

The bicoloured shrew is a health risk for horses

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The bicoloured shrew is a protected species in Central Europe, but these furry insect-eaters have a dark secret. Researchers from the Vetmeduni Vienna have discovered that bicoloured shrews carry the Borna virus. Infection with this virus causes fatal encephalitis in horses. The mechanisms of transmission had until now been unclear, but we now know more about one route - from bicoloured shrews to hosts. The study was published recently in the journal *PLOS ONE*.

The Borna disease – named after the German city of Borna, which saw a cluster of cases over 100 years ago – mainly affects horses and sheep, and in rare cases cattle and rabbits too. A single case of an infected dog has been reported. Affected horses seclude themselves from the herd and suffer from depression and general disorientation. Ultimately, this incurable infection is fatal.

Borna virus detected in bicoloured shrews

Researchers have long been in the dark concerning the transmission mechanism of the Borna virus. The bicoloured shrew was one suspect, but definitive proof was missing. Norbert Nowotny and Jolanta Kolodziejek from the Institute of Virology and Herbert Weissenböck from the Institute of Pathology and Forensic Veterinary Medicine carried out a study on 107 shrews from the German region of Saxony-Anhalt together with a colleague from Germany. All the shrews were found dead, and 58 of them were bicoloured shrews, 14 of which carried

the Borna virus. No Borna viruses were detected in the other shrew species.

Possible transmission mechanism

By examining tissue samples, it was discovered that the shrews carried significant amounts of virus in almost all their organs, including the mucosae of the oral cavity, the respiratory tract and the skin. This meant that dead skin scales from these animals might be infectious.

"We were surprised to discover significant amounts of viruses in the shrews' skin. Usually, viruses are found deeper inside a transmitting organism and are excreted in urine and faeces. In horses, the virus first affects the olfactory brain area, so we assume that infection occurs via the [respiratory tract](#) rather than the digestive tract," explains co-author and pathologist Weissenböck.

Shrews do not like hiking

The bicoloured shrew (*Crocidura leucodon*) lives exclusively in Central Europe, the region where the Borna disease occurs. This area is mostly within Germany, but also includes the eastern part of Switzerland and Vorarlberg in western Austria. Virologist Nowotny explains: "The distribution of bicoloured shrews remains fairly constant because the animals stay within their habitats. They do not like to move around." In fact, the number of incidents of Borna disease has actually declined in the last few years. There are currently about 100 cases per year.

Genetics reveals transmission mechanism

A genetic analysis of viruses taken from bicoloured shrews and horses provides further proof that the bicoloured shrew acts as a 'pathogen

reservoir'. The viral strains found in the shrews correspond exactly with the strains from sick horses in the same region. This supports the assumption that the virus sub-types develop in a particular region over the course of centuries in bicoloured shrews and do not generally spread beyond that area. These sub types can then be transmitted to horses.

Borna disease not contagious

The transmission mechanism of the Borna disease is remarkable in that the [virus](#) is not transmitted from one infected animal to another, so an intermediate host is needed – the bicoloured shrew. The disease is therefore not directly contagious. This is why it never affects whole herds, but individuals. "The best way to avoid transmission is to keep shrews away from the stables. Normal hygiene measures should be sufficient", says study leader Nowotny.

More information: Dürrwald R, Kolodziejek J, Weissenböck H, Nowotny N (2014) "The Bicolored White-Toothed Shrew *Crocidura leucodon* (HERMANN 1780) Is an Indigenous Host of Mammalian Borna Disease Virus." *PLoS ONE* 9(4): e93659. [DOI: 10.1371/journal.pone.0093659](#)

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