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Brief Communication

Clinically Diseased Cats with Non-suppurative Meningoencephalomyelitis have Borna Disease Virus-specific Antibodies

A spontaneous neurological disease in cats characterized by behavioural and motor disturbances was reported in Sweden by *Kronevi et al.* (1974). Generally, the animals showed no gross pathological lesions. Detailed neuropathological investigation revealed mononuclear perivascular cuffing and gliosis throughout the brain and spinal cord consistent with a non-suppurative meningoencephalomyelitis.

After this first report, the disease has become recognized in different parts of Sweden, preferably Uppland and the area around Lake Mälaren, and is referred to as "staggering disease" of cats. The clinical manifestation of the disease includes hindleg ataxia and paresis (Fig. 1), inability to retract the claws (Fig. 2), mental changes, anorexia, increased salivation, hypersensitivity to sound and light, hyperaesthesia, impaired vision and seizures (*Kronevi et al.* 1974, *Ström et al.* 1992). Despite treatment with antimicrobial drugs and corticosteroids most cats deteriorate and die or have to be euthanised after 1-4 weeks of illness.

A recent histopathological, immunohistochemical and serological study of 25 cats (*Lundgren* 1992) showed that the inflammatory reaction of the central nervous system was most pronounced in the grey matter of the brain stem, basal ganglia and hippocampus. Parenchymal lesions in the cerebellum were slight or absent. In all levels of the spinal cord, inflammatory changes were moderate and mostly confined to grey matter. The reaction was characterized by perivascular mononuclear cuffing, neuronal damage and presence of inflammatory nodules consisting of lymphoid cells and macrophages. These changes are typical of viral infection (*Leestma* 1991).

Laboratory findings including leukopenia and elevations in protein content and white blood cell count of the cerebrospinal fluid in affected cats further suggested that staggering disease is infectious in its nature. However, serological and/or immunohistochemical screening for possible aetiological agents (feline infectious peritonitis virus, feline leukaemia virus, feline immunodeficiency virus, pseudorabies virus, tick borne encephalitis virus, canine distemper virus, *Borrelia burgdorferi, Toxoplasma gondii)* yielded no specific correlation with any of these infections (*Lundgren* 1992).

Borna disease (BD) is one of the viral diseases coming closest to clinics and pathology of staggering disease of the cat. BD has only been reported with confirmed laboratory diagnosis in naturally infected horses and sheep, although the susceptibility to experimental infection in animal species is extremely broad (*Ludwig et al.* 1985). The infection with this negative strand RNA-virus (*Briese et al.* 1992) leads either to disease and death or to a life-

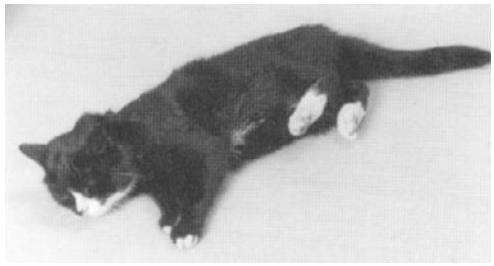

Figure 1: Female domestic shorthair cat affected by staggering disease. Paresis of the hindlegs is evident.

Figure 2: The same cat as in Fig. 1, displaying inability to retract the claws.

long virus persistence without clinical signs. The clinical manifestation in infected horses includes sensorial disturbances, impaired posture, anorexia, hyperaesthesia, excitation, colic, salivation and blindness (*Ludwig et al.* 1988). Histopathologically, BD is a non-suppurative meningoencephalomyelitis with the most severe lesions found in the grey matter of the brain stem, basal ganglia and hippocampus. The cerebellum is only slightly involved (*Ludwig et al.* 1988). This localization pattern is strikingly similar to that in staggering disease of cats.

Furthermore, the incidence of disease in horses is highest during spring time and cases of staggering disease in cats seem to occur most often from February to May. Finally, outbreaks of BD are still focally localized to certain areas, especially in Germany: around the area of the city Borna in Saxony *(Dürrwald & Ludwig, unpublished data)*. Staggering disease in Swedish cats also shows a focal distribution pattern: most cases are observed in Uppland and the region around Lake Mälaren.

Sera were analysed for the presence of Borna disease virus (BDV)-specific antibodies in 24 cats with clinical neurological disease and in 6 clinically healthy control cats. Nineteen of the diseased cats were later necropsied and diagnosed as feline non-suppurative meningoencephalomyelitis/staggering disease.

The serological analysis was performed using an indirect immunofluorescence antibody test recently defined and specified for screening human sera for BDV antibodies (*Bode et al.* 1992).

The coded serum samples which showed the same staining pattern in BDV infected tissue culture cells as a BDV positive control monoclonal antibody were ranked as specifically positive (compare figure 1 in *Bode et al.* 1992). Eleven cats (44%) from the group of animals with typical staggering disease had antibodies against BDV antigen. The 6 control cats were seronegative, except for 1 which showed a weak positive reaction. Serum titres ranged from 1:10 to 1:2000 and more.

The finding of BDV-specific antibodies in cats with non-suppurative meningoencephalomyelitis opens new perspectives on the epidemiology and pathogenesis of a possible

BDV infection in cats. Although carnivores traditionally have been regarded as resistant to this virus, the host spectrum could be broader than suspected. The presence of serum antibodies in humans with chronic diseases of the central nervous system has recently suggested that BDV infections exist in man (*Bode et al.* 1992).

The serological findings in cats with staggering disease suggest that BDV infection may be involved in this feline neurological disorder. Further studies are required in order to isolate the virus and to find out further details on the possible relationship between the so far known BD viruses and the cat virus, as well as investigating the possibility of cross-reactivity with other unknown viruses. This work is now in progress.

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