

SURVEILLANCE OF INFECTIOUS DISEASES IN ANIMALS AND HUMANS IN SWEDEN 2020

Chapter excerpt -
Rabies



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Cover: Juvenile mink in hand. Photo: Elina Kähkönen

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Reporting guidelines: Reporting guidelines were introduced in 2018 for those chapters related to purely animal pathogens. The guidelines build on experiences from several EU projects, and have been validated by a team of international experts in animal health surveillance. The aim is to develop these guidelines further in collaboration within the global surveillance community and they have therefore been made available in the form of a wiki on the collaborative platform GitHub (<https://github.com/SVA-SE/AHSURED/wiki>). Feel free to contribute!

Layout: The production of this report continues to be accomplished using a primarily open-source toolset. The method allows the source text, produced by authors, to be edited independently of the template for the layout which can be modified and reused for future reports. Specifically, the chapter texts, tables and captions are authored in Microsoft Word and then converted using pandoc and R to the LaTeX typesetting language. Most figures and maps are produced using the R software for statistical computing and the LaTeX library pgfplots. Development for 2020 has further improved the importing of content from Excel files to automatically build figures in the pgfplots LaTeX library. The tool is available as an R-package on GitHub (<https://github.com/SVA-SE/mill/>). The report generation R-package and process was designed by Thomas Rosendal, Wiktor Gustafsson and Stefan Widgren. In 2020, final typesetting was done primarily by Wiktor Gustafsson with contributions from the report authors.

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Rabies



Illegally imported dogs from endemic countries are probably the greatest threat to the rabies-free status of Sweden. Photo: MNSanthoshKumar/iStock.

BACKGROUND

Rabies is caused by a lyssavirus in the family *Rhabdoviridae*, which can infect all warm-blooded animals including humans. The disease occurs worldwide, with some exceptions. Rabies is transmitted through contact with saliva, typically via animal bites. Most human cases are caused by bites from infected dogs. The reservoir animal species for rabies in endemic countries are most notably among carnivores of the family *Canidae*. In Europe, the reservoir species are red foxes and raccoon dogs.

Bats in Europe may carry another type of lyssavirus called European Bat Lyssavirus (EBLV), which also can cause rabies-like disease in humans. Sweden has been free from classical animal rabies since 1886. Findings suggest that EBLV is present in Sweden, but virus has never been isolated.

DISEASE

Humans and animals

Rabies virus infects the central nervous system of humans and mammals. Early symptoms of rabies are non-specific, consisting of fever, headache, and general malaise. As the disease progresses, neurological symptoms appear and may include insomnia, severe anxiety, confusion, slight or partial paralysis, excitation, hallucinations, agitation, hypersalivation and difficulties in swallowing. The incubation period of rabies is usually 3–6 weeks but may vary from five days to

one year.

There are still knowledge gaps on how EBLV infections affect bats. Experimentally infected bats have shown clinical signs as weight loss, disorientation, lack of coordination, muscle spasms and aggression. Some infected bats may still be normal in behaviour.

LEGISLATION

Animals

Rabies is included in the Swedish Act of Epizootic diseases (SFS 1999:657 with amendments) and is notifiable on suspicion. If rabies is suspected or confirmed, measures will be taken to combat the disease and to prevent further spread.

To prevent the introduction of rabies, dogs and cats must be vaccinated against rabies before entering Sweden. In addition, depending on the country of origin, some must have their antibody titre tested. The rules are set in SJVFS 2011:49 (with amendments of SJVFS 2014:47) and in the EU Regulation 576/2013.

Humans

Rabies in humans is notifiable according to the Communicable Disease Act (SFS 2004:168 with the amendments of SFS 2013:634).

SURVEILLANCE

Animals

Passive surveillance

Animals with clinical signs where rabies cannot be excluded are euthanized and tested by fluorescent antibody test (FAT) and PCR.

Active surveillance

Some of the illegally imported pets that are detected and come from countries with endemic rabies are euthanized. They are examined for rabies using PCR to exclude the possible introduction of rabies in Sweden.

