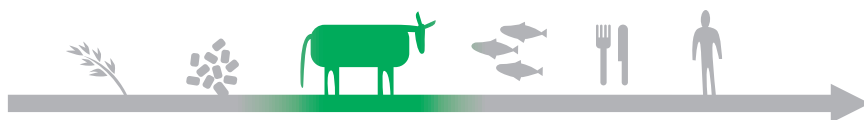


The surveillance programme for *bovine virus diarrhoea* (BVD) in Norway 2016



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Summary

Bovine virus diarrhoea virus was not detected in any of the herds sampled in 2016.

Introduction

Bovine virus diarrhoea (BVD) is caused by bovine virus diarrhoea virus (BVDV) in the genus pestivirus. The virus is the cause of mucosal disease and hemorrhagic 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 virus diarrhoea is a notifiable disease (list B) 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 carrying out 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 2016 was to document freedom from the infection in Norwegian livestock and to contribute to the maintenance of this favourable situation.

Materials and methods

The target population consisted of dairy herds delivering milk to dairies and beef herds delivering cattle to slaughter in 2016. Twelve and a half per cent of all these dairy herds were randomly selected for sampling. Bulk milk samples from all farms delivering milk during a limited period of time, were then provided by the dairies. Beef cattle older than 24 months were sampled at 15 slaughterhouses, with a maximum of five animals per herd and day of sampling.

In 2016 bulk milk samples from 1,181 randomly selected dairy herds were collected. A total of 4,225 individual blood samples from 1,334 beef cattle herds were tested in pools. The sampled herds represented 20% of all Norwegian cattle herds (Table 1).

All samples were tested for antibodies against BVDV using a commercial indirect enzyme-linked immunosorbent assay (ELISA; Boehringer Ingelheim Svanova, Uppsala, Sweden) at the Norwegian Veterinary Institute in Sandnes (5). In case of positive or inconclusive results in pooled blood samples, the individual samples were tested.

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), individual blood samples from young stock should be collected and tested in pools. Seropositive or inconclusive results from beef cattle herds were also followed-up by testing pooled blood samples from young stock. Table 2 shows the numbers of tested herds and individual cattle during the years 1993 to 2016.

In case of seropositive young stock, identification of persistently infected animals would be done by testing blood samples for antibodies from every individual in the relevant herd. Animals with weak

positive or negative serological results would be tested for the presence of virus 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.

Table 1. Numbers of dairy herds and beef herds sampled within the frame of the Norwegian surveillance programme for BVD in 2016.

Herd category	Cattle herds (total no. ¹)	Sampled herds (no. ²)	Sampled herds (%)
Dairy herds ³	8 497	1 181	14
Beef herds ⁴	4 276	1 334	31
Total	12 773	2 502	20

¹Based on data from the Register of production subsidies as of 31 July 2016.

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

³Cattle herds delivering milk to dairies.

⁴Sampling performed at slaughterhouses.

Results

From the 1,181 sampled dairy herds in 2016, bulk milk samples from all herds were negative for antibodies against BVDV.

Of the 1,334 sampled beef cattle herds, a pooled blood sample from one herd was seropositive for BVDV. Individual samples representing this pooled herd sample was also seropositive. This herd was followed-up with individual blood samples from young stock which were found seronegative. Table 2 shows the results of the testing during the period from 1993 to 2016.

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

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 virus diarrhoea virus was not detected in any of the herds sampled in 2016.

In Norway, no infected farm was found and no restrictions were 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 cattle herds were tested. No farm with recent infection was identified. Since then, more than 10% of all dairy and beef cattle farms have been tested every year and none was 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 2016 support that the Norwegian cattle population is free of 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.

References

1. Baker JC. The clinical manifestations of bovine viral diarrhoea infection. *Veterinary Clinics of North America: Food Animal Practice* 1995; 11: 425-45.
2. Nyberg O, Lindheim D, Gudmundsson S, Eikenæs O. The surveillance and control programme for bovine viral diarrhoea (BVD) in Norway. In: Fredriksen B, Mørk T. (editors). *Surveillance and control programmes for terrestrial and aquatic animals in Norway. Annual report 2001*. Oslo: National Veterinary Institute; 2002. p. 93-101.
3. Kampen AH, Åkerstedt J, Gudmundsson S, Hopp P, Grøneng G, Nyberg O. The surveillance and control programme for bovine virus diarrhoea (BVD) in Norway. In: Brun E, Jordsmyr HM, Hellberg H, Sviland S. (editors). *Surveillance and control programmes for terrestrial and aquatic animals in Norway. Annual report 2006*. Oslo: National Veterinary Institute; 2007. p. 65-71.
4. Åkerstedt J, Jonsson M, Klevar S, M, Mørk T. The surveillance programme for bovine virus diarrhoea (BVD) in Norway 2015. *Surveillance programmes for terrestrial and aquatic animals in Norway. Annual report 2015*. Oslo: Norwegian Veterinary Institute 2016.
5. Juntti N, Larsson B, Fossum C. The use of monoclonal antibodies in enzyme linked immunosorbent assays for detection of antibodies to bovine viral diarrhoea virus. *Journal of Veterinary Medicine B* 1987; 34: 356-63.
6. Niskanen R. Relationship between the levels of antibodies to bovine virus diarrhoea virus in bulk tank milk and the prevalence of cows exposed to the virus. *Veterinary Record* 1993; 133: 341-4.
7. Norström, M., Jonsson ME, Åkerstedt J, Whist AC, Kristoffersen AB, Sviland S, Hopp P, Wahlström H. Estimation of the probability of freedom from Bovine Virus Diarrhoea Virus in Norway using scenario tree modelling. *Preventive Veterinary Medicine* 2014; 116: 37-46.

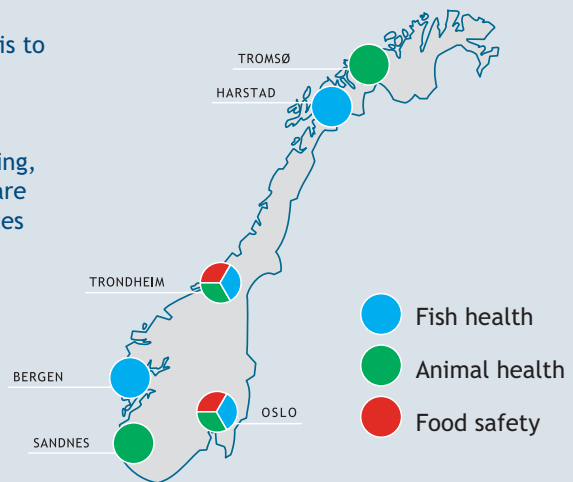
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