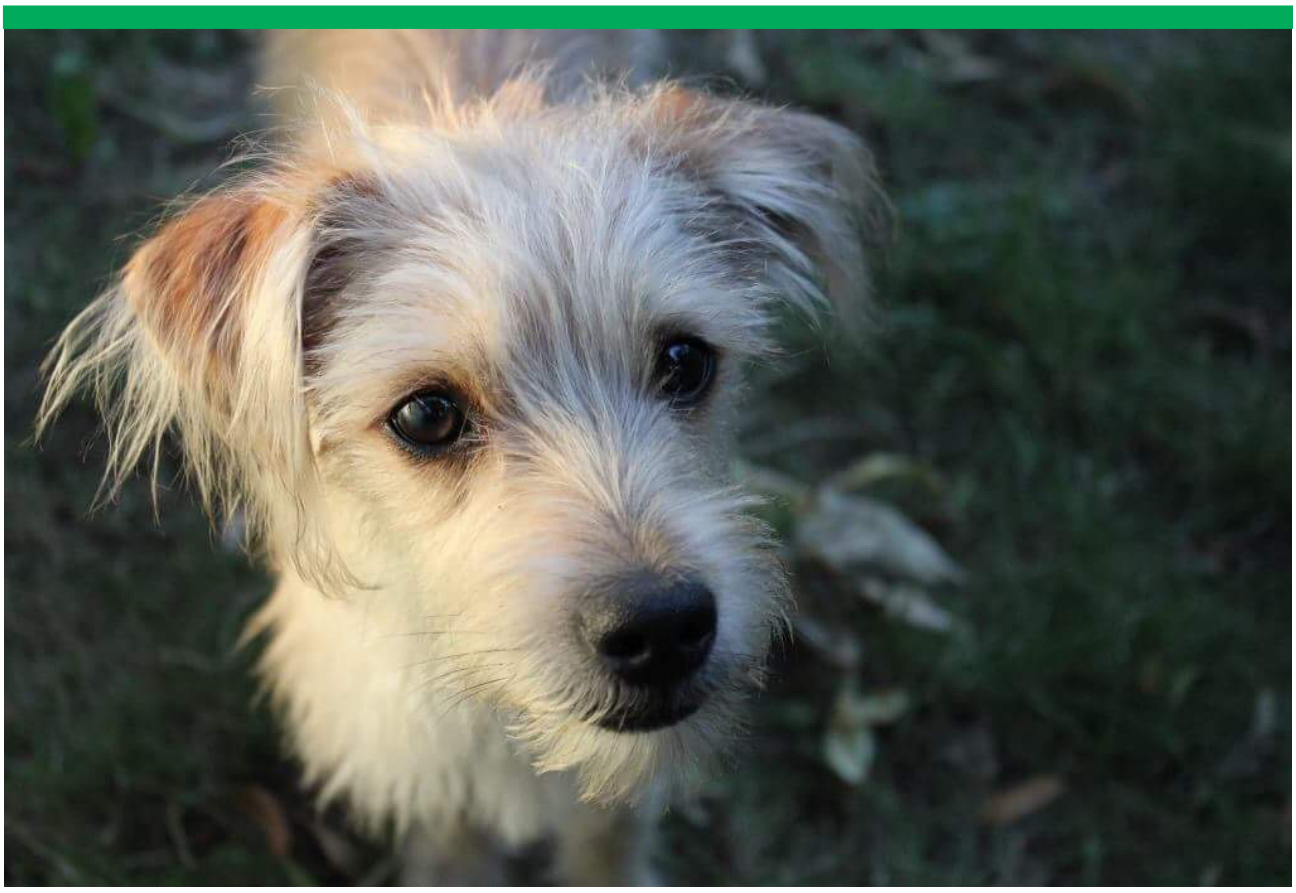
Annual Report

The surveillance programme for imported dogs in Norway in 2018



Veterinærinstituttet
Norwegian Veterinary Institute

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The surveillance programme for imported dogs in Norway 2018

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Summary

A total of 41 dogs imported to Norway from 8 different countries were included in the surveillance programme in 2018. The majority of included dogs (61%) were imported from Spain. Documentation of rabies vaccination is compulsory for entry of dogs into Norway from most countries. 90.2% of the dogs had a rabies antibody level greater than 0.5 IU, which is considered sufficient for protection, and 9.8 % of the dogs had antibody levels below 0.5 IU. The most frequently detected infection was *Leishmania infantum* (9.8%), followed by antibodies against *Erlichia canis/ewingii* (2.4%). No dogs tested positive for heartworm (*Dirofilaria immitis),* French heartworm (*Angiostrongylus vasorum*) or *Brucella canis*.

