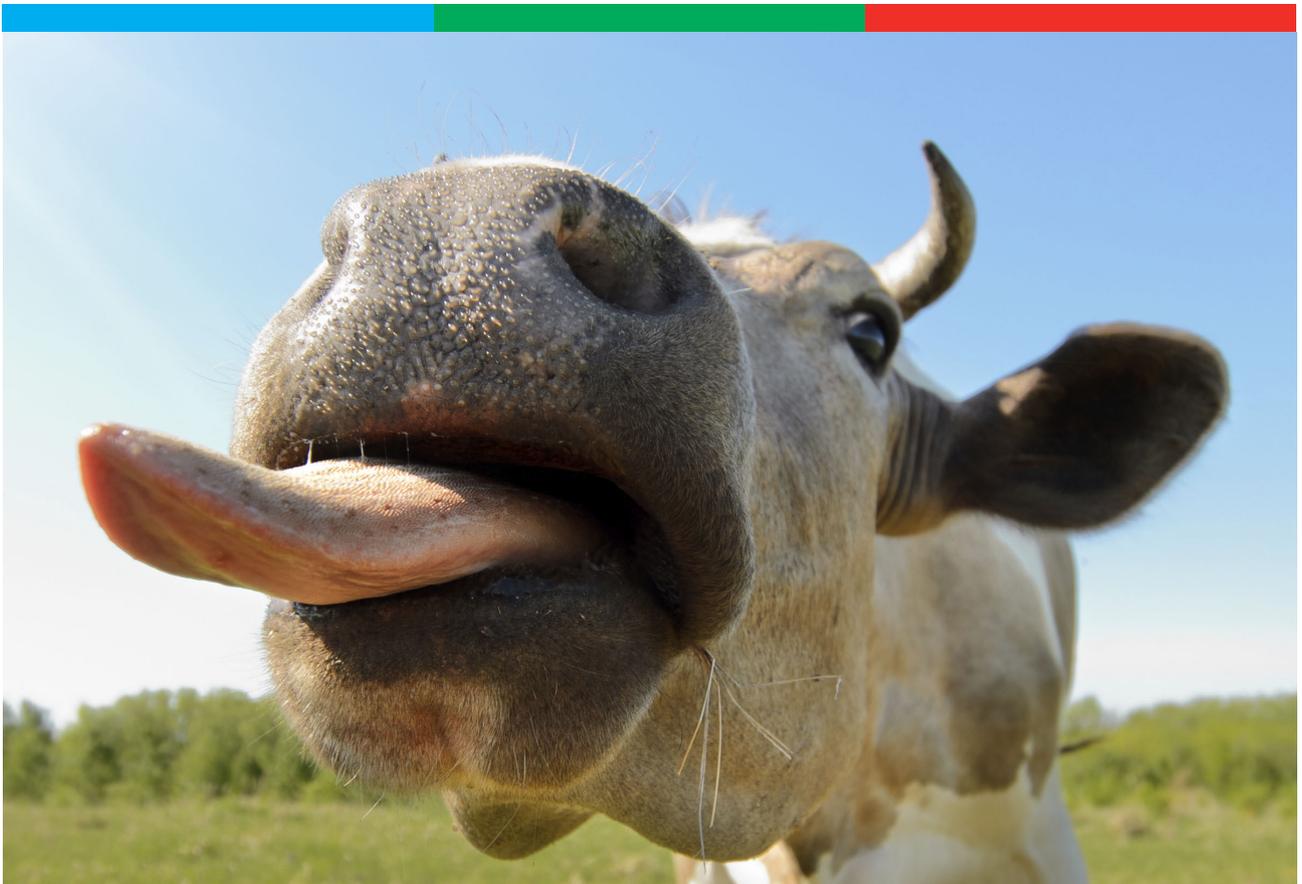




The surveillance programme for *bovine virus diarrhoea* (BVD) in Norway 2021



REPORT 39/2022

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Suggested citation

Ånestad, Lise Marie, Åkerstedt, Johan, Dalaker, Jørgen, Klevar, Siv. The Surveillance programme for bovine viral diarrhoea (BVD) in Norway 2021. Surveillance program report. Veterinærinstituttet 2022. © Norwegian Veterinary Institute, copy permitted with citation

Quality controlled by

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

Published

2022 on www.vetinst.no
ISSN 1890-3290 (electronic edition)
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Commissioned by / In collaboration with

Norwegian Food Safety Authority



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Cover design: Reine Linjer
Cover photo: Colourbox
www.vetinst.no

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Summary

Bovine viral diarrhoea virus was not detected in any of the herds sampled in 2021.

Introduction

Bovine viral diarrhoea (BVD) is caused by bovine viral diarrhoea virus (BVDV) in the genus pestivirus. The virus is the cause of mucosal disease and haemorrhagic syndrome, but the economically most important manifestations of disease are related to infection in pregnant animals, resulting in embryonic death, abortion and congenital defects. Persistently infected calves may be born and serve as the main reservoir of infection to other animals (1). Bovine viral diarrhoea is a notifiable disease (list 2) in Norway.

