



The surveillance programme for *Psoroptes ovis* in llama (*Lama glama*) and alpaca (*Vicugna pacos*) in Norway in 2021



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Summary

Samples taken inside the outer ear canal from 271 individual camelids from 60 holdings were examined in the active surveillance programme for *Psoroptes ovis* in 2021. In the passive surveillance programme, four necropsied camelids were examined. *P. ovis* was not detected in any of these animals.

Introduction

Sheep scab is a contagious, highly pruritic disease caused by the mite *Psoroptes ovis* in the family *Psoroptidae*. Affected sheep develop large, yellowish, scaly, crusted lesions, accompanied by damage to the wool and hide. Emaciation and secondary bacterial infections can occur. Sheep scab is an animal welfare concern due to the pain and irritation caused by the mites (1).

Psoroptes mites have traditionally been separated into different species based on their host and body site preferences. Mites found on the bodies of sheep, cattle and other ungulates were named *P. ovis*, mites in the ears of sheep and on rabbits were called *P. cuniculi*, mites found on horses were *P. equi* and mites on alpacas and llamas *P. auchenia*. Based on genetic analysis, all *Psoroptes* spp. mites have now been reclassified into a single species, *P. ovis* (2).

The persistence of sheep scab within a region despite a prolonged absence of sheep has led many researchers to believe that variants of *P. ovis* virulent for sheep can survive on other animals (3). There is a concern that *P. ovis* isolated from camelids might act as a reservoir for the infestation of sheep with sheep scab mites (4). *P. ovis* is a notifiable (List A) disease in Norway regardless of animal species.

Sheep scab caused by *P. ovis* was widespread in the sheep population on the west coast of Norway throughout much of the 19th century and caused great losses. However, since 1894, sheep scab has never been reported in Norway.

The South American camelids llamas and alpacas were introduced as new species to Norway in 1997 and in 1998. They have increased in popularity in the last 15 years, and live animals have been imported every year from several countries and continents.

In January 2015, *P. ovis* was detected in a skin sample from a cria (young alpaca) with otitis externa in an alpaca holding in Trøndelag County. During 2015, *P. ovis* was detected in samples from alpacas in two contact holdings and finally in samples from a llama and a dwarf goat in a zoo with no epidemiological connection to the other positive holdings. During 2016, *P. ovis* was detected in an additional four holdings; three llama and one alpaca.

Psoroptes ovis is known to be present in llamas and alpacas, but is considered a minor problem because it only causes superficial lesions. However, *Psoroptes* mites in camelids are associated with ear canal lesions causing otitis externa with pruritus, crusting and alopecia of the ear pinna, and characteristic concentric dry flakes in the ear canal (5).

In November 2015, a national surveillance programme for *P. ovis* in llamas and alpacas was launched and financed by the Norwegian Food Safety Authority (NFSA) (6).

The NFSA was responsible for carrying out the surveillance programme for *P. ovis*. The Norwegian Veterinary Institute (NVI) was in charge of planning the programme and performing the diagnostic work. Skin samples from the pinnae and external ear canals of individual animals were collected by inspectors from the NFSA.

Aim

The objective of the programme is to identify *P. ovis* positive llama and alpaca holdings with the intention to prevent the spread of *P. ovis*.

Materials and methods

The active *P. ovis* surveillance programme was coordinated with the surveillance programme for paratuberculosis in llamas and alpacas. All known camelid holdings were selected for sampling. However, holdings that had been sampled continuously in the paratuberculosis programme for the last three years, and holdings with no camelids older than 36 months were excluded from sampling. Additionally, dead or euthanized alpacas and llamas selected for investigations in the surveillance programme for tuberculosis, were included in a passive *P. ovis* surveillance programme.

The exact number of llama and alpaca holdings in Norway is unknown. However, in December 2015 the Food Safety Authority estimated the number of holdings to be 420 (6). In October 2021, 330 farms, with a total of 2,540 camelids, were registered in the Register of production subsidies. The aim of the *P. ovis* programme for 2021 was to collect samples from 400 camelids in approximately 160 holdings.

The pinnae and external ear canals of each individual camelid were sampled by using SodiBox™ cloths moistened with sterile water. A maximum of ten animals were to be sampled per holding; if possible five adult animals and five yearlings. The samples were submitted to the Norwegian Veterinary Institute.

Microscopic examination of the SodiBox cloths under stereomicroscope and 10 x to 100 x magnification was used for the detection of *P. ovis* on the cloths. Any mite found was mounted in glycerol and examined under microscope at 40x to 200x for morphological traits. *P. ovis* mites were identified by the three-segmented pedicle and funnel-shaped suckers on the first and second pair of legs. The mouthparts were pointed (Figure 1).

In case of a positive sample, all camelids in the positive holding were clinically examined and sampled/resampled, and the samples were examined as described.

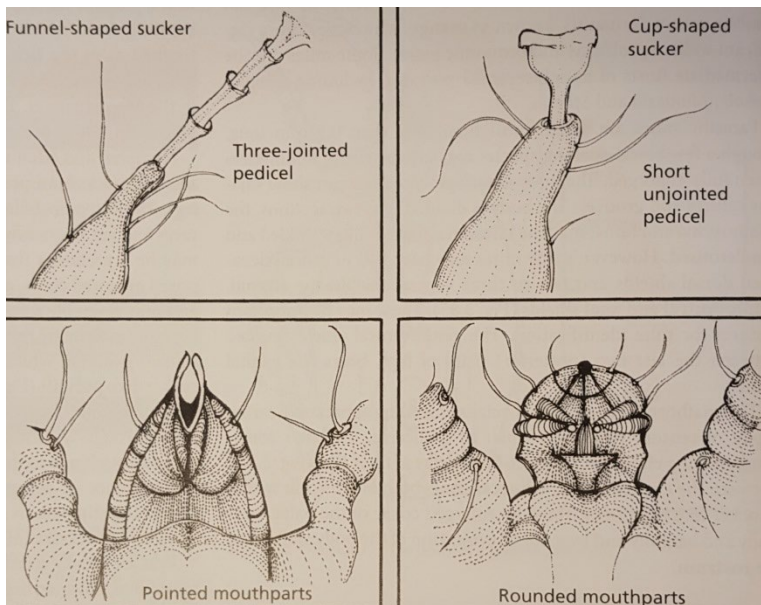


Figure 1. Morphological differences on legs and mouthparts between *Psoroptes* and *Chorioptes mites* (7).

