Norwegian Veterinary Institute

Report 45 – 2025

The surveillance programme for bluetongue in Norway 2024

REPORT 45/2025

The surveillance programme for bluetongue in Norway 2024

Authors

Lise Marie Ånestad*, Marie Myklatun Krosness*, Siv Klevar, Jørgen Dalaker, Tsegabirhan Kifleyohannes, and Johan Åkerstedt

*These authors share first authorship.

Suggested citation

Ånestad, Lise M, Krosness, Marie M, Klevar, Siv, Dalaker, Jørgen, Kifleyohannes, Tsegabirhan, Åkerstedt, Johan. The surveillance programme for bluetongue in Norway 2024. Surveillance programme report. Veterinærinstituttet 2025. © Norwegian Veterinary Institute, copy permitted with citation

Quality controlled by

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

Commissioned by

Norwegian Food Safety Authority

Mattilsynet

Published

2025 on www.vetinst.no
ISSN 1890-3290 (electronic edition)

Colophon

Cover photo: Colourbox
www.vetinst.no

Content

Summary 3

Introduction 3

Aim 4

Materials and methods 4

Bulk milk surveillance 4

Vector surveillance 5

Results 6

Bulk milk surveillance 6

Vector surveillance 8

Discussion 10

Acknowledgements 11

References 11

Summary

Bluetongue re-emerged in Norway in September 2024, the first outbreak since 2009. By the end of the 2024 vector season, 268 dairy herds in Southern Norway tested positive for antibodies against bluetongue virus in bulk milk samples. Vector activity was recorded in Southern Norway until mid-November.

Introduction

Bluetongue is an infectious, non-contagious disease caused by bluetongue virus (BTV), a member of the genus *Orbivirus*. At least 27 serotypes have been identified (BTV 1-27). The virus is insect-borne and primarily transmitted by biting midges of the *Culicoides* genus. Bluetongue virus infects domestic and wild ruminants, such as cattle, sheep, goats, llamas, alpacas, and deer. Clinical presentation varies by species: cattle typically show mild or no symptoms, while sheep are more likely to develop severe or fatal disease. Symptoms may include fever, lethargy, loss of appetite, swelling of the head and ears, ulcers on the mouth and nasal mucosa, and inflammation of the hooves that can lead to lameness. The disease can also cause abortion or foetal malformations (1).

Transmission begins when midges feed on viraemic animals and become infected. The virus then replicates in the midge's salivary glands, a process influenced by ambient temperature. Once replication is complete, BTV can be transmitted to new vertebrate hosts. Due to the dependence on temperature and midge activity, infection has a seasonal occurrence (1). Bluetongue is classified as a List 1 disease in Norway and under disease categories C, D, and E within the EU. The disease is also listed by the World Organisation for Animal Health (WOAH).

In 2006, an outbreak of bluetongue caused by serotype 8 (BTV 8) started in the Netherlands and spread to several Northern European countries during the following years. As a result, Norway implemented a bulk milk surveillance programme in 2008. Four cattle herds in Southern Norway were seropositive for BTV 8 in early 2009, but no further cases were detected. After two years of intensive monitoring, Norway was considered free of bluetongue. Since then, the surveillance programme for BTV has been a less comprehensive programme, mainly based on routine bulk milk testing (2-5).

In autumn 2023, a new bluetongue outbreak caused by BTV 3 emerged in the Netherlands and spread to Belgium, Germany, and the United Kingdom. By summer 2024, BTV 3 cases were rising across Northern Europe, with confirmed cases in Denmark by August 2024. On 6 September 2024, BTV 3 was confirmed in a sheep flock in Kristiansand, Norway, following reports of clinical signs and sudden deaths. This marked the first case of bluetongue in Norway since 2009. Soon after, cases were also confirmed in Sweden, spreading along the west coast toward the Norwegian border (6).

