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The surveillance programme for *Brucella* spp. in small ruminants in Norway 2025

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Content

Summary

Brucella spp. was not detected in any sheep flock or goat herd sampled in 2025.

Introduction

Brucellosis in sheep and goats is mainly caused by *Brucella melitensis*, although infection with *Brucella abortus* and *Brucella ovis* can also occur. The infection usually results in abortion in pregnant females and can cause orchitis and epididymitis in affected males (1, 2). *Brucella melitensis* infection is a zoonosis, and the bacterium causes a serious infection in humans known as Malta fever, characterised by undulant fever, chills, sweat and debilitation (2).

Brucella melitensis is prevalent in sheep and goats in several Mediterranean countries (1) but has never been diagnosed in animals in Norway or any of the other Nordic countries (3, 4). Brucellosis is classified as a list 1 disease in Norway and is notifiable to the World Organisation for Animal health (WOAH). *Brucella melitensis, B. abortus* and *B. suis* are notifiable in the EU (classified as Category B diseases) and must be controlled in all member states with the goal of eradicating it throughout the union. Norway has a status as free from *B. melitensis, B. abortus* and *B. suis*. in sheep and goats in the EU since 2021.

A surveillance programme for *Brucella* in sheep was established in 2004, and goats were included in the programme from 2007.

The Norwegian Food Safety Authority is responsible for carrying out the programme. The samples are collected by inspectors from the Norwegian Food Safety Authority, 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 programme are to document freedom from *Brucella melitensis, Brucella abortus* and *Brucella suis* in sheep and goats according to the demands in Regulation (EU) 2020/689, and to contribute to the maintenance of this favorable situation.

Materials and methods

In sheep, the programme in 2025 was based on serological screening of slaughtered animals from various parts of Norway. Collection of 9,000 blood samples from sheep, taken in representative numbers at 19 larger abattoirs, was planned. The preferred sampling period was from January to March, but a proportion of the animals were sampled from August to December. A maximum of five animals (>2,5 years old) per flock were to be sampled any given day.

In addition, nine sheep flocks that had submitted samples to NVI because of abortions in 2024 were included in the 2025 programme. In flocks with fewer than 30 animals, all animals were sampled. In flocks of 30 to 100, 100 to 200, and more than 200 animals, samples were collected from 30, 35, and 40 animals, respectively.

In goats, collection of blood samples was planned in 60 randomly selected goat herds. In 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 were collected from 30, 35, and 40 animals, respectively. The preferred sampling period was from January to March, but a proportion of the animals were sampled from September to December. In

addition, bulk milk was submitted from a selection of dairy goat farms. The number of herds represented in the surveillance programme for *Brucella* spp. in small ruminants in 2025 is given in Table 1.

Blood samples were examined for antibodies against *Brucella* spp. using the Rose Bengal test (RBT) as an initial screening method. The RBT is a simple spot agglutination test using antigen stained with Rose Bengal and buffered to a low pH. The antigen and positive control sera for the RBT were purchased from Bio-Rad Laboratories Inc. (Hercules, CA, USA) and IDvet (Montpellier, France). Samples that tested positive were re-tested using appropriate confirmatory or complementary methods, such as the ID Screen® Brucellosis Serum Indirect Multi-species ELISA (IDvet, Montpellier, France) and/or the complement fixation test (APHA, Weybridge, Surrey, UK), to rule out false-positive reactions (5). These assays do not discriminate between antibodies against *B. abortus*, *B. melitensis*, and *B. suis*. The methods used are in accordance with the requirements from the EU reference laboratory and the Terrestrial Manual of the World Organisation for Animal Health.

Bulk milk samples from goat herds were tested with ID Screen® Brucellosis Milk Indirect Multi- ELISA (IDvet, Montpellier, France) and samples with doubtful or positive results were re-tested in duplicates. This assay does not discriminate between antibodies against *B. abortus and B. melitensis*.

Samples with doubtful or positive status in confirmatory or complementary tests would be reported as a suspicion, and new blood samples from the suspected animals or herd would be requested and tested. Samples for culturing or investigation by PCR would be required for confirming a diagnosis.

