Annual Report

The surveillance programme for *Angiostrongylus vasorum* in red foxes (*Vulpes vulpes*) in Norway 2016

Veterinærinstituttet
Norwegian Veterinary Institute

The surveillance programme for *Angiostrongylus vasorum* in red foxes (*Vulpes vulpes*) in Norway 2016

Content

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Summary

The highly pathogenic cardio-pulmonary nematode *Angiostrongylus vasorum* was detected for the first time in Norway in 2 of 134 (1.5%; 0.2-5.3%, 95% confidence intervals) red foxes (*Vulpes vulpes*) examined for this parasite during the hunting season in 2016. Further studies are needed to determine its geographic distribution in Norway and the true prevalence in wild canids as well as domestic dogs.

Introduction

The French heartworm, *Angiostrongylus vasorum,* has been the focus of several recent studies due to its apparent emergence and geographical spread throughout Europe. This potentially fatal, snail-borne parasite infects domestic dogs and wild canids causing verminous pneumonia and coagulopathy in conjunction with neurological and gastrointestinal symptoms (1, 2).

The parasite was first discovered in France more than a century ago. Later, it was detected in bordering countries where it appeared to be established in well-defined endemic foci. In addition to the south-west of France, such foci have been known for several years in Ireland, parts of Wales and England, in Northern Sealand and the capital region of Denmark. However, it is only within the past few decades that this parasite has been detected in the majority of European countries including Sweden, where *A. vasorum* was first detected in on the island of Sydkoster in 2003 and since found in both dogs and foxes on the mainland (3). The reasons for the ongoing geographical spread are probably multiple including factors sucTheh as climatic change, altered distribution/dynamics of intermediate hosts, increased urbanisation of red fox populations and frequent movement of dogs within and between countries (4, 5, 6).

Prior to the present study, *A. vasorum* was not detected in Norway.

Aim

The aim of this pilot study/programme was to determine if *A. vasorum* was present in foxes from geographical areas, which were supposed to have an increased risk of occurrence of this parasite. Following detection of the first case, the screening was broadened to include as many Norwegian counties as possible within the restricted project period. The aim was to obtain a preliminary impression of the prevalence of *A. vasorum* in wild canids.

Materials and methods

Fresh faecal samples were collected from red foxes shot during the licensed hunting season in 2016 (i.e. January to mid-April and mid-July to late December). Of the 575 red foxes included in the surveillance programme for *Echinococcus multilocularis* (the dwarf fox tapeworm) in Norway in 2016 135 were analysed for *A. vasorum*.

Initially, the sampling was restricted to the south-eastern part of Norway more specifically the counties of Akershus, Østfold and Oslo. However, following the detection of the first case in February 2016, the sampling was broadened to include foxes from across the country (Table 1). Following Baermannisation, first-stage larvae (L1) were identified by microscopy based on morphological/morphometric characteristics (7, 8). Larvae (5 per fox) identical to *A. vasorum* were verified by polymerase chain reaction (PCR) and partial sequencing of the Internal Transcribed Spacer 2 (ITS-2) (9) and the cytochrome oxidase 1 (CO1) locus (10, 11).

Table1. County of origin of red foxes (*Vulpes vulpes*) (n = 134) examined for *Angiostrongylus vasorum* in mainland Norway during the red fox licensed hunting season in 2016 (January to mid-April and mid-July to late December).

County	No. of foxes examined for *A. vasorum*
Østfold	63
Akershus	18[1]
Oslo	15
Hedmark	6
Oppland	4
Buskerud	0
Vestfold	2
Telemark	3
Aust-Agder	2
Vest-Agdre	0
Rogaland	1[1]
Hordaland	3
Sogn og Fjordane	1
Møre og Romsdal	1
Sør-Trøndelag	5
Nord-Trøndelag	3
Nordland	4
Troms	3
Finnmark	0
Total	134

[1]Finding of a fox positive for *A. vasorum*.

Results and Discussion

In two foxes (1.5%; 0.2-5.3%, 95% confidence intervals) from different regions in southern Norway (the municipality of Ski in the county of Akershus and municipality of Time in the county of Rogaland, respectively) L1 larvae morphologically identical to *A. vasorum* were detected (Figure 1). The identity was further verified by molecular analyses demonstrating the presence of *A. vasorum* larvae, which were 99% identical to sequences from United Kingdom in GenBank.

Generally, the prevalence of *A. vasorum* is much higher in foxes than in dogs, and infection with this parasite is of primary concern to dogs living in areas with dense fox populations and/or in areas with close contact with foxes e.g. suburban areas (12).

The number of samples collected in Norway in 2016 was insufficient to document the current prevalence of *A. vasorum* in foxes. Additionally, determination of the true prevalence would require random selection of samples throughout the whole country. Previous studies from other parts of Europe have demonstrated a patchy geographical distribution of the parasite with high prevalence in “hotspots” from where the parasite may expand into previously uninfected areas. The capital region of Denmark is known as a “hotspot” for *A. vasorum*, and the resent establishment of the parasite in central and southern Sweden may possibly contribute to the risk of increasing prevalence and further spread into Norway via pet-travel or migrating wildlife.

This is the first finding of *A. vasorum* in Norway. Our findings document the northern expansion of this highly pathogenic parasite and warrants further surveillance in wildlife as well as in domestic dogs.

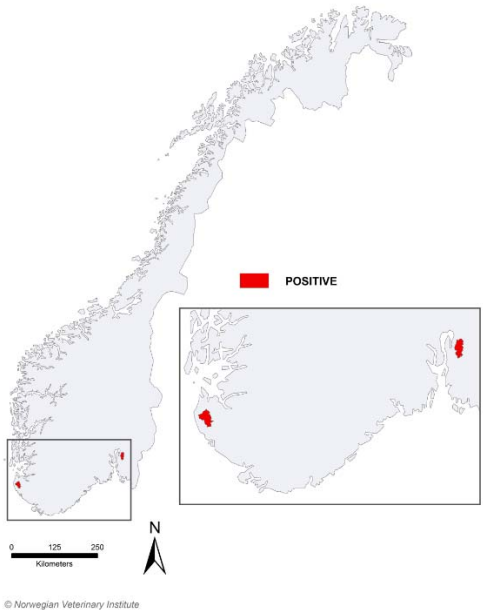

Figure 1. Map of Norway showing the geographical origin of red foxes (n = 2) positive for *Angiostrongylus vasorum* during the red fox licensed hunting period in 2016.

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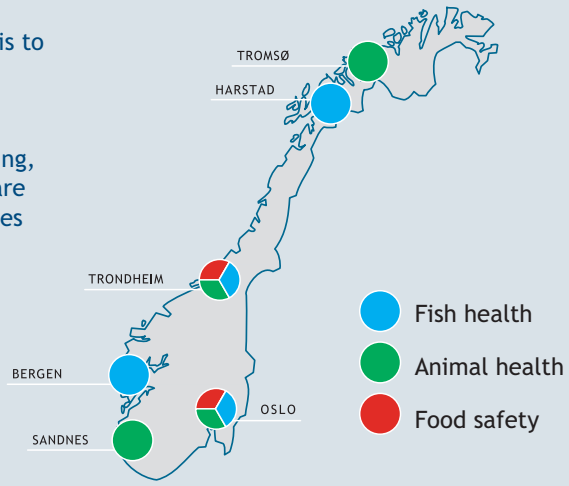

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