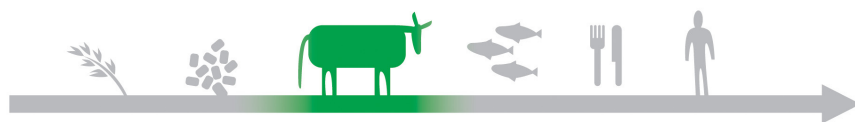


The surveillance programme for maedi in Norway in 2018



Veterinærinstituttet
Norwegian Veterinary Institute



The surveillance programme for lentivirus infection in sheep and goats in Norway 2018

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Summary

None of the 3,282 investigated sheep flocks were diagnosed with maedi in 2018. Of 61 tested goat herds, one goat herd was diagnosed with caprine arthritis encephalitis (CAE).

Introduction

Maedi is a progressive viral pneumonia in sheep first described in Iceland in 1939 (1). The disease occurs in several European countries as well as in other continents. The disease visna is a neuropathogenic manifestation of the infection (1, 2). Both forms of disease are caused by a small ruminant lentivirus (SRLV), the maedi-visna virus (MVV) which is closely related to the caprine arthritis encephalitis virus (CAEV). Maedi-visna and CAE are classified as a list B diseases in Norway and are notifiable to the Office International des Epizooties. In Norway, maedi was officially reported for the first time in 1972 (3).

In November 2002 and January 2003, post-mortem examinations of lungs from two diseased sheep from two different farms in Nord-Trøndelag county showed histopathological changes consistent with maedi. During the following investigations more than 15,000 sheep in 300 flocks were serologically examined for maedi-visna infection, and 50 flocks were found to be seropositive (4, 5). The outbreak demonstrated the need for a nationwide surveillance programme, which started in November 2003 (4, 6).

An overview of the number of new infected flocks registered each year up to 2018 is given in Figure 1.

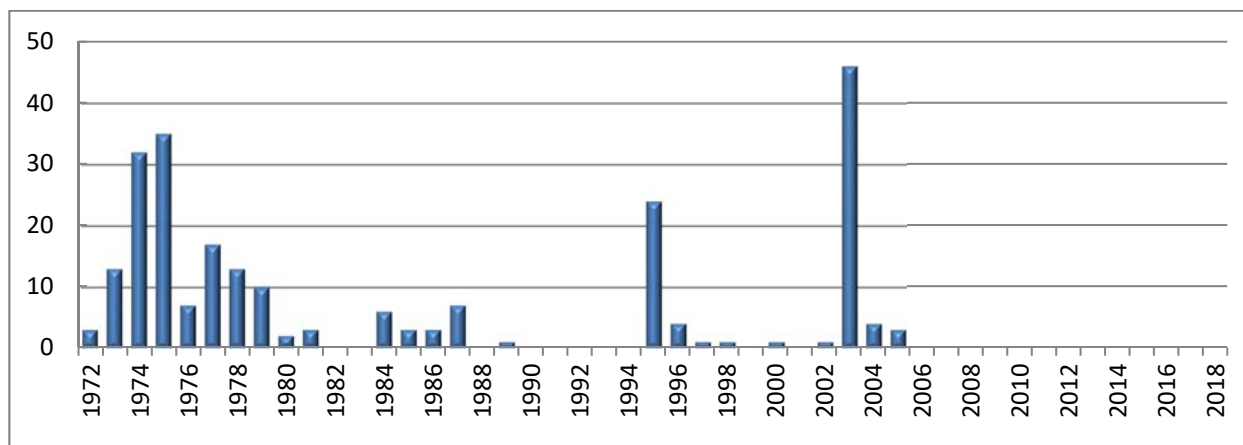


Figure 1. The number of new flocks infected with maedi from 1972 and onwards. The bars for 2003 - 2005 show both seropositive flocks detected through the investigations after the outbreak in Nord-Trøndelag county and seropositive flocks identified in the programme.

Caprine arthritis encephalitis (CAE) causes emaciation, arthritis, encephalitis and sometimes mastitis and pneumonia in goats. Sheep may be infected and produce antibodies against CAEV, but usually show no clinical signs of disease. Before 2001, CAE was widespread in the Norwegian dairy goat population. The dairy organisation (TINE) and the Norwegian Goat Health Services have conducted an eradication programme named "Healthier goats", targeting caprine arthritis encephalitis, caseous lymphadenitis and paratuberculosis. The programme started in 2001, and in total 612 goat herds were included in the programme from 2001 to 2014 (7).

Aims

The aims of the surveillance programme for maedi and caprine arthritis encephalitis are to document the status for maedi-visna virus and caprine arthritis encephalitis virus infection in sheep and goats in Norway and to identify infected flocks for disease control.

Materials and methods

The surveillance programme is based on serological examination of sheep and goats.

In 2018, collection of 9 000 blood samples from sheep taken at slaughter was planned. A maximum of five animals (>2 years old) were to be sampled per herd any given day. The sampling was done at 18 abattoirs, each slaughtering at least 100 sheep per month in the period January - May, which were the preferred sampling months. A proportion of the animals were sampled in the period September - November. In addition, meat inspectors at the abattoirs were asked to monitor sheep and especially their lungs for detection of suspicious cases consistent with maedi-visna virus infection.

In addition, 61 goat herds were randomly selected for sampling. In goat herds of less than 30 animals, all animals (>2 years old) were sampled. In herds of 30 to 100, 100 to 200, and more than 200 animals, samples from 30, 35, and 40 animals were sampled, respectively.