Other BTV serotypes have also been identified in Europe during this outbreak period. Around the same time as the spread of BTV 3, a more virulent strain of BTV 8 appeared in France. Additionally, in October 2024, the Netherlands reported the detection of BTV 12, a serotype not previously found in Europe (6).

During the BTV 3 outbreak in Norway, The Norwegian Food Safety Authority (NFSA) worked closely with the Norwegian Veterinary Institute (NVI) and the livestock industry to prevent further spread between sheep, cattle, and other ruminants. Measures included establishing movement control zones with mandatory testing for certain categories of cattle and sheep, and optional vaccination. The livestock industry also introduced additional testing requirements for movement of cattle.

Following the BTV 3 outbreak, the surveillance programme was expanded to include broader bulk milk screening for BTV antibodies in dairy herds compared to earlier years and the addition of vector surveillance, both conducted in Southern Norway. The NFSA is responsible for implementing the surveillance programme for

bluetongue. The NVI is responsible for planning the programme, collecting the bulk milk samples from dairies, performing the analyses, and reporting results. Additionally, the NVI manages the collection and analysis of midge samples.

Aim

The original aim of the surveillance programme was to document freedom from bluetongue virus (BTV). However, following the virus' introduction into Norway in September 2024, the aim was to assess the prevalence of dairy herds in Southern Norway positive for antibodies against BTV.

The vector surveillance aimed to identify the presence of potential BTV vector species and to monitor vector activity, indicated by the presence of parous (blood-fed) female *Culicoides* species.

Materials and methods

Bulk milk surveillance

Herds and sampling

The target population of the surveillance programme were all dairy cattle herds in Southern Norway that were in areas considered at risk of bluetongue introduction.

In September, approximately one month after the introduction of BTV 3 into Norway, dairy herds located in the counties Østfold, Akershus, Buskerud, Vestfold, Telemark, and Agder, and a subset of dairy herds from Rogaland county, were selected for bulk milk sampling (Table 1). Most herds were from coastal municipalities.

In November, after the end of the vector season, all dairy herds were selected from Østfold, Akershus, Oslo, Buskerud, Vestfold, Telemark, Agder, and Rogaland counties, in addition to all dairy herds from the southernmost municipalities of Vestland and Innlandet counties (Table 1).

In case of duplicate samples from the same herd, all samples were tested. Herds with conflicting results between duplicates (n=4) were excluded. In addition, one herd was excluded because it was not located in the selected study area.

Table1 presents the number of dairy herds per county, and the number of herds selected for surveillance in September and November 2024.

Table 1. Number of dairy herds in selected counties and number of herds selected in the bluetongue surveillance programme in Norway, 2024.

County	No. of dairy herds*	No. of dairy herds selected in September	No. of dairy herds selected in November**
Østfold	99	97	99
Akershus	102	45	102
Oslo	2	-	2
Innlandet	1 177	-	97
Buskerud	136	14	133
Vestfold	49	45	44
Telemark	70	19	70
Agder	258	243	257
Rogaland	995	300	1002
Vestland	937	-	147
Total	3 825	763	1 953

*Based on data from the Register of production subsidies as of 1st of March 2024.
**Number of herds selected may exceed the number of dairy herds that applied for production subsidies, due to data extraction at different time points.

Laboratory methods

Bulk milk samples were tested for antibodies against bluetongue virus (BTV), using a commercial indirect enzyme-linked immunosorbent assay (ELISA), ID Screen® Blue Tongue Milk Indirect (IDvet, Grabels, France), according to the manufacturer's instructions (7). Samples with doubtful or seropositive results were re-tested in duplicate using the same method. Doubtful samples that remained doubtful after retesting were concluded as negative herds.

In cases where herds were followed up by testing of individual animals, blood samples from lactating dairy cows were tested with the ID Screen® Bluetongue Competition ELISA (IDvet, Grabels, France).

