Measles Virus Infection Causes Expression of Class I and Class II MHC Antigens in Rat Brain

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An important factor in the outcome of a viral infection is the occurrence of cells expressing major histocompatibility (MHC) class I and class II antigens, because activation and the effects or functions of T cells depend on recognition of the virus antigen in the context of MHC antigens. Under normal conditions, the nervous system has low levels of MHC antigen expression.[1] However, enhanced expression of both class I and class II MHC antigens occurs during certain circumstances. Among others, gamma-interferon and coronavirus infections induce both class I and class II antigen expression on neural cells *in vitro*.[2-5] We studied the extent to which these antigens can be induced during fatal or nonfatal measles virus encephalitis in the rat as well as the occurrence of immunocompetent cells in infected rat brains, as detected by immunostaining.[6]

Lewis rats (age 3-14 days) were injected intracerebrally with a hamster neurotropic strain (HNT) of measles virus. Controls received a similar suspension without virus. The animals were killed between day 4 and day 48 after inoculation, and the brains were dissected and frozen. Coronal sections were cut, fixed, and subjected to immunohistochemistry. Monoclonal antibodies to viral antigen, class I and II MHC antigen, and antibodies for T cells and T-cell subsets were used (TABLE 1), and the binding was visualized by a modified peroxidase antiperoxidase method.

In controls, anti-class I immunoreactivity was detected in intracerebral vessels, but not in brain parenchyma, and anti-class II immunoreactivity was absent within the brains of uninfected rats. In both young rats with fatal disease and older rats with a milder course of the infection, a marked induction of both class I and class II MHC antigens was detected (TABLE 1). The anti-class I immunoreactivity was distributed diffusely, probably involving most types of cells in the brain, whereas anti-class II immunoreactivity occurred mostly on cells around intracerebral vessels and in small foci in the brain parenchyma. The distribution of class I antigen was not limited to inflammatory cells or areas of the brain where viral antigens were demonstrated. This

may suggest induction by some soluble signal substance released during the early phases of the viral infection. In 14-day-old rats with nonfatal infection, there was marked infiltration of T lymphocytes of cytotoxic/suppressor phenotype in the brain parenchyma, whereas T helper cell phenotypes were mainly located perivascularly. In brains from newborn rats with fatal injection none or only a few lymphocytes were detected.

In conclusion, our study emphasizes that the levels of class I and class II transplantation antigens can readily be enhanced in the brain during a viral infection, providing the necessary elements for lymphocyte activation and function.

TABLE 1. Detection of Different Antigen-Containing Cells by Use of a Panel of Monoclonal Antibodies and Immunoperoxidase Staining

		Monoclonal Antibody Specificity					
Infected Day Postpartum	Killed Day after Inoculation	16AC5 Virus Nucleocapsid	Ox 18 Class I Antigen	Ox 6 Class II Antigen	W3/13 Pan T Cells	Ox 8 T Cytotoxic Suppressor	W3/25 T Helper
3	9	++	+++	++	+	+	+
14	9	++	+++	++	++	+++	++
14	49	+	+	+	−	−	+
Controls	4-49	−	−[a]	−	−	−	−

NOTE: Each row shows observations in 2-4 animals. The results are expressed as the average number of cells per visual field as evaluated on whole sections of the brains (− = none; + = 1-2; ++ = 3-4; +++ = > 5 labeled cells). For diffuse anti-class I immunoreactivity, reaction intensity and extension were graded.

[a]Brain parenchyma was unstained, whereas endothelial, choroid plexus, and ependymal cells showed anti-class I immunoreactivity.

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