The samples were examined for antibodies against lentivirus with ID Screen® MVV / CAEV Indirect ELISA (ID.vet, Grabels, France) at the Norwegian Veterinary Institute in Sandnes. Samples with inconclusive or positive ELISA results were tested in duplicates with ID Verification® MVV / CAEV Indirect ELISA (ID.vet). Positive and inconclusive samples were transferred to the Norwegian Veterinary Institute in Oslo and retested with ID Screen® MVV / CAEV Indirect ELISA and/or ID Verification® MVV / CAEV Indirect ELISA (ID.vet). If samples were inconclusive or positive they were further tested with an ELISA IDEXX MVV/CAEV p28 Ab Verification Test (IDEXX Laboratories, Maine, USA) and/or agar gel immunodiffusion test (AGIDT, Maeditect, Animal and Plant Health Agency (APHA), Weybridge, UK).

In case of positive or inconclusive results on a sample taken from a sheep at slaughter, follow up sampling was done on selected animals in the flock of origin as described previously (8).

Results

Sheep

A total of 9,012 samples were received in the programme in 2018. 212 samples were not suitable for analysis and were rejected, and 115 were not tested because the inclusion criteria were not met, leaving 8,685 samples from 3,282 sheep flocks for analysis (Table 1). This was approximately 23% of the total number of Norwegian sheep flocks.

In 2018, a total of 3 samples from 3 different sheep flocks had inconclusive serological results for maedi. One flock was followed up with sampling of a selection of animals depending on the size of the flock and concluded serologically negative for maedi. Samples from the other flocks will be collected and tested during 2019.

No suspicious cases consistent with maedi-visna virus infection were reported from the meat inspectors at the abattoirs.

Table 1. The results and total number of sheep flocks within the frame of the Norwegian surveillance programme for maedi 2003-2018.

Year	Total no. of flocks*	No. of flocks analysed	No. of animals analysed	Average no. of animals analysed per flock	No. of positive flocks
2003	18 400	456**	13 951	30.6	1
2004	17 439	1 230	36 911	30.0	1
2005	16 500	940	29 248	31.1	2
2006	15 800	911	27 846	30.6	0
2007	15 400	1 004	29 633	29.5	0
2008	15 059	783	23 235	29.7	0
2009	14 800	417	12 198	29.3	0
2010	14 800	188	5 697	60.6	0
2011	14 500	467	13 628	29.2	0
2012	14 300	479	14 043	29.3	0
2013	14 242	468	13 550	29.0	0
2014	14 218	3 506	9 771	2.8	0
2015	14 425	3 357	9 442	2.8	0
2016	14 561	3 504	9 858	2.8	0
2017	14 463	3 447	9 041	2.6	0
2018	14 337	3 282	8 685	2.6	0

* Based on data from the register of production subsidies as of 31 July the respective year.

** Sampling period: November 20. to December 31.

Goat

A total of 1,663 samples from 61 goat herds were received and tested for antibodies against CAEV (Table 2). One flock was concluded serologically positive for CAEV. This was approximately 5% of Norwegian goat herds.

Table 2. The results and total number of goat flocks within the frame of the Norwegian surveillance programme for small ruminant lentivirus 2018.

Year	Total no. of flocks*	No. of flocks analysed	No. of animals analysed	Average no. of animals analysed per flock	No. of positive flocks
2018	1 246	61	1 663	27.2	1

* Based on data from the register of production subsidies as of 31 July the respective year.

Discussion

During the years 2003-2008, ram circles and their flocks registered as members of The Norwegian Sheep and Goat Breeders Association constituted the target population for the programme. Approximately 90% of the Norwegian sheep flocks participating in ram circles were screened for antibodies against maedi during 2003 to 2005. They were retested in the programme during 2006 to 2008. In 2009, breeding flocks of other sheep breeds than those represented by The Norwegian Sheep and Goat Breeders Association were selected for sampling. In 2010 - 2013, randomly selected sheep flocks were sampled. From 2014 onwards, animals were sampled at slaughterhouses, giving a better surveillance of the total population with use of fewer resources compared to on-farm sampling (9). However, since fewer animals are sampled in each flock, the accuracy of the surveillance programme to predict a negative herd status for maedi is lower than before.

Results from the surveillance and control programme for maedi, including data from November 2003 through 2006, showed a preliminary prevalence of less than 0.2 % positive flocks. Knowledge about the distribution of the disease indicates that it was regionally clustered, and that a more extensive spread of maedi-visna virus from the outbreak in 2003 was prevented by the restrictions on transfer of sheep across county borders. The fact that maedi has not been detected in the surveillance programme since 2005 indicates that the prevalence of the infection in Norway is very low.

All dairy goat herds in Norway and many meat and fiber goat herds have joined the eradication programme Healthier goats. This has resulted in improved goat health and welfare in the Norwegian goat industry (7, 10). The finding of CAE in a goat herd that did not participate in the eradication programme and had not been tested earlier shows that attention and continued surveillance is needed.

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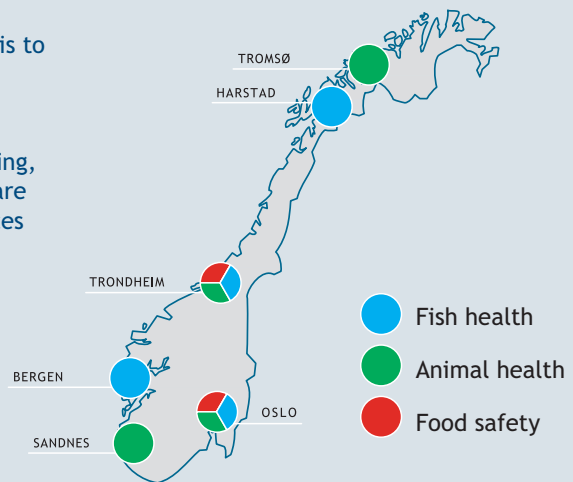
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