Introduction

The import of dogs to Norway from non-Nordic countries increased after a change of regulation in movement policy in 2012. The increased import of stray- and shelter dogs since 2012 has been of particular concern, because these dogs may carry infectious agents that do not exist in Norway or are rare in Norway. A study performed in 2012 demonstrated that 53% of 75 dogs imported mainly from Romania had a lower antibody level than that considered adequate for reliable protection despite documented rabies vaccination (1). The low antibody levels can be explained by incorrect vaccination, immunocompromised dogs or false documentation. In the last years, the Norwegian Veterinary Institute (NVI) has detected, in imported dogs, a number of infectious agents that do not exist in Norway including heartworm (*Dirofilaria immitis*), the brown dog tick (*Rhipicephalus sanguineus*), toungeworm (*Linguatula serrata*) and the protozoan parasite *Leishmania infantum*.

In 2017, a surveillance programme for infectious agents in imported dogs was conducted for the first time, and 72 dogs were examined for antibodies against rabies virus, *Leishmania infantum and Erlichia canis/ewingii*. In addition, the samples were analyzed for *Dirofilaria immitis and Angiostrongylus vasorum* antigen. The programme continued in 2018, and in addition to the agents included in 2017, the samples were also examined for antibodies against *Brucella canis.*

Aims

To document the occurrence of exotic infectious agents in imported dogs and to assess compliance with required pre-import rabies vaccination.

Materials and methods

The Norwegian Food Safety Authority (NFSA) was responsible for identifying dogs relevant for inclusion in the programme. These should be imported for the first time to Norway from Southern- or Eastern Europe or “third countries”, be at least 6 months of age and should be sampled within a week of arrival in Norway. The aim was to include 100 dogs in the programme during 2018. However, the Norwegian import regulations for stray dogs were tightened from 1 July 2018, and after this date, less dogs were imported. Therefore, only 41 dogs were included in the programme for 2018.

Dogs eligible for inclusion were blood sampled and information regarding age, sex, country of origin and the dog’s immunization history was documented on a questionnaire. Samples were sent to the NVI for analyses.

An aliquot of 0.5 ml serum from each included dog was sent to the National Veterinary Institute in Sweden (SVA) for detection of antibodies against rabies, and determination of antibody titer, using the Fluorescent Antibody Virus Neutralization test (FAVN). All imported dogs (except dogs traveling from Sweden) should have valid documentation of rabies vaccination for entry into Norway. An antibody level ≥0.5 IU is recommended by WHO and OIE as sufficient for protection against rabies (2), and more than 85% of vaccinated dogs achieve this level after one dosage of rabies vaccine (1).

Serum samples were also tested at the NVI for heartworm (*Dirofilaria immitis*) and French heartworm (*Angiostrongylus vasorum*) using the snap tests IDEXX SNAP 4dx and IDEXX Angio detect, respectively (IDEXX, Hoofddorp, The Netherlands). Both these tests are antigen tests that detect presence of the parasite (i.e ongoing infection). The IDEXX SNAP 4dx also detects antibodies against *Erlichia canis/ewingii*. Serum from each dog was also tested for specific antibodies against *Leishmania infantum* using the ELISA method IDVet ID Screen® Leishmaniasis Indirect (IDVet, Grabels, France) following the manufacturer's instructions and for antibodies against *Brucella canis* using the Canine Brucellosis Antibody kit (Rapid slide agglutination test (RSAT), Synbiotics, California, USA).