Results

Sheep

There were 9,181 blood samples collected from slaughtered sheep. Of these, ten samples had unknown origin, leaving 9,171 samples for inclusion into the programme. There were 28 samples that were not suitable for analysis. In total, 9,143 samples originating in 3,130 different sheep flocks were tested for *Brucella* spp. In addition, 290 samples were collected in eight sheep flocks that had experienced abortions in 2024. Two of these flocks had also been sampled at the slaughterhouse, hence in total, samples were obtained from 3,136 unique sheep flocks. The number of tested flocks represents approximately 24,5% of the sheep flocks in Norway.

All sheep samples tested for antibodies against *Brucella* spp. were negative (Table 1).

Goats

There were 1,805 blood samples collected in 61 goat herds, and 180 bulk milk samples collected from 177 dairy goat herds. From 24 of the goat herds both bulk milk and blood samples were submitted, hence the total number of sampled goat herds was 214. The numbers of tested flocks represent approximately 11.9% of goat herds in Norway.

All goat samples tested for antibodies against *Brucella* spp. were negative (Table 1).

Table 1. Results and total number of flocks within the frame of the Norwegian surveillance programme for *Brucella* spp. in small ruminants in the years 2004-2025.

Year	Total number of									
	Flocks in Norway[1]		Animals in Norway		Flocks tested		Animals tested (blood samples)		Positive samples	
	Sheep	Goats	Sheep >1 year	Goats	Sheep	Goats	Sheep	Goats	Sheep	Goats
2004	17 439		918 500		1 655		50 501		0	
2005	16 500		927 400		935		28 406		1[2]	
2006	15 800		894 100		911		27 812		0	
2007	15 400	1 300	854 000	71 500	1 004	183	29 633	5 734	0	0
2008	15 059	1 308	891 427	69 637	783	80	23 235	2 399	0	0
2009	14 800	1 300	877 400	67 800	816	104	24 011	3 124	0	0
2010	14 800	1 300	887 600	67 600	269	25	8 160	779	0	0
2011	14 500	1 300	882 000	66 900	467	93	13 629	2 698	0	0
2012	14 300	1 300	868 500	65 400	479	86	13 989	2 562	0	0
2013	14 242	1 276	871 976	64 112	468	95	13 550	2 827	0	0
2014	14 218	1 150	755 987	55 894	3 489	89	9 703	2 528	0	0
2015	14 425	1 177	784 558	58 048	3 353	97	9 418	3 048	0	0
2016	14 500	1 300	951 000	68 500	3 492	86	9 821	2 313	0	0
2017	14 463	1 227	984 832	72 658	3 444	61	9 017	1 712	0	0
2018	14 337	1 246	1 005 793	69 636	3 267	61	8 636	1 691	0	0
2019	13 693	1 209	936 203	71 159	3 259	58	8 951	1 751	0	0
2020	13 506	1 270	947 283	72 526	2 927	215[3]	8 701	1 498[3]	0	0
2021	13 389	1 359	943 912	74 512	3 118	52	9 028	1 540	0	0
2022	13 219	1 414	926 700	75 230	3 136	198[3]	9 609	1 798	0	0
2023	13 048	1 529	912 371	75 644	3 239	204[3]	9 628	1 675	0	0
2024	12 434	1 533	885 343	76 595	3 081	218[3]	8 876	1 579	0	0
2025	12 807	1 797	886 084	78 615	3 136	214[3]	9 143	1 805	0	0

1 Based on data from the register of production subsidies as of 31th July the respective year until 2017. Thereafter, as of 1st March.

2 Probably an unspecific reaction.

3 Includes bulk milk samples from dairy goat herds.

Discussion

During the years 2004 to 2013 breeding flocks and regular sheep flocks were selected for sampling. From 2014, sheep have been sampled at slaughterhouses. This resulted in better surveillance of the total population with the use of less resources than needed when sampled on farm. However, less animals were tested per herd, giving less accurate results on the herd level. In goats, the surveillance is based on sampling live animals in the herds. In 2020, and 2022-2025, bulk milk samples were added to the surveillance programme. In 2022-2025 sheep flocks and goat herds with registered abortions were included in the programme for a more risk-based and targeted surveillance. However, collecting data in herds with higher abortion rates has been challenging, hence few such herds have been included.

The surveillance programme for *Brucella* spp. in sheep has been evaluated using scenario tree modelling (6). When taking into account results accumulated from 2004 to 2018, it was estimated that there is a 99% probability that the prevalence of sheep flocks being positive for *Brucella* spp. is lower than 0.2% (7). The results of the programme from 2019 to 2025 support this conclusion.

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