

The surveillance programme for paratuberculosis in Norway 2023

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Summary

In 2023, *Mycobacterium avium* subsp. *paratuberculosis* was not detected in Norway.

Introduction

Paratuberculosis in ruminants is a notifiable disease (List 2) in Norway. *Mycobacterium avium* subsp. *paratuberculosis* infection was first diagnosed in cattle and goats in Norway in 1907 and 1934, respectively (1, 2). More recently, *Mycobacterium avium* subsp. *paratuberculosis* was detected for the first time in sheep in 2002 and in alpaca in 2014 (3).

The control of this disease is enforced by government legislation and includes restrictions on animal movement.

In goat herds, government restrictions combined with vaccination was previously used to control paratuberculosis. However, in recent years a large proportion of the Norwegian goat herds has undergone a disease eradication programme (4), and vaccination is now prohibited.

A national surveillance programme for paratuberculosis in cattle was established in 1996 (5, 6). The programme was extended to llamas and alpacas in 2000, goats in 2001, and sheep in 2002.

Descriptions of occurrence of the disease in Norway, control measures adopted until 1995, and results from the surveillance programmes from 1996 to 2001, can be found in the annual report for 2001 (6). The number of new infected herds detected since 1996 when the surveillance programme started, is given in Figure 1.

Aim

The aim of the surveillance programme for paratuberculosis is to detect and control the infection in the Norwegian ruminant and camelid population.

Materials and methods

In 2023, cattle and camelids were included in the programme. Faecal samples were collected at farms, and organs were collected at slaughterhouses, by the Norwegian Food Safety Authority.

Active surveillance

Cattle

The target population consisted of all cattle herds delivering milk to dairies during the sampling period and all beef cattle herds receiving state support according to the register of production subsidies as of October 2022. Two hundred and five cattle herds were selected for sampling. Faecal samples from the five oldest animals in each herd were to be collected.

Camelids

The target population consisted of all llama and alpaca holdings. The number of herds to be sampled was predefined for each district. Faecal samples from five animals older than four years of age should be collected in each herd. If the herd had less than five animals, all animals were to be sampled.

Passive clinical surveillance

Clinical surveillance has been part of the programme since 2000. Samples are collected from cattle older than three years that show clinical signs like reduced milk production, weight loss, diarrhoea lasting more than 14 days, and from other species on clinical suspicion.

Methods

Faecal samples – PCR

For faecal sample preparation approximately 2 -3 g of faecal sample was diluted in sterile demineralised water (1% dilution, w/v). The faecal mixture was filtered using the ADIAFILTER (Bio-X Diagnostics S.A). The sample was further subjected to mechanical destruction by use of glass beads and disrupted with a homogenizer machine. The lysate was used for extraction of nucleic acids.

Extraction of nucleic acids from faecal samples was performed on a MagNA Pure 96 using the MagNA Pure 96 DNA and viral NA Large Volum Kit (Roche) before real-time PCR using the ADIAVET[®] REALTIME PARATB kit (Bio-X Diagnostics, Belgium). This test is based on amplification of the DNA segment IS900 target present in multiple copies of *Mycobacterium avium* subsp. *paratuberculosis* genome.

Faecal samples - Bacteriological examination

Faecal samples with positive PCR results were analysed by bacterial culture. These samples were first decontaminated with 4% sodium hydroxide and 5% oxalic acid with 0.1% malachite green (7), and then inoculated onto selective and non-selective Dubos medium with mycobactin (2 µg/ml) and pyruvate (4 mg/ml) (8). Incubation time was 16 weeks.

Organ samples

Organ samples were screened for macroscopic pathological changes, and histopathological examination would be performed if lesions were present. In addition, bacteriological confirmatory diagnostic tests would be performed if suspect lesions had been detected.

Results

In 2023, all except one sample from 919 cattle and 319 camelids were tested negative for paratuberculosis by PCR. One llama was positive with PCR. New faecal sample from the same animal was negative with both direct PCR and by bacterial culturing and thus considered negative. No organ samples were received in the surveillance programme in 2023.

Details on type of samples and number of herds/locations are described in Table 1.

Table 1. Number of samples collected for examination for *Mycobacterium avium* subsp. *paratuberculosis* in 2023.

