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The surveillance programme for small ruminant lentivirus infections in sheep and goats in Norway 2024

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Content

Summary

None of the 3,092 investigated sheep flocks in the surveillance programme for SRLV were diagnosed with maedi in 2024. Of 54 tested goat herds, none were diagnosed with caprine arthritis-encephalitis (CAE).

Introduction

Small ruminant lentivirus (SRLV) comprise the maedi-visna virus (MVV) and the caprine arthritis-encephalitis virus (CAEV), which are closely related. Maedi-visna virus mainly infects sheep, while CAEV mainly infects goats, although cross-infections between the two species do occur.

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).

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.

Maedi-visna and CAE are classified as list 2 diseases in Norway and are notifiable to the World Organisation for Animal Health (WOAH). 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 the former Nord-Trøndelag county showed histopathological changes consistent with maedi, and 61 flocks in the area were found to be seropositive. The outbreak demonstrated the need for a nationwide surveillance programme, and up to 2018 no new cases of maedi were detected (4-5).

In 2019, the surveillance programme detected a new case of maedi in a farm in Trøndelag county. Contacts to this farm were traced, and an outbreak zone was established in Northern Trøndelag, where all sheep farms were monitored by serology. In total, nine herds were diagnosed with maedi in this outbreak (5).

An overview of the number of new infected flocks registered with maedi each year up to and including 2024 is given in Figure 1.

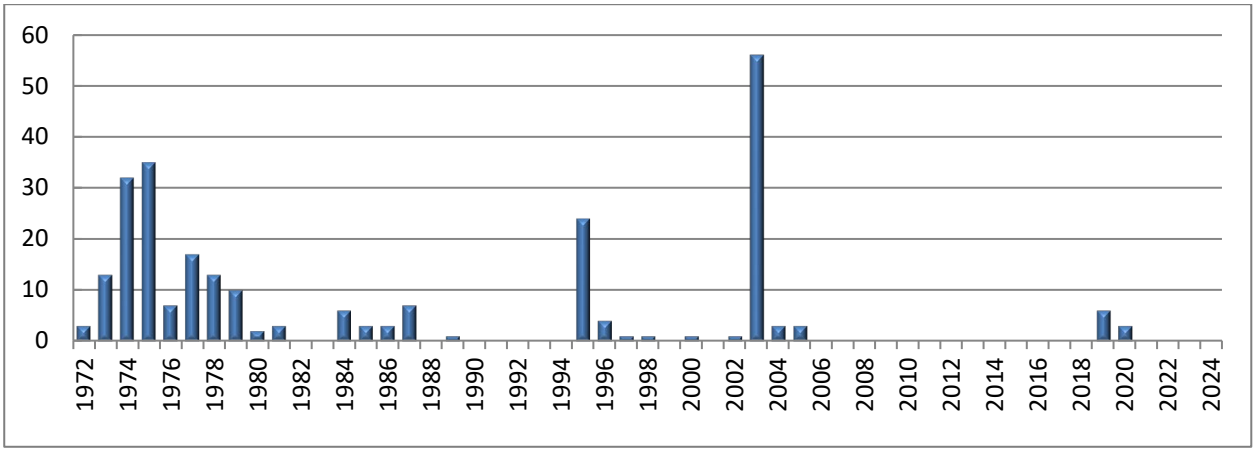

Figure 1. The number of new flocks infected with maedi from 1972 and onwards. The bars for 2003 – 2005 show both seropositive flocks detected through the investigations after the outbreak in the former Nord-Trøndelag county (5), and seropositive flocks identified in the programme. The rise in 2019 to 2020 represents a new maedi outbreak in Trøndelag. The columns for 2003 and 2004 have been corrected after unpublished data about the 2002-2005 outbreak were discovered in 2023 (5)

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 (6). In 2018, the goat population was included in the surveillance programme for SRLV.

The Norwegian Food Safety Authority (NFSA) is responsible for carrying out the programme. The samples are collected by inspectors from the NFSA, while the Norwegian Veterinary Institute (NVI) is in charge of planning the programme, performing the analyses and reporting the results.

Aims

The aims of the surveillance programme for small ruminant lentivirus infections are to document the status for MVV and CAEV infections 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 for SRLV in both sheep and goats.

The plan for 2024, was to collect 10,000 blood samples from sheep at 20 larger abattoirs. Representative numbers of animals were sampled from various parts of Norway. A maximum of five animals (>2.5 years old) were to be sampled per herd any given day. The preferred sampling period was from January to March, but a proportion of the animals were sampled from August to December. In addition, meat inspectors at the abattoirs monitor sheep carcasses, particularly the lungs, for suspicious lesions or findings consistent with maedi.

Sixty goat herds were randomly selected for sampling. In goat herds of less than 30 animals, all animals (>6 months 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 preferred sampling period was from January to March, but a proportion of the animals were sampled from September to December.

