Experimental reproduction of equine herpesvirus-1 myeloencephalitis in mice

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Equine herpesvirus-1 (EHV-1) is a important cause of rhinopneumonitis, abortion and encephalomyelitis in horses. Murine models for studying EHV-1-induced respiratory disease and abortion are already established. To reproduce EHV-1 encephalomyelitis in mice, the author inoculated the virus under various conditions. The author also examined four equine natural cases of EHV-1 encephalomyelitis and compared them pathologically with the murine model.

In four mares, histological changes consisted of widespread vasculitis and perivascular cuffings with a rare occurrence of thrombosis in the brain, spinal cord and meninges. Axonal swelling and loss, status spongiosis due to distension of nerve sheaths, and malacic foci distributed sparsely in the central nervous system (CNS) and they preferably located in the vicinity of the vascular lesions. EHV-1 antigens were detected in the endothelial cells of the brain, spinal cord and meninges. From these findings, EHV-1 encephalomyelitis was considered as the secondary change to the vascular damage.

In the experimental infection of EHV-1, BALB/c and nude mice were inoculated with the virus by intranasal, intravenous, intrapenitoneal or intracerebral routes under the conditions of reinfection, immunosuppression, mixed infection with EHV-4 or pregnancy. Some of the mice developed pulmonary lesions, but none of them showed the nerve lesion.

HH-1 strain of EHV-1 was serially passaged through the brains of infant mice. The mice inoculated intracerebrally with HH-1 strain passaged seven times through the brain exhibited nervous signs and lesions. The result indicates the virus obtained the neuropathogenicity to mice after serial passages through the brain of infant mice.

Two of 6 mice inoculated intraperitoneally at 6-day-old with the EHV-1 passaged 14 times through the infant brain showed depression and ataxia on day 5 of postinoculation, and they progressed to recumbency on the next day. The CNS changes of the two mice consisted of leukocytic and lymphocytic perivascular cuffings in the thalamus and brainstem, and one of them also showed spongiotic focus of necrosis in the thalamus. In the spinal cord, diffuse infiltration of imflammatory cells, neuronal degeneration and necrosis, and status spongiosis of the white matter were observed. Immunohistochemically, EHV-1 antigens were detected in neurons and glia cells of the CNS in the two mice. Other two mice inoculated intraperitoneally with the virus and killed without clinical signs also showed similar CNS changes in milder extent.

EHV-1-induced encephalomyelitis in mice were apparently different from that in horses in respect to the abscence of vasculitis, thrombosis and viral antigens located in the vascular endothelial cells. However, this is the first report on the EHV-1 encephalomyelitis in mice.