



The surveillance programme for *Brucella melitensis* in small ruminants in Norway 2024

REPORT 44/2025

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Suggested citation

Kampen, Annette H, Åkerstedt, Johan, Klevar, Siv. The surveillance programme for *Brucella melitensis* in small ruminants in Norway 2024. Surveillance program report. Veterinærinstituttet 2025. © Norwegian Veterinary Institute, copy permitted with citation.

Quality controlled by

Merete Hofshagen, Director of Animal Health, Animal Welfare and Food Safety, Norwegian Veterinary Institute

Commissioned by

Norwegian Food Safety Authority



Published

2025 on www.vetinst.no
ISSN 1890-3290 (electronic edition)
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In collaboration with (Applies to OK reports)
Norwegian Food Safety Authority
Norwegian Institute of Public Health

Colophon

Cover photo: Colourbox
www.vetinst.no

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Summary

Brucella melitensis was not detected in any sheep flock or goat herd sampled in 2024.

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* spp. are notifiable (classified as Category B diseases) in the EU, and must be controlled in all member states with the goal of eradicating it throughout the union. Norway has a status as free from *Brucella* in the EU since 2021.

A surveillance programme for *B. melitensis* 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 *B. melitensis* in sheep and goats according to the demands in Regulation (EU) 2020/689, and to contribute to the maintenance of this favourable situation.

Materials and methods

In sheep, the programme in 2024 was based on serological screening of slaughtered animals from various parts of Norway. Collection of 11,000 blood samples from sheep, taken in representative numbers at 20 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) were to be sampled per herd any given day.

In addition, one sheep flock that had submitted samples to NVI from abortions in 2023 was included in the programme for 2024. In herds of less than 30 animals, all animals 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.

In goats, collection of blood sampling 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 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. In addition,

bulk milk was submitted from a selection of dairy goat farms. The numbers of herds represented in the surveillance programme for *B. melitensis* in small ruminants in 2024 is given in Table 1.

Blood samples were examined for antibodies against *B. melitensis* using the Brucella Rose Bengal Test (RBT) for the initial screening. This test is a simple spot agglutination test, using antigen stained with rose bengal and buffered to a low pH. The antigen and the positive control sera for the RBT was purchased from Bio-Rad Laboratories Inc. (Hercules, CA, USA) and IDvet (Montpellier, France). Positive reactors were re-tested by suitable confirmatory or complementary methods, such as the ID Screen® Brucellosis Serum Indirect Multi-species ELISA (IDvet, Montpellier, France) and/or complement fixation test (APHA, Weybridge, Surrey, UK), to rule out false positive reactions (5).

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.

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

Results

In total, 8,901 blood samples of slaughtered sheep from 3,093 sheep flocks, 30 blood samples sampled in one sheep flock, 1,580 blood samples from 54 goat herds, and 199 bulk milk samples from 188 dairy goat herds, were received in the programme in 2024. Of slaughterhouse samples from sheep, 49 samples were not suitable for analysis and six samples had unknown origin, leaving 8,876 samples from 3,081 sheep flocks. From goats, one blood sample was not suitable for analysis, leaving 1,579 samples for analysis. From 24 of the goat herds both bulk milk and blood samples were submitted. Hence the total number of sampled goat herds was 218. The numbers of tested flocks represent approximately 24.8% of sheep flocks and 14.2% of goat herds in Norway.

Of the screened blood samples, all except for nine sheep samples were negative in RBT (0,1%). The samples were retested in duplicates and eight of the samples had negative result for *B. melitensis*, whereas one sample remained seropositive. A duplicate of the RBT positive sample also tested positive in the Indirect Multi-species ELISA. Thirty-one sheep from the flock of origin were tested as a follow-up and all were seronegative for *Brucella* in RBT.

One bulk milk sample tested positive (0,5%) and one had a doubtful result, whereas the other bulk milk samples were negative. At retesting these two samples had the same results. The flock of origin of the positive bulk milk sample was followed up by blood sampling of all the goats in the flock (n = 96) that were all seronegative for *B. melitensis* in the RBT test.

In conclusion, all samples tested for antibodies against *B. melitensis* in 2024 were negative. The results from the surveillance programme are shown in Table 1.

Table 1. Results and total number of flocks within the frame of the Norwegian surveillance programme for *Brucella melitensis* in small ruminants in the years 2004-2024

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

1 Based on data from the register of production subsidies as of 31st 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 2004-2008, ram circles and their member flocks registered by 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 *B. melitensis* during 2004 and 2005. Most flocks participating in the ram circles were retested in the programme during 2006 to 2008. Breeding flocks of other sheep breeds than those regulated by The Norwegian Association of Sheep and Goat Farmers were selected for sampling in 2009.

During 2010-2013 sheep and goat herds were randomly 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. However, in 2020, 2022 and in 2023, bulk milk samples were added to the surveillance programme. In 2022, 2023 and 2024, sheep flocks and goat herds with registered abortions were included in the programme for a more risk-based and targeted surveillance.

The surveillance programme for *B. melitensis* 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 *B. melitensis* is lower than 0.2% (7). The results of the programme from 2019 to 2024 support this conclusion.

Acknowledgements

The authors would like to thank the technical staff for performing the analyses with excellence.

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