Vector surveillance

Sample collection

Vector surveillance started in late autumn 2024, following the introduction of bluetongue into Norway. Trapping started in October 2024 and ended in December 2024. Onderstepoort blacklight suction traps were used for collection of the midges. The traps were located at farms close to the towns or villages Søgne, Konsmo, Skoppum, Vigrestad, Rykene, and Sandnes, along the Norwegian southern coast. The farmers were responsible for capturing and submitting the samples to the laboratory. From one of the traps, we received only one sample. The traps were to be placed in close proximity to farm animals and to be active for a 24 hour period, once a week in the designated sampling periods. After collecting the sample from the trap, the catch was transferred to a container with ethanol and shipped to the laboratory.

Figure 1. Blood feeding *Culicoides* female. (Foto: Inger Sofie Hamnes, Veterinærinstituttet)

Laboratory methods

The samples collected were examined using a stereomicroscope. All the *Culicoides* in the samples were isolated, and the female *Culicoides* were examined using morphological criteria to designate the midges into the following categories: blood-fed/parous; ≥ 5/< 5/not detected in sample, bad morphology (blood-fed status not possible to determine), and presence of midges belonging to *Culicoides obsoletus* complex and/or *Culicoides pulicaris* complex.

The criteria for vector active period, as given in Regulation (EU) 2020/689, is finding ≥ 5 blood-fed midges in catches. Identification and enumeration of blood-fed/parous females were performed on the *Culicoides* found in the samples. If ≥ 5 blood-fed *Culicoides* females were found (indicating vector active period), no further identification of parous status was done in the sample.

Results

Bulk milk surveillance

Summary of screening

In September and November of 2024, a total of 2,666 bulk milk samples from 1,866 dairy herds were analysed in the surveillance programme. Of all sampled herds, 637 were included in both sampling periods.

In September, 710 bulk milk samples (including 38 duplicates) from 672 dairy herds were analysed, while 1,954 samples (including 113 duplicates and three triplicates) from 1,835 dairy herds were analysed in November. After exclusion of herds according to the criteria described in the methods section, 1,830 dairy herds from the sampling in November were included in the final results.

Of 672 tested dairy herds in September, 54 (8.0%) were positive for antibodies against BTV. In November, 268 of 1,830 herds (14.6%) tested positive. Of the 637 herds sampled both months, 49 were positive in September and remained positive upon re-sampling. Of the 588 herds that were negative in September, 131 (22.3%) had seroconverted by November.

Handling of doubtful samples

During screening, nineteen samples produced doubtful results. Eighteen of these were re-tested in duplicate, resulting in seven positive, seven still doubtful, and four negative samples. One doubtful sample was not retested and was concluded as doubtful.

Geographical distribution of outbreak

The prevalence of BTV antibodies varied between counties (Table 2). In September, the highest prevalence was observed in Agder (22.8%), while all other tested counties had low prevalence (≤ 5.3%). In November, Agder again showed the highest prevalence (60.3%), followed by Østfold (29.9%), Vestfold (25.0%), and Telemark (19.0%). These results indicate that the infection was concentrated in Southern Norway, with evidence of new infections occurring between September and November. The geographical distribution of sampled dairy herds in November is presented in Figure 2. The map illustrates the regional pattern and extent of BTV spread in Southern Norway in 2024.

Herds followed up by testing of individual animals

Two herds with positive bulk milk samples, located in Buskerud and Innlandet counties, were followed up by collecting blood samples from individual cows. Both herds were outliers in the spatial distribution of positive herds and were sampled in November. Individual testing of all milking animals in the two herds showed no seropositive results, and the bulk milk positive results were therefore considered to be false positives.

Table 2. Numbers of dairy herds in counties with sampled herds and their results in the surveillance programme for bluetongue in Norway in 2024.

