Annual Report

The surveillance programme for *Angiostrongylus vasorum* in red foxes (*Vulpes vulpes*) in Norway 2018

Veterinærinstituttet
Norwegian Veterinary Institute

Mattilsynet

The surveillance programme for *Angiostrongylus vasorum* in red foxes (*Vulpes vulpes*) in Norway 2018

Content

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Summary

The pathogenic cardio-pulmonary nematode *Angiostrongylus vasorum* (*A. vasorum*) was detected in four of 67 (6.0%; 2-15%, 95% confidence intervals) red foxes (*Vulpes vulpes*) examined by serological analysis during the hunting season in 2018. So far, the surveillance of *A. vasorum* in Norway has included relatively few animals, and further studies, including randomly selected animals from the whole country, can possibly determine the geographical distribution and the true prevalence of *A. vasorum* in wild canids.

Introduction

In recent years, studies have been conducted on the prevalence of the French heartworm, *A. vasorum,* in several European countries due to its apparent emergence and geographical spread throughout Europe. This snail-borne parasite infects domestic dogs and wild canids causing potentially fatal, verminous pneumonia and coagulopathy in addition to neurological and gastrointestinal symptoms (1, 2).

First discovered in France more than a century ago, the bordering countries also detected the parasite in well-defined endemic foci. In addition to the south-west of France, endemic foci in the Copenhagen Metropolitan Region of Denmark, in Ireland, parts of Wales and in England are well known. However, it is only within the past few decades, a majority of European countries including Sweden have reported the discovery of this parasite. In Sweden, *A. vasorum* was first identified on the island of Sydkoster in 2003 and since diagnosed in dogs and foxes on the mainland (3). Numerous reasons for the ongoing geographical spread are likely factors such as climatic change, altered distribution and dynamics of the intermediate hosts, increased urbanisation of red fox populations and common movement of dogs within and between countries (4, 5, 6).

A. vasorum was first detected in Norway in 2016, in two foxes from Eastern and Western Norway, respectively (7).

Aims

Following the first detection of *A. vasorum* in Norway, the aims of the current programme are 1) to implement surveillance based on a serological test instead of the previously utilised coproscopic method and 2) to start collecting data on the prevalence and geographical distribution of *A. vasorum* in red foxes in Norway.

Materials and methods

Whole blood samples for this study were collected from red foxes (*Vulpes vulpes*) from October to December 2018. In September 2018, hunters that had volunteered to participate in sampling of red foxes for the *Echinococcus multilocularis* (the dwarf fox tapeworm) surveillance program 2018 were invited to submit blood samples for the *A. vasorum* screening. Hunters who had previously submitted high-quality samples (i.e. the required sample volume in tight containers and with all necessary information) were selected. Sampling containers, pipettes and detailed instructions for sampling were send to those hunters who accepted the invitation to participate in the program. The hunters collected whole blood samples directly from the heart or from the abdomen of the foxes. The samples together with information on origin of the fox, date of the hunt, sex (male or female) and estimated age of the animal (juvenile or adult) were submitted to the laboratory in pre-paid envelopes. Upon arrival at the Veterinary Institute, sera were collected after centrifugation of the blood samples and frozen at -20 ^{o}C until analysis.

Collection of blood from hunted red foxes proved to be difficult and relatively few hunters submitted blood samples of sufficient quality for laboratory analysis. Of the 151 blood samples submitted during October – December 2018, only 67 were analysed for *A. vasorum*. Origin of the foxes is listed in Table 1. Presence or absence of *A. vasorum* antigen in the blood samples was tested using the commercially

available "Canine *A. vasorum* antigen test kit" (Angio Detect Test, IDEXX Laboratories) according to the manufactures instructions.

Table1. County of origin of red foxes (*Vulpes vulpes*) (n = 67) from mainland Norway tested for *Angiostrongylus vasorum* during the red fox licensed hunting season in 2018 (January to mid-April and mid-July to late December).

County	No. of foxes tested for *A. vasorum*	No. of positive foxes
Østfold	1	0
Akershus	12	0
Oslo	6	1
Hedmark		0
Oppland	4	0
Buskerud	24	3
Vestfold		0
Telemark		0
Aust-Agder	1	0
Vest-Agder	1	0
Rogaland		0
Hordaland	14	0
Sogn og Fjordane		0
Møre og Romsdal		0
Trøndelag		0
Nordland	3	0
Troms	1	0
Finnmark		0
Total	67	4

Results and Discussion

Although relatively few blood samples were submitted for the *A. vasorum* screening in 2018, all regions, apart from Central Norway, were represented (Figure 1 A). Of the 67 samples that were suitable for laboratory analysis, four tested positive for *A. vasorum* (Figure 1 B) corresponding to a prevalence of 6.0% (2-15%, 95% confidence intervals). The four samples originated from two different counties: Buskerud (3 positive) and Oslo (1 positive), both located in Eastern Norway, the region with the highest human population density (27.4/km^2 (8)). Similarly, in 2016 *A. vasorum* was detected in the county of Akershus, which is next to the county of Oslo. However, the other positive find in 2016 was from Rogaland in Western Norway. Although the prevalence are not directly comparable due to the different methods applied, *A. vasorum* has currently been detected in four counties in Norway: Akershus, Buskerud, Oslo and Rogaland.

Generally, the prevalence of *A. vasorum* is considerably higher in foxes than in dogs, and infection with this parasite is of concern mainly to dogs living in areas with dense fox populations and/or in areas with close contact with foxes e.g. suburban areas (9).