Serum samples were examined for antibodies against SRLV with ID Screen® MVV / CAEV Indirect ELISA (IDvet, Grabels, France, (hereafter referred to as IDvet ELISA)) for initial screening. Samples with inconclusive or positive IDvet ELISA results were re-tested in duplicates. If samples were inconclusive or positive, samples were further tested in duplicates with Elitest-MVV/CAE ELISA (Hyphen BioMed, Neuville sur Oise, France (hereafter referred to as Hyphen ELISA)).

In case of positive or inconclusive results in Hyphen ELISA 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 (7).

Samples with doubtful or positive status in confirmatory tests were reported, and new blood samples from the suspected animals or herd were requested and tested.

Results

Sheep

A total of 8,895 sheep samples from 3,092 flocks were analysed in the programme in 2024. (Table 1). This was approximately 24.9% of the total number of Norwegian sheep flocks.

Of the 8,895 samples, 8,790 (98.8%) tested negative in the IDvet ELISA, while 105 (1.2%) samples were doubtful or positive. These were further tested with Hyphen ELISA, which gave negative results for 84 and positive results for 21 samples from 20 flocks. Fifteen flocks with positive samples were followed up by collecting samples from a selection of the oldest animals in the flock as described previously (7). Follow-up samples from 14 flocks were negative, and the flocks were concluded to be seronegative for SRLV.

From one of the flocks, a follow-up sample from one animal tested positive in both tests and remained positive on repeated testing some weeks later. The animal was slaughtered, and lung samples were submitted from the slaughterhouse. Pathological examination of lungs and lymph nodes from the suspected animal and PCR for lentivirus were negative.
The remaining five flocks had either been slaughtered (n = 3) or follow-up sampling was planned for 2025 (n = 2).

Table 1. The results and total number of sheep flocks tested for maedi within the frame of the Norwegian surveillance programme for SRLV 2003-2024.

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
2019	13 693	3 264	8 993	2.6	1
2020	13 506	2 927	8 701	3.0	0
2021	13 389	3 123	9 089	2.9	0
2022	13 182	3 129	8 910	2.8	0
2023	13 048	3 258	9 416	2.9	0
2024	12 434	3 092	8 895	2.9	0

* Based on data from the register of production subsidies as of 31st of July the respective year until 2017. Thereafter, data from 1st of March was used.
** Sampling period: 20th of November to 31st of December.

Goats

A total of 1,582 samples from 54 goat herds were received and tested for antibodies against SRLV (Table 2). This was approximately 3.5% of Norwegian goat herds.

Of these samples, 1,572 samples were negative and 10 individuals were positive or inconclusive for SRLV (0.63%), with the IDvet ELISA. The ten positive or inconclusive samples gave negative results in the Hyphen ELISA. Thus, no herd was concluded to be positive for CAE in the surveillance programme.

Table 2. The results and total number of goat herds within the frame of the Norwegian surveillance programme for small ruminant lentivirus 2018-2024.

Year	Total no. of herds*	No. of herds analysed	No. of animals analysed	Average no. of animals analysed per herd	No. of positive herds
2018	1 246	61	1 663	27.2	1
2019	1 209	58	1 751	30.2	1
2020	1 270	50	1 443	28.9	0
2021	1 359	52	1 540	29.6	2
2022	1 412	59	1 798	30.5	2**
2023	1 529	27	810	30.0	0
2024	1 533	54	1 582	29.3	0

* Based on data from the register of production subsidies as of 1st of March the respective year.
** Two herds with continuous restrictions from 2012 and 2013, respectively.

Discussion

During the years 2003-2008, ram circles and their flocks registered as members of The Norwegian Association of Sheep and Goat Farmers constituted the target population for the programme. Approximately 90% of the Norwegian sheep flocks participating in ram circles were screened for antibodies against SRLV during 2003 to 2005. These herds were retested 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. During 2010-2013, randomly selected sheep flocks were sampled. During this period (2003-2013), all samples were collected from live animals at the farms.

From 2014, sheep have been sampled at slaughterhouses, giving a better surveillance of the total population with the use of less resources than needed when sampling on farms (7). However, less animals were tested per herd, giving less accurate results on the herd level.

In goats, the surveillance is still based on sampling live animals in the herds.

Results from the surveillance programme for maedi from November 2003 through 2006, showed a prevalence of less than 0.2% positive flocks. The distribution of the disease indicated that it was regionally clustered. A more extensive spread of MVV virus from the outbreak both in 2003 and 2019 was probably prevented by the restrictions on transfer of sheep across county borders. Maedi was not detected in the surveillance programme in the years 2005 to 2018. Maedi was detected in nine flocks in total during 2019 and 2020, but not in the years 2021-2024.

All dairy goat herds in Norway and many meat and fiber goat herds were part of the eradication programme Healthier goats which was active during 2001-2014. This has resulted in improved goat health and welfare in the Norwegian goat industry (6, 8). The finding of CAE in the years 2019 to 2021 in several hobby and meat goat

herds, as well as in dairy goat herds where CAE previously had been eradicated, shows that control and continued surveillance is needed in all types of goat herds.

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