		September			November		
County	No. of dairy herds*	No. of sampled herds	No. of positive herds	Prevalence (%) [95% CI]	No. of sampled herds	No. of positive herds	Prevalence (%) [95% CI]
Østfold	98	94	3	3.2 [1.1-9.0]	97	29	29.9 [21.7-39.6]
Akershus	100	42	0	0 [0-8.4]	95	4	4.2 [1.6-10.3]
Oslo	2	1	0	0 [0-94.9]	2	1	50 [2.6-97.4]
Innlandet	1 161				91	1	1.1 [0.1-6.0]
Buskerud	134	14	0	0 [0-21.5]	120	1	0.8 [0-4.6]
Vestfold	47	42	1	2.4 [0.1-12.3]	40	10	25.0 [14.2-40.2]
Telemark	67	19	1	5.3 [0.3-24.6]	58	11	19.0 [10.9-30.9]
Agder	257	197	45	22.8 [17.5-29.2]	234	141	60.3 [53.9-66.3]
Rogaland	998	262	4	1.5 [0.6-3.9]	961	70	7.3 [5.8-9.1]
Vestland	924	1	0	0 [0-94.9]	132	0	0 [0-2.8]
Total	3 788	672	54	8.0 [6.2-10.3]	1 830	268	14.6 [13.1-16.3]

* Based on data from the Register of production subsidies as of 1st of October 2024.

