

SURVEILLANCE OF INFECTIOUS DISEASES IN ANIMALS AND HUMANS IN SWEDEN 2020

Chapter excerpt -
Bovine viral diarrhoea



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Cover: Juvenile mink in hand. Photo: Elina Kähkönen

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Reporting guidelines: Reporting guidelines were introduced in 2018 for those chapters related to purely animal pathogens. The guidelines build on experiences from several EU projects, and have been validated by a team of international experts in animal health surveillance. The aim is to develop these guidelines further in collaboration within the global surveillance community and they have therefore been made available in the form of a wiki on the collaborative platform GitHub (<https://github.com/SVA-SE/AHSURED/wiki>). Feel free to contribute!

Layout: The production of this report continues to be accomplished using a primarily open-source toolset. The method allows the source text, produced by authors, to be edited independently of the template for the layout which can be modified and reused for future reports. Specifically, the chapter texts, tables and captions are authored in Microsoft Word and then converted using pandoc and R to the LaTeX typesetting language. Most figures and maps are produced using the R software for statistical computing and the LaTeX library pgfplots. Development for 2020 has further improved the importing of content from Excel files to automatically build figures in the pgfplots LaTeX library. The tool is available as an R-package on GitHub (<https://github.com/SVA-SE/mill/>). The report generation R-package and process was designed by Thomas Rosendal, Wiktor Gustafsson and Stefan Widgren. In 2020, final typesetting was done primarily by Wiktor Gustafsson with contributions from the report authors.

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Bovine viral diarrhoea



The fact that Sweden has been free from bovine viral diarrhoea since 2014 is very important for cattle health in the country. Photo: Therese Selén.

BACKGROUND

Bovine viral diarrhoea (BVD) is caused by bovine viral diarrhoea virus (BVDV), which is classified in the genus *Pestivirus* and the family *Flaviviridae*. Cattle are the primary host of BVDV, but most even-toed ungulates are likely to be susceptible to the disease. Cattle that are persistently infected serve as a natural reservoir for the virus. The virus may spread between animals via direct or indirect routes. A voluntary surveillance and control programme with the objective to eradicate BVD without vaccination was launched by the Swedish Dairy Association in 1993. The government and the farmers share the costs for sampling and testing. Since June 2001, there is also a compulsory control programme requiring all cattle herds to be tested for BVDV on a regular basis. Since 2014, Sweden is considered free from BVD.

DISEASE

BVDV may induce disease of varying severity, duration and clinical signs after an incubation period of 6–12 days. Fever, depression, respiratory distress, diarrhoea are typical signs of acute BVD. In pregnant cattle, infection may result in reproductive failure such as abortion, stillbirth or the birth of calves that are persistently infected with the virus. A more

uncommon form of BVD is mucosal disease, that may occur in an acute or chronic form in persistently infected animals. At the herd-level, the main impact of BVDV infection is often related to its immunosuppressive effects which commonly is expressed as problems with respiratory and gastrointestinal disease among calves and youngstock.

LEGISLATION

BVD is a notifiable disease according to SJVFS 2013:23. The voluntary control is regulated through SJVFS 2015:17 and the compulsory control in SJVFS 2011:17.

SURVEILLANCE

Surveillance of dairy herds is performed by sampling bulk milk in conjunction with milk quality testing. The laboratory gets an order from Växa Sverige (the former Swedish Dairy Association) about which herds to sample. All samples are marked using bar code labels. Surveillance of beef herds is performed by blood sampling at slaughter. Field testing can also be carried out as a backup component if herds to be tested cannot be accessed through the abattoir or through sampling of bulk milk.

Since 2018 the BVD surveillance is based on a risk-based design where herds are individually categorised based on the number of herds they have purchased from and sold

to during the preceding 12-month period (Table 4). The status of each herd is updated 1st of January each year. The system is set to order samples from high-risk herds twice a year, medium risk herds once a year and low risk herds randomly until the total number in the programme is reached. Sampling is carried out provided that the herd has sent animals to slaughter and that there is milk sent for milk quality testing. The sampling is distributed over the year.

The scheme is designed to demonstrate freedom from infection at a herd design prevalence of 0.2%, with 99% confidence. The within-herd design prevalence is set to 30%. In case of re-appearance of BVD, herds that are infected will be screened, and persistently infected virus carriers identified and removed. Details on numbers of samples and herds tested 2020 are given in Tables 5 and 6.

Diagnostic testing is performed at the National Veterinary Institute. For screening, an indirect antibody ELISA (SVANOVIR[®] BVDV-Ab ELISA, Svanova) is used on serum, milk and bulk milk samples. Presence of virus is analysed by an in-house IPX (immunoperoxidase) test or PCR tests.

RESULTS

The outcome of antibody testing of bulk milk, slaughter, and field samples tested in 2020 is given in Table 5. As shown in Table 5, four blood samples from beef-cattle herds and one bulk milk sample were antibody positive during the year. Two of the positive blood samples came from older animals that had been infected as young and had also been previously tested as antibody positive. Younger animals in these herds were tested negative. The remaining two beef and the one dairy herd were further sampled with negative results. In 2020, no newly infected herds were identified, and no virus positive animals were born.

DISCUSSION

All herds in Sweden were affiliated to the voluntary or compulsory programmes during 2020. At the end of the year, no herd was diagnosed as having an ongoing BVDV-infection. A newly infected herd has not been detected since 2011, and the last virus positive animal was born in an infected dairy herd in 2012. Since 2014, Sweden is considered free from BVDV. Continued surveillance is necessary to maintain confidence in freedom from the disease.

REFERENCES

Växa Sverige, Statistics for 2020.

Niskanen, R. (1993). Relationship between the levels of antibodies to bovine viral diarrhoea virus in bulk tank milk and the prevalence of cows exposed to the virus. *Vet Record* 133: 341–344.

Table 4: Risk-based evaluation of herds eligible for sampling of bulk milk or blood.

Livestock purchased from	Livestock sold to		
	< 2 herds	2–4 herds	> 4 herds
0–4 herds	Low	Medium	High
> 4 herds	Medium	High	High

Table 5: Total numbers of samples with different contents of bovine viral diarrhoea virus antibodies tested in 2020.

Sample type	Class/Finding	Herds	Animals
Bulk milk	0–1 ^A	2338	-
Bulk milk	2–3 ^A	1	-
Blood sample at slaughter	Negative	-	6741
Blood sample at slaughter	Positive	-	4
Field sample	Negative	-	27
Field sample	Positive	-	0

^A Class 0–1 = no or very low levels of antibodies; Class 2–3 = moderate or high levels of antibodies. (Based on Niskanen, 1993)

Table 6: Dairy and beef herd results from testing of bovine viral diarrhoea virus antibodies in bulk milk or blood samples in 2020 divided by herd level risk.

Herd level risk ^A	Herd numbers (N)	Production type	
		Dairy	Beef
<i>Low risk</i>	N of herds	2348	7655
	N of herds tested	952	1457
	N positive	1	2
<i>Medium risk</i>	N of herds	1294	2031
	N of herds tested	905	815
	N positive	0	2
<i>High risk</i>	N of herds	268	445
	N of herds tested	268	271
	N positive	0	0

^A Based on the number of herds they have purchased from and sold to during the preceding 12-month period.