The number of samples collected in Norway so far is insufficient to document the true prevalence of *A. vasorum* in foxes. Additionally, the establishment of the true prevalence requires random selection of samples throughout the whole country. Previous studies from other parts of Europe have found a patchy geographical distribution of the parasite with high prevalence in "hotspots". From these "hotspots", the parasite may expand into previously uninfected areas. The capital region of Denmark, known as a "hotspot" for *A. vasorum*, and the recent establishment of the parasite in Central and Southern Sweden (10) may possibly contribute to the risk of increasing prevalence and further spread into Norway via pet-travel or migrating wildlife. Thus, monitoring of the geographical spread and establishment of the true prevalence of *A. vasorum* in wild canids as well as in domestic dogs in Norway are warranted.

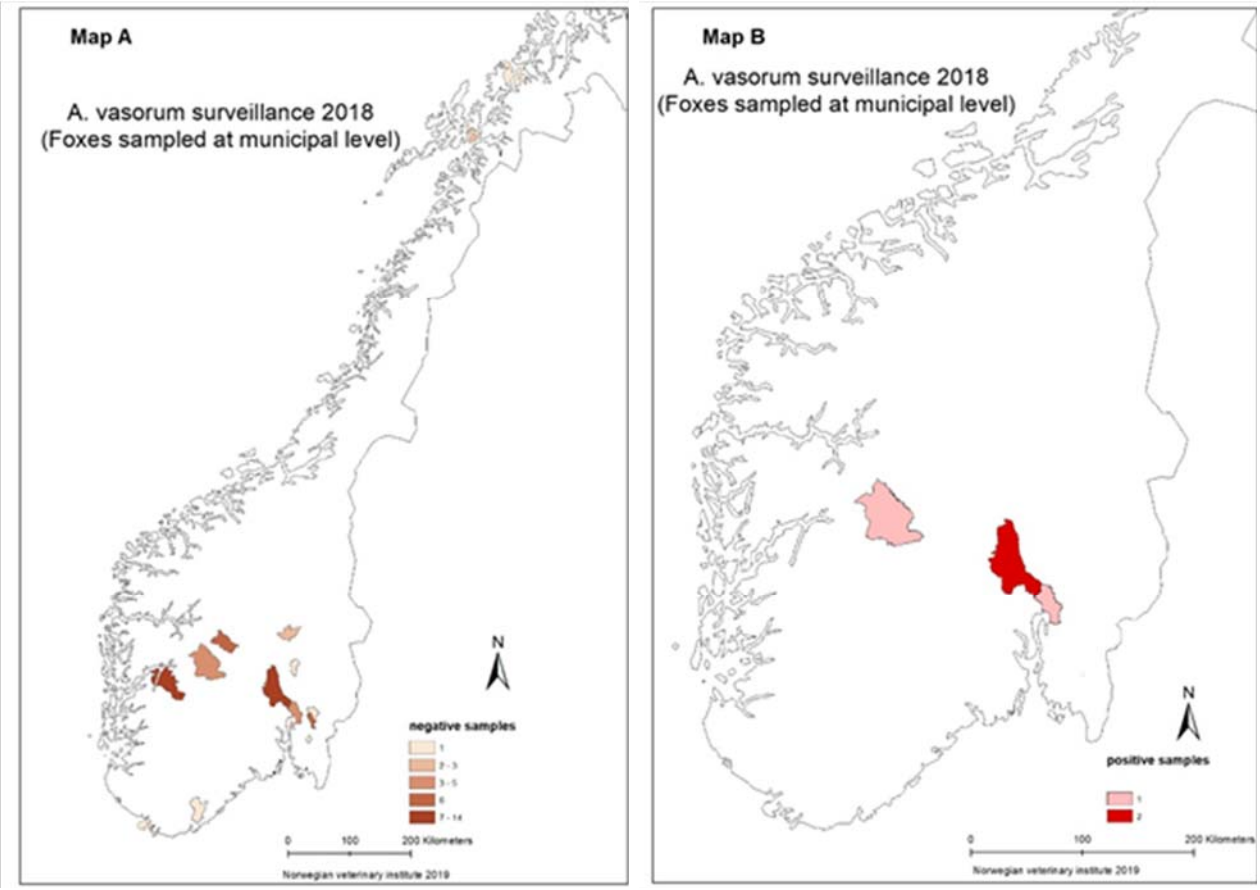

Figure 1. Maps of Norway showing Left: The geographical origin of all red foxes (n = 67) tested for *Angiostrongylus vasorum* during the red fox licensed hunting season in 2018, and Right: The origin of red foxes (n = 4) that tested positive for *A. vasorum* antigen by serological analysis.

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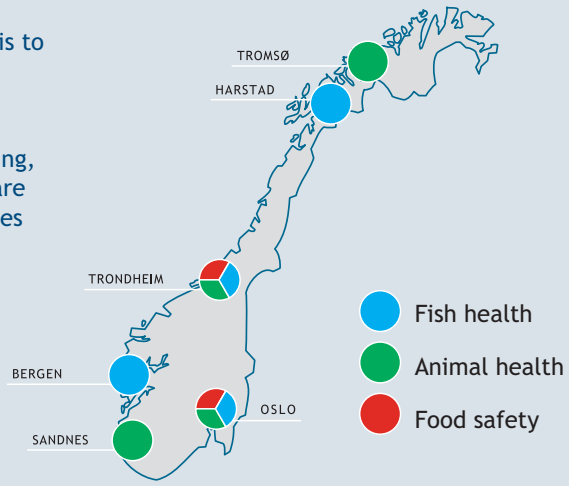

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