

Historical freedom of classical rabies in Norway

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Summary

Norway is historically free of rabies. The last recorded domestic case of classical rabies in animals was in 1826. The last case of domestic infection in a human was in 1815.

The estimated annual risk for import of one RABV infected pet is very low.

Together with the Food Safety Authority, the veterinary services and other actors ensure control of domestic and wild animal populations relevant to both surveillance of rabies and detection of rabies. Furthermore, they also hold the competence, structure and function to control rabies in animals if it should occur.

Introduction

Rabies is an invariably fatal viral disease of almost all warm-blooded animals. It is characterized by unique transmission, usually through a bite, and an incubation period of variable length. Affected animals can transmit the disease up to 15 days before the onset of clinical signs. Effective vaccines are available. Rabies is a zoonosis.

The risk of rabies in Norway is connected to import of animals with the infection.

The last recorded case of classical rabies in animals in Norway was in 1826.

In 2019, a Norwegian citizen died from rabies in Norway after contact with a rabid dog in the Philippines. Before that, the last recorded case in a human was a domestic case in 1815 (NIPH, Smittevernveilederen).

Objectives

The Norwegian Veterinary Institute was requested by the Norwegian Food Safety Authority to provide evidence of historical freedom from rabies virus (RABV), classical rabies, in Norway by 1.) demonstrating that the disease is notifiable in accordance with Article 8 of Directive 64/432/EEC, 2.) documenting that the different surveillance systems are in place to detect any imported cases, 3.) demonstrate that no case of RABV infection has been reported in listed animal species for the past two years, and 4.) give a qualitative estimate for the risk of importing a RABV infected pet to Norway.

Definitions

Norway refers to mainland Norway, excluding Svalbard which is not part of the EEA.

Imported animal refers to animals entering Norway, either originating from another country or a Norwegian animal returning from abroad.

Actors

The NFSA is the risk manager for infectious diseases in animals including wildlife and manages official animal disease surveillance programs, and reports to OIE and EU. The NFSA has official veterinarians in regional and local offices covering all of Norway

The NVI is the risk assessor for infectious diseases in animals, including wildlife, and holds the national reference laboratory for rabies in animals.

Norway has long traditions of game harvest and a large body of active hunters. The central authorities, together with official local management, hunter organisation and other stakeholders cooperate on management of wild populations.

Norway has well-developed official and private veterinary services both for livestock and companion animals that covers the entire country.

1. RABV is a notifiable disease in Norway

Infection with RABV in animals has been a notifiable in Norway since 1877 when the first Animal health law in Norway came into force. Today it is notifiable according to the Norwegian Food Law (Lovdata.no, 64/432/EEC). Any suspected rabies case in animals shall be immediately notified to the NFSA. Suspected live animal cases will be killed. Carcasses of suspected cases will be transported to the NVI for testing. The NFSA is responsible for implementing measures to prevent spread and control the disease if rabies is suspected in animals.

Rabies in humans is notifiable according to Smittevernloven (www.fhi.no). In 2019, a Norwegian citizen died from rabies in Norway after contact with a rabid dog in the Philippines. Before that, the last recorded case in a human was a domestic case in 1815.

2. Surveillance for RABV in animals in Norway

Animal populations in Norway

The number of domestic animals, and where relevant the number of farms, in Norway are shown in Table 1.

Table 1. Norwegian domestic animal populations as of March 2020.

Species	Category	No. of animals	No. of farms
Cattle		877 358	13 072
	Dairy	475 544	6 274
	Beef	272 571	5 883
	Combined	129 243	954
Pigs		741 725	1 720
Small ruminants		1 023 664	14 243
	Sheep*	950 782	13 606
	Goat	72 882	1 303
Alpaca and Llama		2 297	295
Farmed red deer		6 836	109
Horse		23 696	4 187
Poultry		13 706 000	2 011

Source: Register of production subsidies per 1st of March 2020

* winter-feed sheep (no lambs)

In 2019 the dog and cat population was estimated to 550 000 and 660 000 animals, respectively (Dyreid.no).

In Norway there is no stray dog population and there are very few free-ranging large carnivores, known to act as hosts to circulating rabies in wildlife in endemic countries. Of smaller carnivores/omnivores only the red fox (*Vulpes vulpes*) is abundant in Norway. This is a species subjected to hunting and is also monitored for infection with *Echinococcus multilocularis*. The raccoon dog (*Nyctereutes procyonoides*) is another species with potential to spread rabies. This is an emerging species in Europe, but is not

established in Norway and for which there is ongoing national effort to prevent establishment. Because the racoon dog is classified as not wanted, hunting is permitted all year round.

The passive surveillance

All animals with relevant clinical signs and where rabies cannot be excluded, are laboratory tested.