Although not formally part of the programme, the dogs were also tested for antibodies against *Anaplasma phagocytophilum/platys* and *Borrelia* spp. This was done because the snap test used for detection of heartworm (IDEXX SNAP 4dx) also detects antibodies against these agents. *Anaplasma phagocytophilum* and *Borrelia* spp. are prevalent in some areas of Norway and are transmitted through endemic ticks (*Ixodes ricinus*).

Results

Blood samples were received from 42 imported dogs during 2018. However, the sample from one of the dogs had been spoilt and were excluded. Hence, samples from 41 dogs were analysed. Information regarding country of origin was available for all 41 dogs and data on immunisations were available for 40 (97.6%) of the dogs (Table 1). Twenty-nine (70.7%) of the dogs were mixed breed. Remaining dogs belonged to 7 different breeds.

Table 1. Country of origin of 41 dogs included in the surveillance programme in 2018.

Country of origin	No. of dogs	Number of dogs with documented vaccination against:						
		Rabies	Leishmania	Leptospirosis	Hepatitis	Distemper	Parvo	No information*
Bosnia	2	2			1	1	1	
Canada	1	1		1				
Ghana	1	1		1	1	1	1	
Greece	7	6		6	6	6	6	1
Hungary	2	2			2	2	2	
Italy	1	1						
Romania	2	2		2	2	2	2	
Spain	25	25	2	19	22	22	22	

*No information given regarding vaccinations.

A result for rabies antibodies was available for all the dogs (Table 2). Thirty seven dogs (90.2 %) had a rabies antibody level ≥0.5 IU. The remaining four (9.8 %) dogs had antibody levels <0.5 IU.

Table 2. Rabies titer measurement of 41 imported dogs with respect to country of origin.

Country of origin	Rabies titer (%)	
	≥0.5 IU	0.2-0.5 IU
Bosnia	2 (100)	
Canada	1 (100)	
Ghana	1 (100)	
Greece	5 (71.4)	2 (28.6)
Italy	1 (100)	
Hungary	2 (100)	
Romania	1 (50)	1 (50)
Spain	24 (96)	1 (4)

*Not sufficient serum from two dogs, to analyze rabies titer.

Results for testing for antibodies or antigens against five infective agents are shown in Table 3. In addition to the four dogs positive for *Leishmania infantum* antibodies, two dogs from Spain were concluded as doubtful and the owners were recommended to repeat the testing in six months.

One dog from Bosnia (2.4%) was positive for antibodies against *Anaplasma phagocytophilum/platys* and no dogs were positive for antibodies against *Borrelia spp.*

Table 3. The number of dogs positive for antibodies or antigens against five infective agents with respect to country of origin.

Country of origin	No. positive (%)				
	Leishmania infantum **antibodies**	*Dirofilaria immitis* **antigen**	*Angiostrongylus vasorum* **antigen**	*Erlichia canis/ewingii* **antibodies**	*Brucella canis*
Bosnia	0	0	0	0	0
Canada	0	0	0	0	0
Ghana	0	0	0	0	0
Greece	0	0	0	0	0
Hungary	0	0	0	0	0
Italy	0	0	0	0	0
Romania	0	0	0	0	0
Spain	4 (9.8 %)*	0	0	1 (2.4)	0

*Two dogs from Spain were concluded as doubtful according to the manufacturer's instructions.

Discussion

The import of shelter dogs from other countries increased following a change in import regulations in 2012. There is a potential for these dogs to bring with them infectious agents that are exotic to Norway, and to survey the situation, the NFSA initiated this surveillance project. From 1 July 2018, the requirements for import of stray dogs were tightened, and hence, fewer dogs were imported after that date.

The majority of dogs (61%) sampled in 2018 came from Spain. This is in agreement with the impression that, for the last few years, Spain has been the main country of origin of shelter-dogs imported to Norway, which may be a result of activity of Norwegian dog rescue organisations in this country. The included dogs were identified at border control by the NFSA, and are presumed to accurately reflect the population of legally imported dogs to Norway. However, since there is no registry over imported dogs, their origin cannot be properly assessed. Both the NFSA and the NVI have warned about the potential risks to animal and public health in Norway that are associated with import of stray dogs. In addition, a study has shown that the majority of veterinarians in Norway would prefer a ban of import of stray dogs to Norway (3).

