Shrew mice (Crocidura leucodon) as possible reservoir host species for Borna Disease Virus

Felix Ehrensperger[1], Maria E. Puorger[1], Monika Hilbe[1],
[1]Institute of Veterinary Pathology, Vetsuisse Faculty, University of Zurich, Winterthurerstrasse 268, CH-8057 Zurich

Key words
Borna Disease Virus, Reservoir Host Species, Shrews, Crocidura leucodon, Immunohistochemistry, RT-PCR

Aim of the study
Borna Disease Virus (BDV) ist he causative agent of Borna Disease, a fatal Encephalomyelitis occurring mostly in horses and small ruminants. Borna Disease occures sporadically and is restricted to certain geographical regions in Germany and Switzerland, cases have also been reported from Austria. Aim of this study was to identify possible virus reservoir species using Immunhistochemistry and polymerase chain reaction (RT-PCR)

Material and methods
We sampled mice and other small mammals from endemic areas in Eastern Switzerland, mainly in Graubünden, by using special live traps (Longworth Mammal Trap with NestBox). Trapped animals were then euthanized and brought to post mortem investigation. Tissues were then screened for histological lesions and for the presence of BDV antigen and -RNA by immunohistochemistry and RT-PCR.

Results and significance
Between 2004 and 2006, 69 mice (2 Arvicola terrestris, 46 Apodemus sp., 9 Clethrionomys glareolus, 7 Mus domesticus, and 5 Microtus sp.) and 12 shrews (6 Sorex araneus and 6 Crocidura leucodon) were trapped. Interestingly, we found BDV exclusively in 2 shrews of the species Crocidura leucodon. Together with 3 BDV positive shrews from previous investigation, we had a total of 5 BDV-positive shrews, all from areas which BD had occurred previously. We could demonstrate the presence of BDV in almost all organs by using immunohistochemistry and RT-PCR. We could however not detect histological lesions typical for Borna Disease, in particular no inflammatory lesions in the CNS, in any of these animals. PCR products were sequenced and the results were compared with those from horss and sheep from the same geographical region, which had died from Borna Disease. These findings are compatible with the assumption that white toothed shrews (Crocidura leucodon) play en important role as reservoir and vector species of BDV. The exact way of transmission of the virus however remains unclear. Excretion of the virus by urine, feces and saliva appears likely. We initially had planned to keep infected and uninfected shrews under lab conditions in order to study transmission. We had to cancel this due to the difficulty in sampling living shrews and to check these for BDV in vivo. Moreover, sampling of shrews is restricted due to the fact that they are a protected species.

Publications, posters and presentations
Puorger, T.M.E. (2008) Vetsuisse Faculty, University of Zurich.
Puorger, ME.; Hilbe, M.; Müller, JP.; Kolodziejek, J.; Nowotny, N.; Zlinszky, K.; Ehrensperger, F. (2010) Distribution of Borna disease virus antigen and RNA in tissues of naturally infected bicolored white-toothed shrews, Crocidura leucodon, supporting their role as reservoir host species. Vet Pathol. Mar;47(2):236-44.

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