Pets

Of relevance to passive surveillance for RABV infection in pets, is the fact that the health and welfare of pets in Norway in general is good. The vast majority of pets receive necessary prophylactic and veterinary care. The dog population of Norway is well vaccinated with more than 83 % having an updated vaccination status for core vaccines (canine distemper, infectious canine hepatitis, and Parvovirus as recorded in 2019 (www.vetinst.no, 2019)). There are no stray dog populations in Norway.

The NFSA has run several awareness campaigns on the risk of rabies associated with imported dogs in years (www.Mattilsynet.no) directed both towards pet owners and veterinarians. Hence, asking for travel history is standard procedure for Norwegian veterinarians when companion animals present with neurological symptoms. The threshold for rabies testing, therefore, is low. For example, in recent years the NVI has received for RABV testing a dog that had visited Sweden (a rabies-free country) and that later fell ill with neurological symptoms, and a dog visiting Norway from Germany (low risk country) that was vaccinated against rabies and displayed aggressive behaviour.

Monitoring of wildlife

All wildlife cases with suspected neurological symptoms are notifiable to NFSA.

The NVI runs a wildlife health surveillance program (ViltHOP) financed by the Norwegian Environment Agency. Together with other contingency programs run by the NVI, this program continuously surveys and monitors disease outbreaks and emerging diseases in wildlife. With government funded health surveillance programs of wild species, both passive and active surveillance is assured and conducted (REF ViltHOP). Cases of notifiable diseases found in the programme are immediately recorded to the NFSA.

3. No case of rabies has been reported in listed animal species for the past two years

The last recorded case of classical rabies in animals in Norway was in 1826. Since then no cases of classical rabies has been demonstrated. Since 2010, NVI has received between two and six dogs for testing annually, because rabies could not be ruled out by the treating veterinarian. All of these dogs had some sort of travel history. . All tests have been negative (Table 2).

Table 2. Number of domestic suspected cases analysed at NVI by year 2010-2020. No case of RABV has been confirmed.

Year	Pets (cats and dogs)	Wild foxes/ ferrets/ raccoon dogs
2010	2 (0)	1 (0)
2011	5 (0)	1 (0)
2012	1 (0)	1 (0)
2013	2 (0)	
2014	4 (0)	
2015	3 (0)	1 (0)
2016	5 (0)	
2017	4 (0)	
2018	4 (0)	
2019	3 (0)	3 (0)
2020	0	0

Diagnostic scheme for RABV

The national reference laboratory for RABV at the NVI is the only veterinary laboratory with established adequate laboratory methods and approved laboratory facilities for rabies testing in Norway.

NVI participates in ring tests on RABV including PCR and FAT awarded by the EU-RL. The test scheme is shown in Figure 1 and the tests meet the standards set by the OIE and EU-RL.

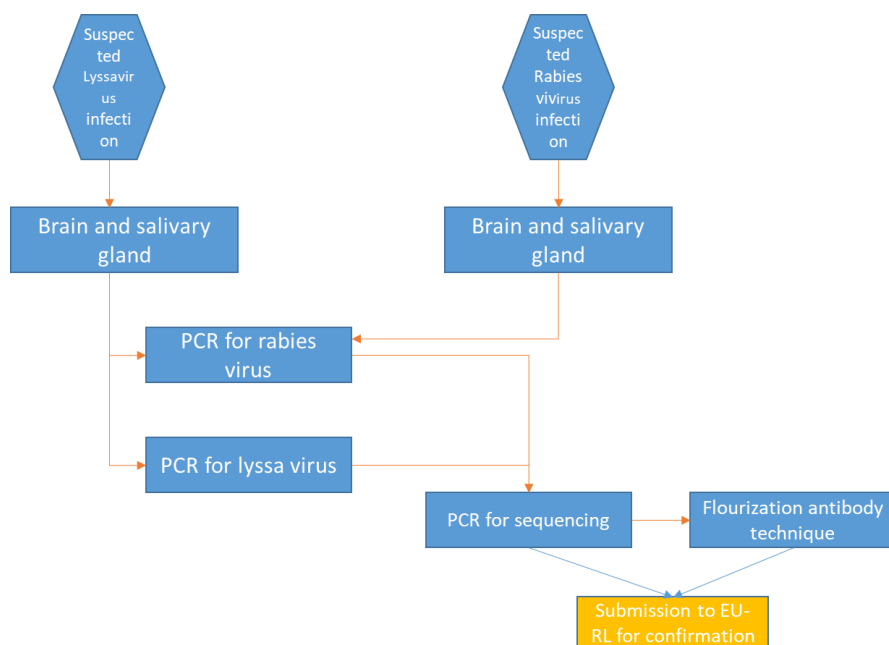


Figure 1. Diagnostic scheme for RABV in animals in Norway.