Although confirmation of rabies vaccination was lacking for one dog, it is presumed that this dogs did have a valid pet-passport upon arrival and hence that it was vaccinated. Out of the 41 dogs with a result for rabies antibody measurement, 90.2% had an antibody level greater than 0.5 IU, which is considered sufficient for protection. The proportion of dogs with a sufficient antibody response is higher than findings from a study conducted on rescue dogs from Eastern Europe in 2012 (1) where only 47% of the dogs had titers ≥0.5 IU. One explanation could be that the majority of the imported dogs in the current surveillance program originated from well-organised shelters and rescue centres in Spain, while the majority of rescue dogs examined in 2012 came from Romania.

The four (9.8%) dogs with antibody levels between 0.2 and 0.5 IU, are likely to have been vaccinated against rabies but have a lower antibody level than expected. It is a concern that the antibody level detected in these dogs was too low to be considered sufficient for protection against rabies. The prevalence of rabies in dogs in Europe is extremely low, and the likelihood of importing dogs with

infection is considered to be very low. However, the consequences of importing an infected dog could be severe and it is of great importance that imported dogs are properly vaccinated.

Antibodies against *Leishmania infantum* were detected in four dogs that originated from Spain. This parasite is found in the Mediterranean countries, and it was not a surprise, therefore, that it was detected in this investigation with such a large proportion of dogs from Spain. *Leishmania infantum* can give persistent and life-long infections and treatment is complicated. The sand fly vector has been considered necessary for transmitting the parasite and is not found in Norway. However, recent reports have indicated horizontal transmission of the parasite between dogs through direct contact or bites (4, 5, 6, 7) blood transfusions (8) and mating (9, 10), and also vertical transmission from mother to offspring (9, 11). Hence, there is a potential for domestic infection of dogs in Norway following from import of infected dogs.

None of the dogs tested in this study was positive for heart worm (*Dirofilaria immitis*), but this parasite has been detected in imported dogs previously (12). It is not unlikely that there are imported dogs in Norway that, unknown to the owner, are carrying infective adult stages of heart worm. The Norwegian Meteorological Institute has previously shown that the required medium temperatures for development of infective heart worm larvae in the intermediate host (mosquito) can be reached during summer in some areas of Southern Norway (13). For instance, in Oslo-Blindern, in the period 1981-2011, there was an average of 11 (0-52) days per year with possible transmission risk (based on calculated Heartworm Developing Units, HDU). Furthermore, potential intermediate host mosquitos (*Culex pipiens*, *Aedes vexans*, *Anopheles maculipennis*) are endemic in Norway.

All but six of the 41 (85.4%) dogs with information on immunisations had been given core vaccines (infectious canine hepatitis, canine parvovirus and canine distemper) in addition to the compulsory rabies vaccine. Although this was somewhat higher than expected, it should be an aim that all dogs imported to Norway are given core vaccines before traveling. Treatment against ectoparasites such as ticks, fleas and lice are also strongly recommended.

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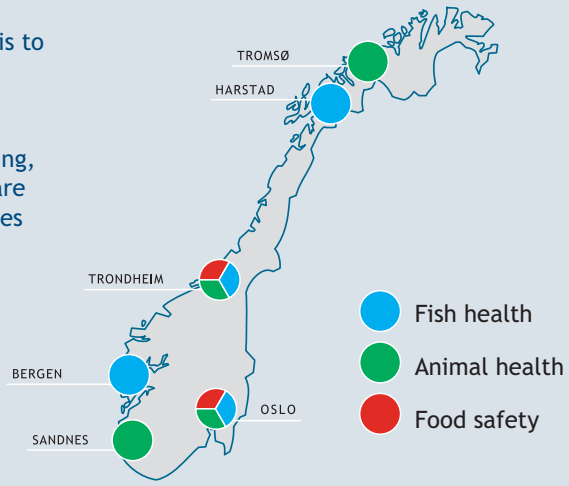

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