

SURVEILLANCE OF INFECTIOUS DISEASES

IN ANIMALS AND HUMANS IN SWEDEN 2022

*Chapter excerpt:
Bovine viral diarrhoea*



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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 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 to the LaTeX typesetting language using a custom package written in the R software for statistical computing. The package uses the pandoc document conversion software with a filter written in the lua language. Most figures and maps are produced using R and the LaTeX library pgfplots. Development for 2022 has focused on generalising the R package to accommodate conversion into formats other than LaTeX and PDF, with a focus on markdown files which can be published as HTML websites using the Quarto publishing system. The report generation R package and process was designed by Thomas Rosendal, Wiktor Gustafsson and Stefan Widgren.

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Bovine viral diarrhoea



Figure 10: The fact that Sweden has been free from bovine viral diarrhoea since 2014 is very important for cattle health in the country. Photo: Bengt Ekberg/SVA.

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. In June 2001, a compulsory control programme was founded requiring all cattle herds to be tested for BVDV on a regular basis. 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. Sweden has been considered free from BVD since 2014 and was officially declared free from the disease by the EU Commission in April 2022. The compulsory control programme has been removed but surveillance for BVDV continues to demonstrate freedom from the disease.

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 clinical outcome of BVDV infection is mucosal disease, which 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 listed disease (category C, D and E) in the Animal Health Law (EU) 2016/429. Since 2022, Sweden is officially free from the disease in accordance with (EU) 2021/620. BVD is notifiable on clinical suspicion as described in SJVFS 2021/10 (K12).

During the reporting year for this report, 2022, the voluntary control was regulated through SJVFS 2015:17 and the compulsory control regulated 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 (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 in 2022 are given in Tables 5 and 6.

Diagnostic testing is performed at the National Veterinary Institute (SVA). For screening, an indirect antibody ELISA (SVANOVIR[®] BVDV-Ab ELISA, Svanova, Uppsala, Sweden) is used on serum, milk and bulk milk samples. For confirmation, a competitive ELISA (ID Screen BVD p80 Antibody Competition, Innovative Diagnostics, Grabels, France) is used for serum, and for milk samples, a confirmatory ELISA (SVANOVIR[®] BVDV-Ab ELISA confirmation format, Svanova, Uppsala, Sweden) is used. Presence of virus is analysed by an in-house IPX (immunoperoxidase) test or PCR tests.

In addition to the active surveillance, clinically suspected cases are investigated for BVD, as a part of passive surveillance.

RESULTS

The outcome of antibody testing of bulk milk, slaughter, and field samples tested in 2022 is given in Table 5. As shown in Table 5, four blood samples from slaughtered cattle from three herds (Table 6) were antibody positive during the year. The positive blood samples came from older animals that had been infected as young and had also been previously tested as antibody positive. In 2022, no newly infected herds were identified, and no virus positive animals were born.

No clinically suspected cases of BVD were reported.

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 2022.

Sample type	Class/Finding	Herds	Animals
Bulk milk	0-1 ^A	1716	2273
Bulk milk	2-3 ^A	0	-
Blood sample at slaughter	Negative	2615	5311
Blood sample at slaughter	Positive	-	0
Field sample	Negative	-	0
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 2022 divided by herd level risk.

Herd-level risk ^A	Herd numbers (N)	Production type	
		Dairy	Beef
<i>Low risk</i>	N of herds	13	7560
	N of herds tested	13	1464
	N positive	0	0
<i>Medium risk</i>	N of herds	1152	1904
	N of herds tested	1129	901
	N positive	0	0
<i>High risk</i>	N of herds	1108	453
	N of herds tested	619	262
	N positive	0	0

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

DISCUSSION

All herds in Sweden were affiliated to the voluntary or compulsory programmes during 2022. At the end of the year, no herd was diagnosed as having an ongoing BVDV-infection. In April 2022 Sweden was declared free from the disease by the EU Commission. Hence, there will no longer be a compulsory BVDV programme. Continued surveillance to demonstrate freedom from the disease will continue as regulated in (EU) 2020/89.

REFERENCES

Växa, Statistics for 2022.

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