4. Qualitative risk assessment for the introduction of RABV to Norway via import of an infected animal

Rabies has been a notifiable disease in Norway for more than 100 years, and the animal populations are well documented and monitored for RABV. No case in animals has been reported for >100 years, indicating that the the risk for introduction of RABV to Norway via import of an infected animal is extremely low.

Hazard identification

The hazard is RABV imported to Norway via an infected animal.

Release assessment

Wildlife import to Norway

Norway borders to Finland, Sweden, and Russia. Sweden and Finland are officially free of rabies. The areas of Russia bordering Norway, or bordering parts of Finland that are close to Norway, from where wild animals in theory could enter Norway has very limited, if any, reported cases of rabies (REF Shulpin et al 2018). Import of a RABV infected wild animal to Norway is extremely unlikely.

Large domestic animal import to Norway

Live animal import of livestock to Norway is extremely limited and in 2018 and 2019 no live cattle or swine was imported while only 16 live sheep are registered imported during these years. Norwegian horses travel abroad for competitions and races, and horses from other countries may visit Norway for such purposes. Such events are a low-risk environment with regards to infection with RABV and horses are a low risk species for RABV. Import of a RABV infected large domestic animal is extremely unlikely.

Pet import to Norway

For Norway, pets (dogs, cats and ferrets) are the most relevant animal species with respect to a risk of importing RABV. The current recommendations from NFSA and NVI is to limit import and travel with pets to other countries, and to avoid import of stray dogs and cats from other countries to Norway. With the exception of Sweden, all cats, dogs and ferrets imported to Norway must be microchipped and vaccinated against RABV.

On the grounds that i) there is high awareness among Norwegian pet owners of the vaccination requirements upon return from international travel, ii) that the countries most frequently visited with pets are within Europe, and iii) these pets are generally well-cared for and therefore have a very low likelihood of exposure to rabies during a stay abroad, the highest risk for import of RABV is likely through import of pets that are returning to Norway, but originate from a different country.

Risk pathway

The theoretical risk pathway for importing a RABV infected pet to Norway is outlined in Figure 2. It is assumed that only pets without clinical signs of RABV infection are imported, meaning any infected pets would be in the incubation period.

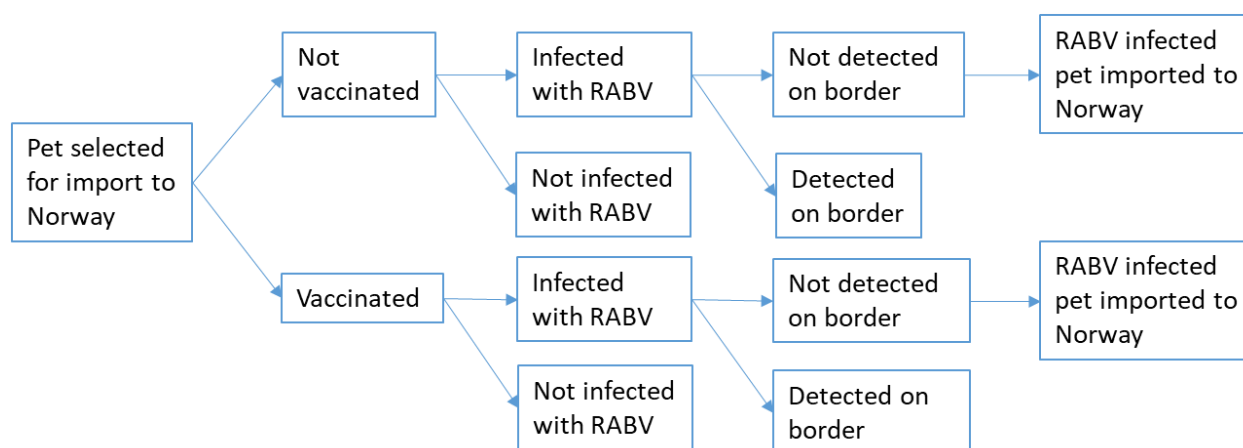


Figure 2. Risk pathway for the risk of importing a RABV infected pet to Norway. Modified from Høgåsen (2005).

Pets imported to Norway

A pet imported to Norway for non-commercial purposes should be accompanied by a valid ID document (passport), proof of veterinary treatment against *Echinococcus multilocularis* 24-120h before arrival in Norway, and valid rabies vaccination certificate. Pets arriving from Sweden are not required to be vaccinated against rabies. Animals that cannot obtain a valid rabies vaccine certificate due to young age (<3 months) cannot enter Norway except from Sweden.

