Family
Paroviridae

Affected species
Wild and laboratory mice

Frequency
Common among both laboratory and wild mice.

Transmission
The various paroviruses 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 paroviruses’ 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 paroviral infections.

Clinical Signs and Lesions
Mouse paroviral 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 paroviruses (MPVs). The MPVs cause no histologic lesions.

Diagnosis
Diagnosis of mouse paroviral infection is usually made with serology, either by MFIA™/ELISA or IFA. There are specific assays for the structural antigens (VP) specific to each parovirus as well as for the non-structural (NS) antigens, which are common to all paroviridae. Parovirus 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 paroviruses 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 paroviruses have also been explored as anti-cancer agents due to their oncotropic and oncolytic characteristics.

Prevention and Treatment
Paroviruses 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 paroviral 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 paroviral infection is diagnosed, measures should be taken to prevent its propagation via material or contacts between animals. The persistence and stability of paroviruses 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 parovirus is retained after heating for 2 hours at 80°C and for at least 60 days at 40°C. Parovirus 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
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