An eradication programme, financed by the authorities and the industry, started December 1992 (2). During the programme period, the number of herds with restrictions decreased from 2,950 in 1994 to none at the end of 2006. Details of the programme and a discussion of factors important for its success are given in the annual report for 2006 (3). Since 2007, the aims of the programme have been surveillance and control (4).

The Norwegian Food Safety Authority was responsible for implementing the surveillance programme for BVD. The Norwegian Veterinary Institute was in charge of planning the programme, collecting the bulk milk samples from the dairies and performing the tests. Blood samples from beef herds were collected by inspectors from the Norwegian Food Safety Authority.

Aim

The aim of the surveillance programme for BVD in 2021 was to document freedom from the infection in Norwegian livestock and to contribute to the maintenance of this favourable situation.

Materials and methods

The surveillance programme included both dairy and beef herds. The target population of dairy herds consisted of all cattle herds delivering milk to dairies during the sampling period. The target population of beef herds were all herds delivering cattle to slaughter in 2021.

Of the Norwegian dairy herds, 19.6% herds were randomly selected for sampling. From the beef herds, individual blood samples from animals older than 24 months were collected at 18 slaughterhouses, with a maximum of five animals per herd and day of sampling.

The dairies provided 1,406 bulk milk samples from 1,212 dairy herds. A total of 3,952 individual blood samples from 1,413 beef herds were received for analyses in pools (n =1,803). The sampled herds represented approximately 20.0% of all Norwegian cattle herds (Table 1).

Table 1: Numbers of dairy herds and beef herds sampled within the frame of the Norwegian surveillance programme for BVD in 2021.

Herd category	Cattle herds (total no. ¹)	Sampled herds (no. ²)	Sampled herds (%)
Dairy herds ³	6 905	1 212	17.6
Beef herds ⁴	5 927	1 413	23.8
Total	12 875	2 581	20.0

¹Based on data from the Register of production subsidies as of 1 March 2021.

²Combined beef- and dairy farms could be sampled under both herd categories. Number of unique farms is given as a total number of sampled herds.

³Cattle herds delivering milk to dairies.

⁴Sampling performed at slaughterhouses.

Bulk milk samples and blood samples (pooled or individual samples) were examined for antibodies against BVDV using a commercial indirect enzyme-linked immunosorbent assay Svanovir® BVDV- Ab ELISA (Indical Bioscience GmbH, Leipzig, Germany) (5). In case of positive or inconclusive reactions in pooled blood samples, individual samples were retested. Bulk milk and individual serum samples with inconclusive or positive results were retested in duplicates with Svanovir® BVDV- Ab ELISA to rule out false positive reactions (5). New bulk milk samples were collected from herds with positive or doubtful serological results, and tested using the same methods.

Depending on the level of antibodies in bulk milk, dairy herds were divided into four groups (3, 6). In herds with low to high levels of antibodies (classification 1 to 3), new bulk milk samples or individual blood samples from young stock were collected and tested.

Positive or inconclusive results from beef herds were followed-up by testing blood samples from young stock.

In case of seropositive young stock, persistently infected animals would be identified by testing blood samples for antibodies from every individual in the relevant herd. Animals with weak positive or negative serological results would then be tested for the presence of BVDV using an antigen-capture ELISA (IDEXX Laboratories, Inc., Westbrook, Maine, USA). Positive

reactions in newly infected herds would be verified with the polymerase chain reaction (PCR) and sequence analysis.

Results

When screening the 1,406 bulk milk samples from dairy herds, three samples (0.2%) had weak positive reactions (classification 1), while the remaining samples were negative. After retesting the weak positive samples, two remained weak positive and one was concluded to be negative. New bulk milk samples were collected from the two dairy herds from which the weak positive samples originated, and all tested negative. In conclusion, all 1,212 dairy herds tested by bulk milk samples were negative for antibodies against BVDV.

Out of 1,803 pooled blood samples from beef herds, five pools (0.3%) tested positive, while the rest were negative. After testing the individual blood samples contributing to the five positive pools, all samples were concluded to be negative. Thus, all 1,413 beef herds sampled were negative for antibodies against BVDV.

Table 2 shows the results of the testing during the period from 1993 to 2021.

Table 2: Numbers of herds and individual cattle tested for antibodies against BVDV, and numbers of herds and individual cattle positive for BVDV (antibody results not shown).

