

# Variegated squirrel 1 bornavirus (VSBV-1)

## Susceptible Species

Variegated squirrel 1 bornavirus (VSBV-1) has been detected in squirrels of the species *Sciurus variegatoides* (variegated squirrel) and in several species of the subfamily *Callosciurinae* as well as in three breeders of variegated squirrels. Extensive molecular biological and immunohistological investigations indicate that the three deceased breeders contracted the infection through contact with their infected squirrels and that VSBV-1 is therefore a novel zoonotic pathogen. At present it is unclear whether VSBV-1 also occurs in other animal species. Investigations on the identification of other susceptible species and on the origin of the pathogen are ongoing.

## Geographical Distribution

So far, all VSBV-1 infected squirrels have been detected in Saxony-Anhalt, Saxony, Schleswig-Holstein, North Rhine-Westphalia, and Lower Saxony. It is currently unclear if the animals were infected in Germany or if the pathogen was introduced to Germany by importation of infected animals.

## Causative Agent

The newly detected VSBV-1 belongs to the genus *Bornavirus* within the family *Bornaviridae* and is genetically closely related with bornaviruses of the species *Mammalian 1 bornavirus*, which also cause disease in different mammals with central nervous symptoms. Bornaviruses of birds and reptiles show a more remote genetic relationship with VSBV-1.

## Transmission

The transmission routes of VSBV-1 between squirrels and to humans are still unknown. Direct transmission by scratches or bites is most likely.

## Symptoms

The VSBV-1 infected squirrels displayed no symptoms of disease. The affected breeders developed severe encephalitis which led to death 2 to 4 months after onset of clinical symptoms.

## Diagnostics

The FLI has developed and validated molecular diagnostic and serological test methods for detection of viral genome and antibodies against the pathogen. As a direct association between virus detection in saliva and infection of the squirrels has been established, the FLI recommends sending in two dry mouth swabs for live testing of squirrels.

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If there is a possibility to gain serum, a serological investigation can be carried out to further assess the infection status. All RT-PCR-positive animals detected so far also showed VSBV-1-specific antibodies. If squirrels die with unclear cause the entire body should be sent in for investigation either refrigerated or frozen. So far, there is no indication that squirrel species other than the genus *Sciurus* and squirrels of the subfamily *Callosciurinae* might be affected. However, currently there are not enough data to exclude an infection of other squirrels. Samples for investigation should be sent to the Institute of Diagnostic Virology, Friedrich-Loeffler-Institut, Südufer 10, 17493 Greifswald-Insel Riems, to the attention of Dr. Bernd Hoffmann ([bernd.hoffmann@fli.bund.de](mailto:bernd.hoffmann@fli.bund.de)). At present, investigation is free of charge, the costs for sampling and transport to the FLI must however be borne by the holder/sender. In case of questions on diagnostics in humans please contact the Bernhard-Nocht-Institute for Tropical Medicine in Hamburg (Dr. Dennis Tappe ([tappe@bni-hamburg.de](mailto:tappe@bni-hamburg.de))).

### Similar Clinical Pictures

As a specific clinical picture in infected squirrels has not been observed, similar clinical pictures cannot be described.

### Control

The FLI recommends to euthanize squirrels which have been tested positive and send them to the FLI either refrigerated or frozen for further investigation. Therefore it is crucial to label samples accurately so that they can clearly be traced back to the respective animal. To exclude further infections within the holding, it is recommended to repeat sampling of the entire holding after at least 3 months. If retesting of mouth swabs and optionally also serum samples confirms the negative status of all animals in the holding, testing should again be repeated after at least 6 months.

Furthermore, it is recommended to test squirrels prior to selling or purchasing. It is also recommended to retest a newly acquired squirrel after 3 months to detect infections contracted during time of purchasing.

Until animals have been tested negative, squirrels should be kept separately. If this is impossible, the newly acquired animals should be re-tested after 3 months and the entire holding after approx. 12 months.

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