During a random check in 2020 in Poland a former stray dog from Russia on its way to Sweden, was found not to have reached the acceptable rabies antibody levels needed to prove effective rabies protection. In the follow-up-investigation by Swedish authorities two shipments of a total of 32 dogs imported from Russia to Sweden were investigated for antibody concentration. The purpose was to investigate possible systematic deficiencies in vaccination protection.

Humans

The surveillance in humans is based on identification of the disease by treating physician and/or by laboratory diagnosis (i.e. passive surveillance). Contact tracing to find the source of a detected infection is mandatory in case of domestic transmission. Humans exposed to rabies virus will be evaluated for need of post-exposure vaccination and immunoglobulin treatment.

RESULTS

Animals

In 2020, seven dogs, three cats one red squirrel (*Sciurus vulgaris*) and one fox (*Vulpes Vulpes*) were examined for rabies due to clinical suspicion.

Three dead bats were examined for rabies. The investigations were requested and paid for by different individuals. Amongst them two cat-owners whose cats had been exposed to the bats.

In addition, 40 illegally introduced euthanized dogs and six cats were examined after decision by the Swedish Board of Agriculture. None of the animals had presented clinical signs associated with rabies.

In conclusion, all the above animals that were examined for rabies during 2020 tested negative.

17 of the 32 dogs imported from Russia to Sweden had a rabies antibody concentration below the international threshold of 0.5 IU/ml. Five of these dogs had values below 0.1 IU/ml.

Humans

No human cases were reported during the year.

DISCUSSION

During the last 50 years, two people have been hospitalised for rabies in Sweden, both of whom succumbed to the disease. In 1974, a Swedish man fell ill after having become infected in India. In 2000, a woman fell ill after a visit to Thailand. Both patients had most probably been infected by rabid dogs. Since Sweden is free from classical rabies, the risk of acquiring the disease from Swedish animals is negligible. However, since 2004, there has been an increasing problem with illegal importation of pets, mostly dogs. Illegally imported dogs from endemic countries are probably the greatest threat to the rabies-free status of Sweden.

During a random check in 2020 in Poland a former stray dog from Russia on its way to Sweden, was found not to have reached the acceptable rabies antibody levels needed to prove effective rabies protection. In the follow-up investigation five out of 32 dogs had antibody concentrations below 0.1 IU/ml and were euthanized after decision by The Board of Agriculture. Twelve dogs with titres between 0.1 and, 0.49 were isolated in their homes for a period of four months. The results are in line with investigations made in Norway and Finland. The recommendations from the authorities are to test dogs which are to be imported from Russia before they enter Sweden. Furthermore, the Board of Agriculture will carry out random checks on dogs from Russia to follow up the results from 2020.

However, the greatest risk to people is contact with dogs in countries with endemic dog rabies. In 2019 one woman in Norway died from rabies after having been exposed to a rabid puppy in the Philippines.

The rabies situation in many countries, especially in the EU, is improving due to control and eradication programmes. All countries in the EU are now considered rabies-free or low-risk countries. EU co-finances control, eradication and surveillance programmes in member states as well as in some third countries adjacent to EU. Russia is considered a high risk country with a lot of rabies cases in wild and domestic animals each year.

From 1998 to 2016, an enhanced passive surveillance programme where dead bats were examined for the presence of rabies was implemented almost every year. In addition, from 2008 to 2013 an active surveillance programme for EBLV was performed in different regions in Sweden.

Antibodies to EBLV have been detected in specimens from live Daubenton's bats as part of the active surveillance programme, suggesting that EBLV is present in Sweden. Daubenton's bats (*Myotis daubentonii*), associated with EBLV-2, are common and may be found from the south up to the county of Ångermanland in the north. Six other *Myotis* species may also be found in Sweden. The Serotine Bat (*Eptesicus serotinus*), associated with findings of EBLV-1 in Europe, is found in certain habitats in the south of Sweden. The Northern Bat (*Eptesicus nilssonii*), which is related to the Serotine Bat, is the most common bat in Sweden, and may be found all over the country.