MINUTE VIRUS OF MICE (MVM)

Host species

- natural host: laboratory and wild mice (Parker et al. 1970, Singleton et al. 1993, Smith et al. 1993)
- hamsters and rats are susceptible to experimental infection (Kilham and Margolis 1970, 1971)

Properties of the Virus

- highly temperature resistant (Fassolitis et al. 1985)
- highly resistant to environmental conditions like e.g. desiccation (Tattersall & Cotmore 1986, National Research Council 1991)
- like other parvoviruses, MVM can infect cells only during the S phase of the mitotic cycle (Tattersall 1972)
- two allotropic variants exist which replicate in fibroblasts (MVMp) or in T lymphocytes (MVMi) (McMaster et al. 1981, Spalholz and Tattersall 1983, Antonietti et al. 1988, Gardiner and Tattersall 1988)
- Oncogenic transformation of cells by radiation, chemical carcinogens, or SV40 increases permissiveness to MVMp (Cornelis et al. 1988a).
- transplacental transmission after experimental infection of pregnant hamsters, mice and rats (Kilham and Margolis 1971)
- mouse embryos with intact zona pellucida are not susceptible to infection (Mohanty and Bachmann 1974)

Strain susceptibility

- the host strain may influence the mode and extend of horizontal transmission (Tattersall & Cotmore 1986)
- three susceptibility phenotypes in response to MVMi: asymptomatic infection in C57BL/6, lethal with intestinal haemorrhage in DBA/2, lethal with renal haemorrhage in BALB/c, C3H and other strains (Brownstein et al. 1991)
- amount of viral DNA produced during infection is dependent on host strain (Kapil 1995)

Organotropism

- viral replication only in mitotically active tissues like, e.g. embryos (Tattersall & Cotmore 1986)
- benign foetal infections in mice (Kilham and Margolis 1975)

- MVMi causes generalised infection of endothelium, lymphocytes, and haematopoietic cells and produces bilateral infarcts of the renal papilli (Brownstein et al. 1991)

Clinical disease

- natural infection of mice usually asymptomatic (Ward and Tattersall 1982, National Research Council 1991, Jacoby et al. 1996)
- subclinical infection in experimentally infected rats or mice and lethal disease in hamsters after experimental infection (Kiham & Margolis 1970)
- infectivity, organotropism, and pathogenesis of infection is dependent on characteristics of the virus (Brownstein et al. 1992, Jacoby & Ball-Goodrich 1995)
- growth retardation of mice after experimental infection (Kilham and Margolis 1970)
- MVMi but not MVMp is able to induce a runting syndrome in experimentally infected new-born mice (Kimsey et al. 1986)
- foetal death and resorption (Kilham and Margolis 1971)
- periodontal disease and mongolism in hamsters surviving experimental infection (Kilham and Margolis 1970)

Pathology

- intranuclear inclusions in some infected animals (Kilham and Margolis 1971)
- no pathological lesions after natural infection (National Research Council 1991)

Morbidity and mortality

- MVMi more pathogenic for mice than MVMp, MVMi influences growth of mice shortly infected after birth, some die of the infection; non pathogenic in adult mice (Kimsey et al. 1986)
- pathogenic in foetal hamsters and rats, no clinical disease in experimentally infeced mothers (Kilham and Margolis 1971)

Zoonotic potential

- none

Interference with research

Pathology

- intranuclear inclusion bodies (Kilham and Margolis 1971)

- dental defects in aged hamsters after infection at 5 days of age (Baer and Kilham 1974)

Immunology

- weak induction of interferon in vivo (Harris et al. 1974) and of IFN-b, TNFa and IL-6 in vitro (Schlehofer et al. 1992)
- strong inhibitory effects of the immunosuppressive variant (MVMi) on allogeneic mixed lymphocyte cultures in vitro (Bonnard et al. 1976)
- inhibition of lymphocyte proliferation and the generation of cytolytic T lymphocyte activity but not interferon production, inhibition of growth and cytolytic activity of T cell lines, suppression of an in vitro antibody response by MVMi but not by MVMp (Engers et al. 1981)
- inhibition of the generation of cytolytic T lymphocytes by MVMi (McMaster et al. 1981)
- reduction of T cell mitogenic responses and interference with helper dependent B cell responses in vitro (Tattersall and Cotmore 1986)
- depression of splenic T cell and B cell mitogenic stimulation in vivo (Tattersall and Cotmore 1986)
- neonatal infections by MVMi may have long-term effects on immunocompetence (Kimsey et al. 1986)
- inhibition of haematopoiesis in vitro by MVMi but not by MVMp (Segovia et al. 1991, Bueren et al. 1991)
- decreased haematopoiesis in spleen and bone marrow cells (Segovia et al. 1995)

Physiology

- degeneration of the lens and the adjacent retinal layers after infection of new-born hamsters, extensive hypertrophy of the Harderian glands (Toolan 1983)

Cell biology

- contaminant of cell lines, leukemias, and transplantable tumours (Parker et al. 1970, Collins and Parker 1972, Zoletto 1985, Garnick 1996, Chang et al. 1997)
- persistent infection of cell lines (Ron & Tal 1985, Koering, C. E., et al. 1996)
- disruption of nucleolar functions by virus replication in the nucleolus (Walton et al. 1989)
- interference of a virus protein (NS1) with cell DNA replication, cell cycle stops in the S phase (op de Beeck & Caillet-Fauquet 1997)
- viral DNA replication in fibroblasts co-infected with MVM and adenovirus is markedly dependent on the cell line (Fox et al. 1990)

Teratology

- congenital malformation (Margolis & Kilham 1975)
- death and resorption of foetuses (Kilham & Margolis 1971, Jordan & Sever 1994)

Infectiology

- first described as a contaminant of a stock of mouse adenovirus (Crawford 1966)

Oncology

- contamination of transplantable or chemically induced tumours (Parker et al. 1970, Collins & Parker 1972, Bonnard et al. 1976, Lussier 1991, Nicklas et al. 1993)
- inhibition of cell transformation by SV40 (Mousset & Rommelaere 1982)

- stable transformed phenotype is required for complete competence for MVM replication (Rommelaere & Tatersall 1990)
- greater susceptibility of human oncogenic transformed cells and tumour-derived cell lines than of normal untransformed parental cells (Mousset et al. 1986, Cornelis et al. 1988a, Rommelaere & Cornelis 1991)
- cultures of transformed rat fibroblasts are more susceptible to the cytopathic effect of MVMp than their untransformed homologues (Cornelis et al. 1988b, Guetta et al. 1990)
- suppression of Ehrlich ascites tumours in mice after coinjection of MVM and acquisition of long-term resistance to additional injections of tumour cells (Guetta et al. 1986)
- both strains suppress growth of p815 mastocytoma in mice concurrently infected (Kimsey et al. 1986)
- oncogenes from different functional classes cooperate in the responsiveness of cells to attack by MVMp (Legrand et al. 1992)
- cooperation of virus proteins (NS1) with oncogenes results in cell death (Mousset et al. 1994)

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