Species	Type of sampling	Number of animals (herds or locations)			
		Faecal	Cadavers/Organs	Total positive	Total analysed
Cattle	Risk-based samples	919 (183)	-	0 (0)	924 (187)
	Suspected cases	5 (4)	-		
Goats	Risk-based samples	20 (1)	-	0 (0)	20 (1)
	Suspected cases	0 (0)	-		
Camelids	Risk-based samples	319 (100)	-	0* (0)	329 (101)
	Suspected cases	10 (2)	-		

*One llama was positive with PCR, but new sample from the same animal was negative tested with PCR and bacterial culturing

Since the surveillance programme for paratuberculosis started in 1996, *M. avium* subsp. *paratuberculosis* has been detected in altogether 35 goat herds (some of these also positive before 1996), 11 cattle herds, six sheep flocks, and two alpaca herds (Figure 1). In the figure, only herds where *M. avium* subsp. *paratuberculosis* is detected for the first time are presented. However, a herd that has previously been reported as positive for *M. avium* subsp. *paratuberculosis*, can be counted as a herd with new cases again if *M. avium* subsp. *paratuberculosis* is reported in a different ruminant species.

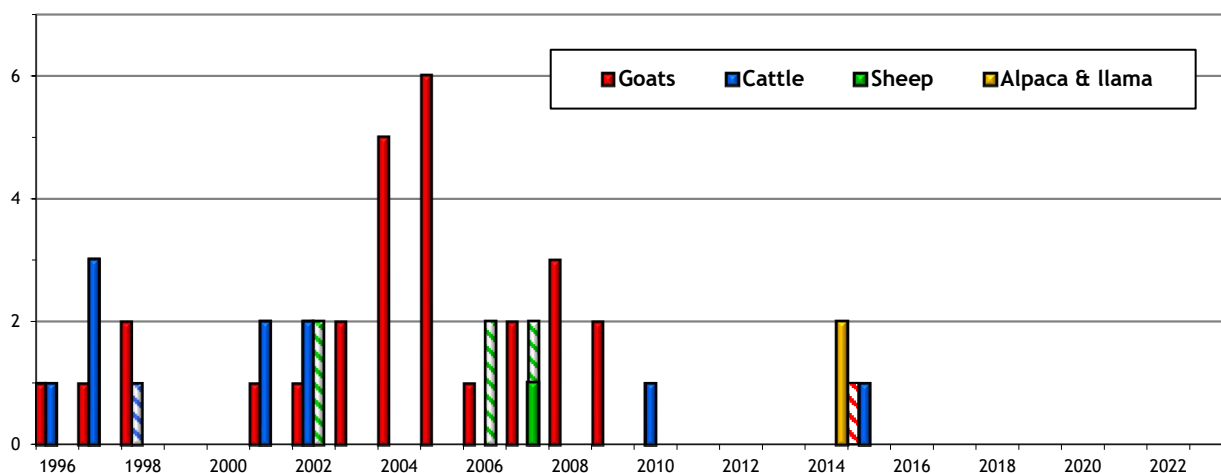


Figure 1. Number of new herds being reported positive for *Mycobacterium avium* subsp. *paratuberculosis* irrespective whether the samples were collected as part of the surveillance programme or not. Striped bars represent herds where another species in the same holding previously was reported positive.

Discussion

Mycobacterium avium subsp. *paratuberculosis* was not detected in Norway in 2023.

One llama tested positive in the initial sampling in surveillance programme in 2023. New sample from the same animal was negative tested with PCR and bacterial culturing, and the herd was concluded negative for paratuberculosis.

Twenty goats from a goat herd with a previous paratuberculosis history were also included in the programme and tested negative, although goats were originally not part of the surveillance programme in 2023.

Paratuberculosis in goats has previously been detected in five out of the 11 counties in Norway (7). All the cases among cattle and sheep have been traced to imported animals (seven cattle herds, one sheep flock) or contact with infected goats (three cattle herds, five sheep flocks). Importation of live cattle is limited and largely replaced by importation of semen and embryos.

The dairy organisation (TINE) and the Norwegian Goat Health Services have conducted an eradication programme named “Healthier goats”, targeting three infectious diseases that were previously widespread in goats; namely caprine arthritis encephalitis, caseous lymphadenitis and paratuberculosis. In total 612 goat herds were included in the programme from 2001 to 2014 (4).

All dairy goat herds in Norway have joined the eradication programme. All known goat herds diagnosed with paratuberculosis have joined the eradication programme or have slaughtered their animals. Hence, Norway is in the unique position in the world of currently having no known positive cases of paratuberculosis (8).

Even though the eradication programme has reduced the indigenous source of *M. avium* subsp. *paratuberculosis*, there may still be undetected infected goat herds or other species that pose a risk for new infections to the Norwegian ruminant population in the coming years. Furthermore, imports of cattle, sheep, goats, llamas and alpacas as well as import of animal feed, for example hay, may present risk for new introduction of *M. avium* subsp. *paratuberculosis* infection into the Norwegian ruminant population.

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