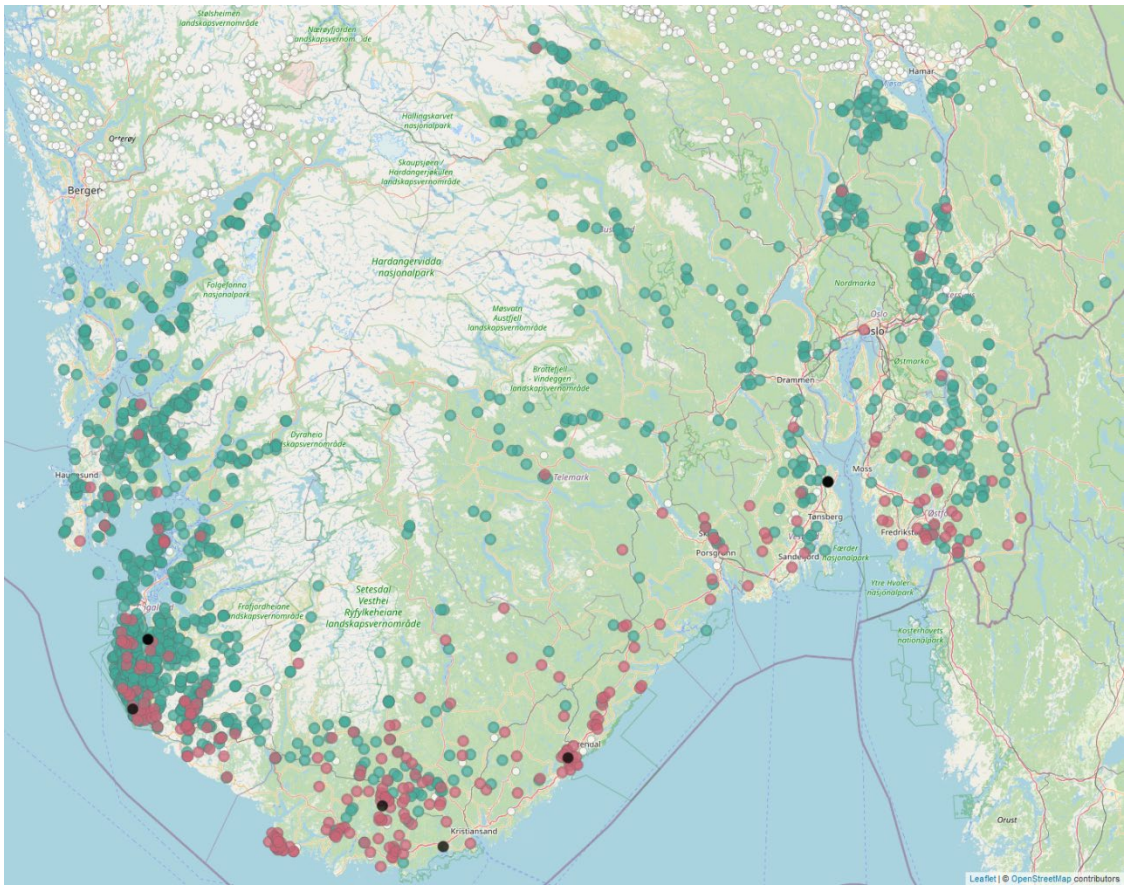

Figure 2. Detection of antibodies against bluetongue virus in bulk milk from 1,830 dairy herds in Southern Norway, November 2024. Red dots mark dairy herds that tested positive, green dots mark negative herds, and white dots represent untested dairy farms. Black dots show the locations of the six midge traps.

Vector surveillance

A total of 54 samples were submitted from six locations (Figure 3, Table 3). The results from October to November (week 40-48) show that ≥ 5 blood-fed/parous midges were present in trappings from Søgne (Agder) from early October until mid-November, whereas in Konsmo (Agder), Skoppum (Vestfold), Sandnes (Rogaland), and Vigrestad (Rogaland), ≥ 5 bloodfed/parous were present in trappings until the end of October.

From the trap in Søgne, results indicate that the vector active period, both indoors and outdoors, lasted until mid-November (week 46). Despite outdoor temperatures dropping below 0◦C during the following week (47), a few blood-fed female *Culicoides* were still captured indoors.

From all locations, *Culicoides obsoletus* complex was detected, whereas *Culicoides pulicaris* complex was found at four locations (all except Skoppum and Rykene). Both these species complexes contain known competent vector species. In the majority of samples (90.7%), midges from the *C. obsoletus* complex were the most commonly found, whereas midges from the *C. pulicaris* complex were present in 65.1% of the samples containing *Culicoides* spp. (Table 3).