Year	Bulk milk samples	Pooled blood samples from beef cattle >24 months ¹	Pooled milk samples from primiparous cows	Pooled blood samples from young stock ²	Individual blood samples		No. of virus positive	
	No. of herds	No. of herds	No. of herds	No. of herds	No. of herds	Samples	Herds	Ind. blood samples
1993	26 424	-	5 031	5 000	NA	46 000 ²	NA	1 300 ³
1994	26 148	-	3 228	4 107	NA		NA	
1995	25 577	-	3 191	5 347	NA	36 065	NA	1 180
1996	25 167	-	1 849	3 163	NA	21 437	NA	685
1997	24 862	-	1 297	3 292	1 515	16 023	265	525
1998	24 038	-	1 415	3 407	780	7 091	98	198
1999	23 584	-	924	3 060	648	7 619	92	224
2000	21 796	-	100	1 610	423	6 947	72	129
2001	19 910	-	53	4 198	386	6 287	56	174
2002	18 771	-	-	2 854	284	3 962	28	43
2003	17 549	-	-	2 100	149	1 135	9	22
2004	7 365	-	-	1 351	84	1 017	2	6
2005	7 481	-	-	1 230	48	356	1	4
2006	14 620	-	-	997	28	113	0	0
2007	1 575	-	-	387	8	20	0	0
2008	1 424	-	-	423	8	34	0	0
2009	1 315	435	-	10	7	31	0	0
2010	1 328	507	-	47	11	63	0	0
2011	1 226	1 278	-	0	5	44	0	0

2012	1 190	1 179	-	0	4	19	0	0
2013	1 042	1 167	-	0	2	10	0	0
2014	1 489	937	-	11	4	20	0	0
2015	1 178	1 206	-	0	6	32	0	0
2016	1 181	1 334	-	0	1	5	0	0
2017	1 107	1 448	-	0	2	20	0	0
2018	1 131	1 341	-	0	0	0	0	0
2019	1 071	1 328	-	0	0	0	0	0
2020	1 169	1 258	-	0	2	10	0	0
2021	1 212	1 413	-	0	0	0	0	0

¹Sampling performed in the herds prior to 2011. A small number of blood samples collected at slaughterhouses could originate from dairy herds.

²Prior to 2009, this number included surveillance in beef cattle.

³Approximate numbers

NA=Data not available

Discussion

Bovine viral diarrhoea virus was not detected in any of the herds sampled in 2021.

In Norway, no infected farm has been found and no restrictions have been imposed on any farm due to BVD since 2005. In 2006, bulk milk from all dairy herds and blood samples from 20% of the beef herds were tested. No farm with recent infection was identified. Since then, more than 10% of all dairy and beef farms have been tested every year and none of them has been found to be infected by BVD. Using scenario tree modelling, the probability of freedom from BVDV in Norway at the end of 2011 was calculated to 99.6% (7). The results of the surveillance programme from 2012 to 2021 support that the Norwegian cattle population is free from BVD.

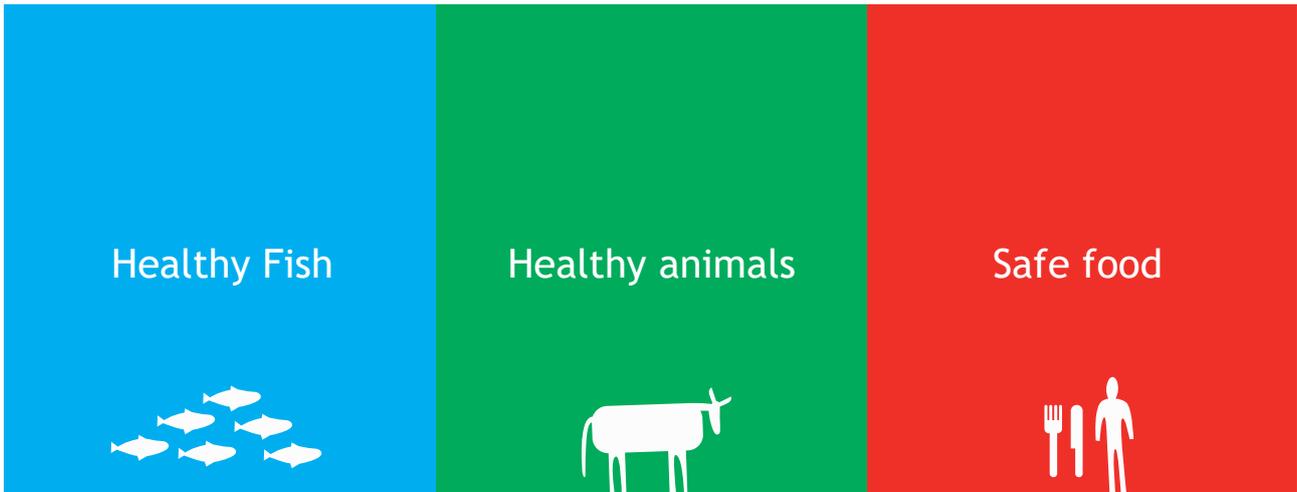
Although Norwegian livestock is currently free from the disease, import of infected animals and animal products of bovine origin may pose a threat to the present status. For the rapid detection of a potential reintroduction and consecutive control of spreading, a surveillance system has to make efficient use of the competence and awareness existing among farmers and local veterinarians.

Acknowledgments

The authors thank all the persons who have contributed in collecting, preparing and examining the samples. The authors would also like to thank all the technical staff from the NVI for performing the analyses with excellence.

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