



The surveillance programme for *Brucella melitensis* in small ruminants in Norway 2019



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Summary

Brucella melitensis was not detected in any sheep flock or goat herd sampled in 2019.

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). *B. 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).

B. 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 A disease in Norway and is notifiable to the Office International des Epizooties.

After the agreement on the European Economic Area in 1994, Norway achieved status as free from *B. melitensis* in small ruminants on a historical basis. However, documentation is required to maintain the status. Hence, 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 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 EU Directive 91/68/EEC with amendments and to contribute to the maintenance of this favourable situation.

Materials and methods

In sheep, the programme in 2019 was based on serological screening of blood samples at 17 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. A maximum of five animals (>2 years old) were to be sampled per herd any given day. Collection of 9 000 blood samples from sheep taken at slaughter was planned.

In 2019, 60 goat herds were randomly selected for collecting herd samples. 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 numbers of herds represented in the surveillance programme for *B. melitensis* in small ruminants in 2019 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 (CA, USA) and The Animal and Plant Health Agency (APHA) (Weybridge, Surrey, UK). Positive reactors were re-tested by suitable confirmatory or complementary methods, such as ID Screen® Brucellosis Serum Indirect Multi-species ELISA (ID.Vet, Montpellier, France) and/or complement fixation test (APHA, Weybridge, Surrey, UK), to rule out false positive reactions (5). 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, 9 222 samples from 3 333 sheep flocks, and 1 751 samples from 58 goat herds, were received in the programme in 2019. From sheep, 114 samples were not suitable for analysis and were rejected. In addition, 157 samples were not tested because the selection criteria were not met, mainly too young animals, leaving 8 951 samples from 3 259 sheep flocks for analysis. This is approximately 23.7% of the total Norwegian sheep flocks and 4.8% of Norwegian goat herds.

Of the screened sheep samples, only two samples from two sheep flocks were positive in RBT and inconclusive in the Indirect Multi-species ELISA. The two sheep flocks were re-tested by sampling a selection of animals depending on the size of the flock. All the samples were analysed with RBT and concluded serologically negative for *B. melitensis*.

In conclusion, all samples tested for antibodies against *B. melitensis* in 2019 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 2004-2019.

Year	Total number of									
	Flocks in Norway ¹		Animals in Norway		Flocks tested		Animals tested		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	13 734	1 209	936 203	71 159	3 259	58	8 951	1 751	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 unspecific reaction.

Discussion

During the years 2004-2008, ram circles and their member flocks registered by 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 *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 Sheep and Goat Breeders Association were selected for sampling in 2009.

During 2010-2013 sheep and goat herds were randomly selected for sampling. From year 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 the farms themselves. 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.

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 has been estimated that there is a 99% probability that the prevalence of sheep flocks being positive for *B. melitensis* is lower than 0.2% (P. Hopp, personal communication). The results of the programme in 2019 have further confirmed this conclusion.

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