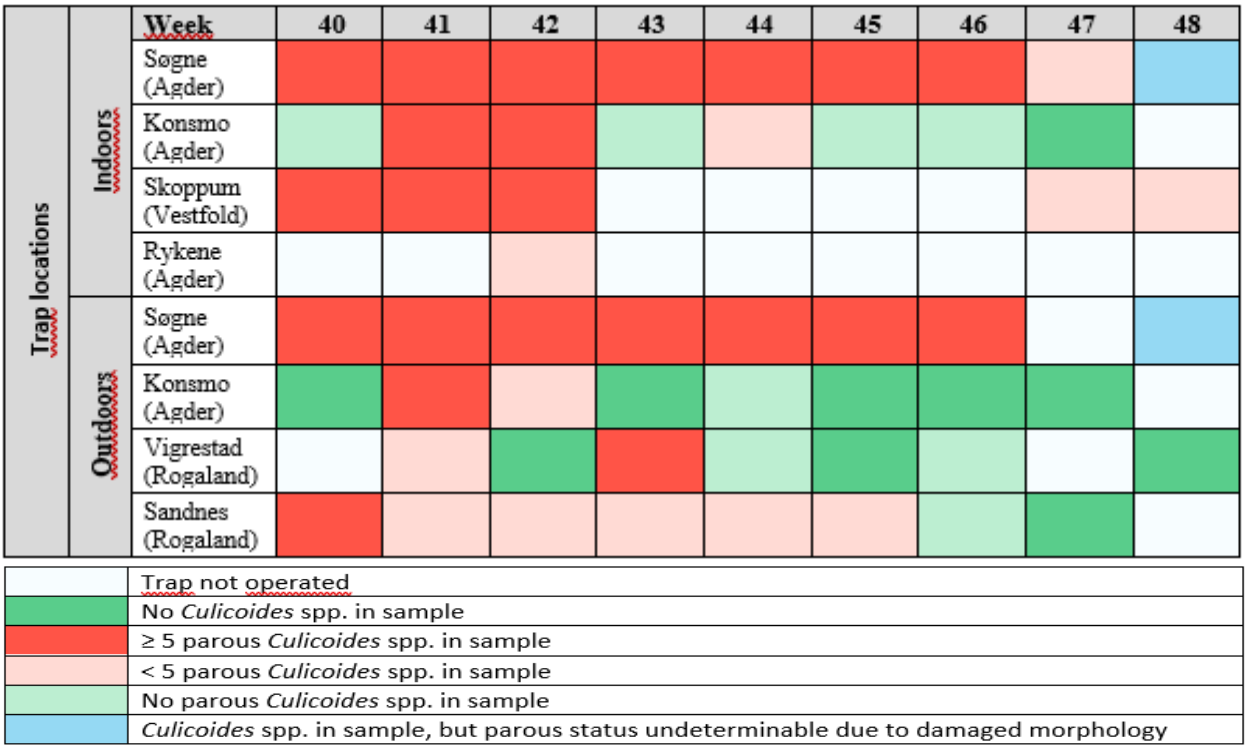

Figure 3. Blood-fed (parous) status in *Culicoides* samples, 2024

Table 3. Results from vector surveillance 2024

	Week										
	40	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**Total**	**Percent of samples**
Number of outdoor samples	3	5	3	5	3	4	4	2	2	31	57.4
Number of indoor samples	2	2	3	2	2	2	2	2	1	18	33.3
Number of samples from inside open barn	1	1	1	0	0	0	1	0	1	5	9.3
Total number samples	**6**	**8**	**7**	**7**	**5**	**6**	**7**	**4**	**4**	**54**	
Total number of samples with *Culicoides* spp. present (%)	5	7	7	6	5	4	5	1	3	43	79.6
Number of samples with ≥ 5 parous[a] *Culicoides* spp. present	4	5	4	3	2	2	2	0	0	22	40.7
Number of samples with 1-4 parous[a] *Culicoides* spp. present	0	2	3	1	2	1	1	1	1	12	22.2
Number of samples with parous[a] *Culicoides* spp present (≥1)	4	7	7	4	4	3	3	1	1	34	63.0
Total number of samples with no *Culicoides* spp. present	1	1	0	1	0	2	2	3	1	11	20.4
Number of samples with *Culicoides obsoletus* complex present[b]	5	7	7	6	5	4	4	1	0	39	90.7
Number of samples with *Culicoides pulicaris* complex present[b]	2	6	4	5	4	1	4	0	2	28	65.1

a parous/blood-fed
b among 43 samples containing *Culicoides* spp.

Discussion

In 2024 BTV was detected in Norway for the first time since 2009. Originally, the surveillance programme was designed to document freedom of BTV in Norway and to detect possible infections introduced by windborne midges during the vector season. Surveillance focuses on herds in Southern Norway, where entry is most likely. Following the detection of BTV in a sheep flock in Kristiansand, the surveillance programme served to investigate the seroprevalence in dairy herds in Southern Norway.

Bluetongue virus may be introduced into Norway either through the importation of infected animals, frozen semen, or by airborne transfer of infected *Culicoides* midges. All ruminants imported from EU countries not officially free from bluetongue virus, and those imported from outside the EU, are tested for the virus. However, such imports are infrequent or not occurring in most years. Windborne introduction of infected midges is therefore considered the most likely route of introduction. Infected midges may originate from Sweden,

Denmark, or Scotland. In 2024, BTV was detected in Denmark in August, and infected midges may have been transported with the wind to the southern coastline of Norway.