The pet should have an ID chip with the ID number indicated in the passport. For arrival from third countries (non EU/EEA), there are additional requirements, for example documentation of adequate rabies antibody levels.

There are additional requirements for non-commercial import of pets and the owner must be able to present documentation supporting all. For example, hotel reservations, invoices, or boarding cards that clearly indicate that the pet has travelled with the owner for the full extent of the journey before entering Norway. For commercial import of pets, there are several additional requirements. Stray dogs and cats cannot be imported commercially.

Unofficial (illegal) imports of pets are considered to be mainly puppies from “puppy farms” in Eastern Europe. The risk of exposure to RABV is low for such animals.

Vaccination against RABV

Unvaccinated, or insufficiently vaccinated, pets are assumed to be susceptible to RABV, and are the main population at risk of infection. The pet population that is officially imported into Norway consists of RABV-vaccinated adults and puppies >12 weeks of age. Unvaccinated animals <12 weeks of age can only be imported from Sweden, which is free of rabies.

Pets that are vaccinated can be considered to be protected against rabies. No cases of rabies has been documented I vaccinated pets.

In 2017 and 2018, the NFSA and NVI ran a disease surveillance program for dogs imported to Norway from and that were identified by the NFSA at border control. In 2017, 87% of 72 dogs had satisfactory levels of rabies specific antibodies following vaccination (≥ 0.5 IE), and in 2018, 90% of 41 dogs had adequate titres (www.vetinst.no).

Prevalence in the exporting countries

The probability that a pet that is imported to Norway is RABV infected will depend on the prevalence in the exporting country. Thanks to EU-funded control efforts, the RABV situation in EU and adjacent countries with a previously high rabies incidence has improved significantly. The annual reported rabies cases in domestic animals in most European countries is zero. During 2018 and 2019, eight European countries reported at least one domestic animal with rabies (Rabies bulletin (2018) (2019), WHO). None of these countries are geographically close to Norway. Improved surveillance and reporting have been part of the EU-funded control efforts, meaning the reported incidences would represent the true RABV infection prevalence in Europe.

Because the sub-population that is imported to Norway should be vaccinated, the prevalence estimate for rabies in this population is expected to be significantly lower than the national RABV prevalence of the exporting country.

Detection on the border of pets not meeting the import criteria

For pets arriving via an airport from an EU/EEA country, the documents control is carried out by customs. For pets arriving from third countries, the NFSA staff at the airport carry out the control.

Norway shares a land border with Sweden, Finland, and Russia. Entry on land is by car or by train. When crossing the national border this way, or via a seaport, dog owners should without request present all necessary documentation to the border customs. Given the geographical location of Norway, pets arriving by car or by train arrive mainly from European countries.

Regardless of the entry point, if the pet is not accompanied by the required documentation, it may be quarantined whilst waiting for vaccination and/or antibody titre results, euthanized, or be returned to the exporting country. Such euthanized pets are tested for RABV by NVI, as part of the active surveillance for RABV infection in Norway.

Annually, between 30 and 60 attempted illegal imports of pets are detected at Gardermoen airport. In addition, a number of pets with insufficient or insufficiently documented rabies vaccination or RABV antibody tests are detected. In 2019, there were 68 such pets (personal communication Marit Forbord, NFSA, 2020).

Imported volume of pets

The likelihood that a RABV infected pet shall be imported to Norway increases with increasing number of imported pets. There is no official statistics on the total number of pets that are imported to Norway from other countries. The number of pets (mainly dogs) that annually arrive at the main international airport (Gardermoen), is approx. 12 000 (personal communication Marit Forbord, NFSA, 2020). This figure includes Norwegian pets returning to Norway.

Qualitative estimate of the annual risk for import of a RABV infected pet to Norway

In summary:

- There is a legal requirement for rabies vaccination for imported pets.
- There is border control for import of pets.
- The fraction of unvaccinated, or insufficiently vaccinated, pets among imported adults and puppies >12 weeks of age is likely low.
- Most imported pets originate in Europe from rabies free, or low prevalence countries.
- An unknown total number of pets are imported annually to Norway;
 - The number of dogs imported from countries where rabies is endemic is likely very low, and the sub-population from which such dogs are exported is vaccinated and mostly also a documented antibody titre.
 - The number of cats and ferrets imported from countries where rabies is endemic is likely extremely low.

Conclusions

Given this, the overall annual risk of importing one RABV-infected pet to Norway is estimated to be very low for dogs and extremely low for ferrets and cats.

There is an uncertainty to these estimates mainly from the lack of data on the annual number of imported pets, and from which countries these are exported. Illegal import of dogs to Norway is known to occur, and this may confer a possibility of dogs infected with RABV. However, illegally imported dogs are mainly puppies with a low risk of being exposed to RABV before export.

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