Results and Discussion

A total of 275 animals from 62 holdings were received for examination for *P. ovis*. No samples were rejected. All but two holdings had registered their camelids in the Register of production subsidies.

For active surveillance, 271 individual samples from 60 holdings were suitable for examination. The mean number of individuals examined per holding was 5.1 and 3.0 for the alpaca and llama holdings, respectively. The distribution of holdings sampled and samples examined in the active programme, with respect to camelid species, is given in Table 1.

Table 1. The number of holdings sampled and samples examined, and the number of positive holdings and samples detected in the active surveillance programme for *Psoroptes ovis* in 2021.

Species	Number of			
	Sampled holdings	Sampled animals	Positive holdings	Positive animals
Alpaca	42	214	0	0
Llama	19	57	0	0
Total	60	271	0	0

Four animals from four holdings were examined in the passive surveillance programme. Two of these holdings were also sampled in the active surveillance programme. The species distribution of holdings sampled in the passive surveillance programme is given in Table 2.

Table 2. The number of holdings and individuals examined, and the number of positive holdings and individuals detected in the passive surveillance programme for *Psoroptes ovis* in 2021.

Species	Number of			
	Sampled holdings	Sampled animals	Positive holdings	Positive animals
Alpaca	4	4	0	0
Llama	0	0	0	0
Total	4	4	0	0

Table 3. Numbers of holdings and individual animals tested for *Psoroptes ovis*, and numbers of positive holdings and positive individual animals

Year	Target population	Active surveillance				Passive surveillance ¹			
		No. of sampled holdings	No. of positive holdings (%)	No. of sampled animals	No. of positive animals (%)	No. of sampled holdings	No. of positive holdings (%)	No. of necropsied animals	No. of positive animals (%)
2016	Camelids	234	4 (1.7)	906	6 (0.7)	N.D. ²	N.D.	38	3 (7.8)
2017	Camelids	152	2 (1.4)	622	2 (0.3)	14	2 (14.3)	14	2 (14.3)
2018	Camelids	174	3 (1.7)	823	4 (0.5)	11	0	12	0
2019	Camelids	75	1 (1.3)	294	1 (0.3)	6	0	10	0
2020	Camelids	2	0	8	0	1	1	1	0
2021	Camelids	60	0	271	0	4	0	0	0

¹ Animals sampled as part of the surveillance programme for tuberculosis.

² No active surveillance initiated.

The prevalence of positive holdings in 2021 (0%, 95% confidence interval 0% - 6.0%) is not significantly different from the prevalence in 2019 (1.3%, 95% confidence interval 0.001% - 7.2%) (8).

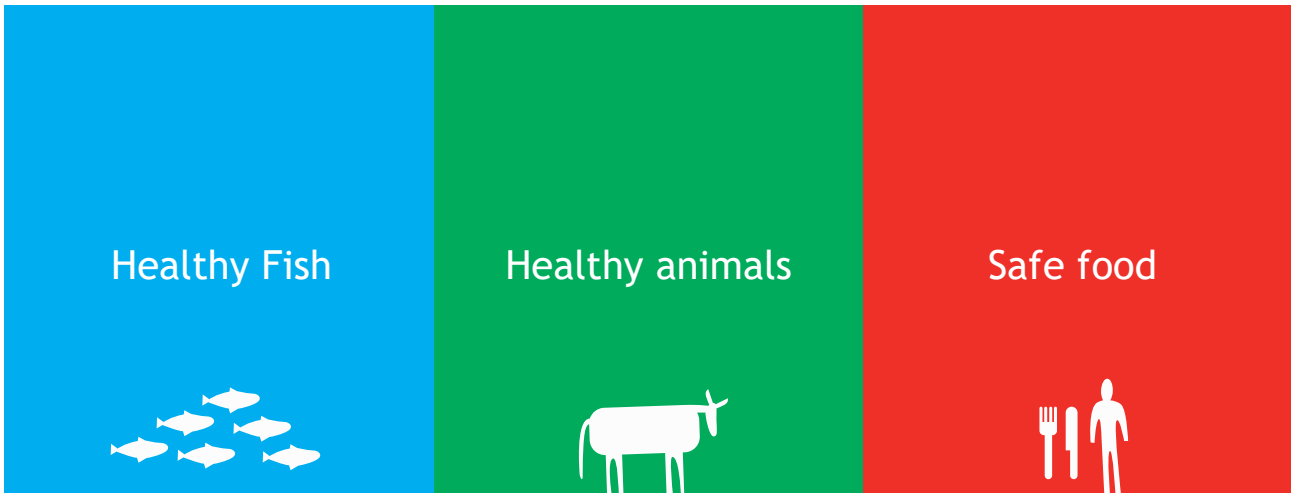
Psoroptes ovis was not detected in the surveillance program in camelids in 2021, either in samples collected actively nor passively. Based on the results one cannot conclude that the mites are absent in the Norwegian camelid population, but the results from the surveillance program indicates that prevalence is low and with a sinking trend.

Acknowledgements

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