The results provide a clear indication of the extent of the bluetongue outbreak towards the end of the vector season in 2024. Since BTV had not been detected in Norway since 2009, and only one herd was vaccinated against BTV 3 (personal communication, Animalia, 2024), these results show that seropositive herds were infected in the fall of 2024. The bulk milk surveillance of 2024 shows a substantial spread of BTV 3 compared to the limited outbreak of BTV 8 in 2008 (5). However, the spread was mainly within the predefined risk areas along the southern coast of Southern Norway.

The vector surveillance in 2024 demonstrated midge activity at the farm near Søgne until mid-November. This is consistent with the findings of the midge surveillance in the years 2007-2009 and 2022-2023 (2, 4, 8). While the duration of the vector season may vary between years and locations depending on the weather conditions, the results from the vector surveillance indicates that the average vector season is between early to mid-May and mid-November.

Acknowledgements

The authors would like to thank the outstanding staff at the Section for substrate production and Logistics for processing the bulk milk samples, and the serology unit at the Section for virology, immunology, and parasitology for their excellent work in performing the bulk milk analyses. We are also grateful to the participating farmers for collecting and submitting midge samples, and Kyrre Kausrud and Kristin Henriksen for coordinating the midge sampling. Moreover, we would like to thank Petter Hopp for his contributions to the herd selection process, and Inger Sofie Hamnes and Annette H. Kampen for their valuable input and contributions to completing this report. Finally, we wish to thank the staff at the dairies TINE SA and Q-meieriene AS for their excellent service and collaboration in the collection of bulk milk samples.

References

1. Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, Chapter 3.1.3 Bluetongue (Infection with bluetongue virus). Paris: World Organisation for Animal Health (WOAH); Web version adopted May 2021 (http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/3.01.03_BLUETONGUE.pdf).
2. Krosness MM, Åkerstedt J, Klevar S, Hamnes IS. The surveillance programme for bluetongue in Norway 2023. Surveillance program report. Oslo: Norwegian Veterinary Institute; 2024.
3. Hamnes IS, Hopp P, Høgåsen HR, Jor E, Mørk T, Sviland S, Tollersrud T. Blåtunge i Norge — status og risikovurdering per 5. mai 2009 (Bluetongue in Norway – status and risk assessment per 5 May 2009). Norwegian Veterinary Institute report series 06-2009. Oslo: Norwegian Veterinary Institute; 2009.
4. Sviland S, Åkerstedt J, Håland KS, Klevar S, Mørk T. Overvåkingsprogrammet for blåtunge 2009 - En vurdering (Surveillance programme for bluetongue 2009 – an evaluation). Norwegian Veterinary Institute report series 02-2010. Oslo: Norwegian Veterinary Institute; 2010.
5. Sviland S, Kjeang T. Bluetongue serotype 8 outbreak in Norway. Surveillance and monitoring of ruminants and vectors in the years 2007 to 2010. Norwegian Veterinary Institute report series 06-2011. Oslo: Norwegian Veterinary Institute; 2011.
6. Falk M, Reiersen A, Wolff C, Paulson B, Hofshagen M (red). Dyrehelserapporten 2024 (Animal health report 2024). Norwegian Veterinary Institute report series 21-2025. Oslo: Norwegian Veterinary Institute; 2025.
7. Kramps JA, van Maanen C, Mars MH, Popma JK, van Rijn PA. Validation of a commercial ELISA for the detection of bluetongue virus (BTV)-specific antibodies in individual milk samples in Dutch dairy cows, Vet. Microbiology, 2008; 130 (1-2): 80-87.
8. Ånestad LM, Krosness MM, Åkerstedt J, Klevar S, Hamnes IS. The surveillance programme for bluetongue in Norway 2022. Surveillance program report. Oslo: Norwegian Veterinary Institute; 2023.

Health and well-being for animals and people

Norwegian Veterinary Institute

Ås ▪ Sandnes ▪ Bergen ▪ Trondheim ▪ Harstad ▪ Tromsø

postmottak@vetinst.no

vetinst.no