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The surveillance programme for Schmallenberg virus (SBV) in Norway 2012-2013

Johan Åkerstedt, Inger Sofie Hamnes, Ståle Sviland

Southern Norway was infected by Schmallenberg virus in 2012.

Introduction

Schmallenberg virus (SBV) is an artropodborn virus in the genus Orthobunyavirus and is a member of Simbu serogroup viruses. Midges (*Cullicoides* spp.) act as vector. Vertical transmission occurs through placenta.

The virus causes subclinical infection or mild non-specific clinical signs in cattle and sheep during the vector season. In pregnant cattle, sheep, goats and bison, SBV causes stillbirth and congenital malformations. Disease caused by Schmallenberg virus is not notifiable in Norway.

Orthobunyavirus of the Simbu serogroup was not detected in Europe before 2011. Schmallenberg virus was first identified in Germany and the Netherlands from dairy cattle diseased in summer and autumn of 2011. Soon after, presence of SBV was confirmed in new-born lambs with congenital malformations. Since then, SBV rapidly spread to many European countries (1).

A surveillance programme, financed by The Norwegian Food Safety Authority, was active in 2012 and 2013. The Norwegian Veterinary Institute was responsible for carrying out the surveillance programme for SBV, and was in charge of planning the programme, collecting the bulk milk samples from the dairies and performing the tests. Blood samples from sheep and beef herds were collected by inspectors from The Norwegian Food Safety Authority.

Aim

The aim of the surveillance programme for SBV in 2012 and 2013 was to document if SBV had been introduced to Norway and the prevalence of SBV infection in Norwegian livestock.

Material and methods

During the second quarter of 2012, farmers and veterinary practitioners in the southern part of Norway were requested to send in ruminant offspring born with congenital deformities to the Norwegian Veterinary Institute for autopsy. The material comprised of 5 calves, 21 lambs and 2 roe deer kids.

In the first half year of 2013, 15 stillborn calves as well as 3 lambs and 2 goat kids with congenital deformities were collected from geographical areas with seropositive dairy farms.

In November 2012, bulk milk samples from 2,391 dairy herds were provided by the dairies. Bulk milk samples came from all herds delivering milk to dairies in Southern Norway , i.e. the counties of Rogaland, Vest-Agder, Aust-Agder, Telemark, Vestfold, Akershus, Oslo and Østfold, as well as the southern areas of the counties of Hordaland, Buskerud, Oppland and Hedmark. According to data from the Register of production subsidies as of 31 July 2012, the sampled herds represented 22.0% of all Norwegian dairy herds (n=10,857). Based on the results of the testing of these samples, bulk milk samples from seropositive herds, collected a half year previously (n = 54), were included in a retrospective study.

In 2013, bulk milk samples from 86 goat farms were submitted from dairies in Southern Norway. Beef cattle older than 24 months were sampled at slaughterhouses. In this manner, 195 cattle from the same amount of herds were collected from Southern Norway, the same area where dairy were sampled in 2012. Herds in Southern Norway were also selected for blood sampling on the farms themselves. Thus, animals in 26 dairy herds (n=624), 17 beef cattle herds (n=329), and 39 sheep herds (n=397) were sampled. Bulk milk was also collected from 482 dairy herds located further north along the Norwegian

coastline in 2013. The bulk milk samples were delivered by dairies located in the counties of Hordaland, Sogn and Fjordane, Møre and Romsdal. South Trøndelag as well as North Trøndelag.

Onderstepoort blacklight suction traps were used to trap Midges. Several samplings took place in September 2012 when farmers collected midges at five locations close to husbandry along the Norwegian south coast. In 2013, midges were collected at seven locations during April to September.

From ruminant offspring with congenital disorders, RNA was extracted from spleen and brain and analysed with real-time RT-PCR for detection of SBV (part of small segment), as described elsewhere (2). Midges (*Cullicoides* spp.) were sorted out from trapped insects. RNA was extracted from samples containing appr. 50 midges each and analysed with real-time RT-PCR. Positive results were verified by sequencing appr. 400 bp from both small (S), medium (M) and large (L) segment (3). Bulk milk and blood samples were tested for antibodies against SBV using commercial indirect enzyme-linked immunosorbent assays (ELISA; ID Screen® Schmallenberg Virus Milk, Indirect test, and ID Screen® Schmallenberg Virus Indirect Multi-species, Screening test, both from IDvet, Montpellier, France).

Results

All ruminant offspring with congenital disorders collected in the second quarter of 2012, were negative for SBV. In April 2013, SBV was detected in one calf with fetal malformations from Aust-Agder County (3). Table 1 shows real-time RT-PCR results for SBV in ruminant offspring.

Table 1. Results of real time RT-PCR analysis for Schmallenberg virus in ruminant offspring.

	2012		2013	
Species	**No. animals**	**No. (%) positive**	**No. animals**	**No. (%) positive**
Cattle	5	0	15	1 (5.0)
Sheep	21	0	3	0
Goat	0	-	2	0
Roe deer	2	0	0	-
Total	**28**	**0**	**20**	**1 (2.1)**

Schmallenberg virus was detected for the first time in September 2012 from midges (*Culicoides* spp.) trapped on to locations in Southern Norway (Farsund and Kragerø; Figure 1). Schmallenberg virus was isolated from *Culicoides obsoletus complex* which constituted more than 80% of the captures (4). High load of viral RNA was found in the samples. The finding was verified by sequencing parts of the S, M and L segment. A total of 60 samples of midges collected in 2013 were negative for SBV.

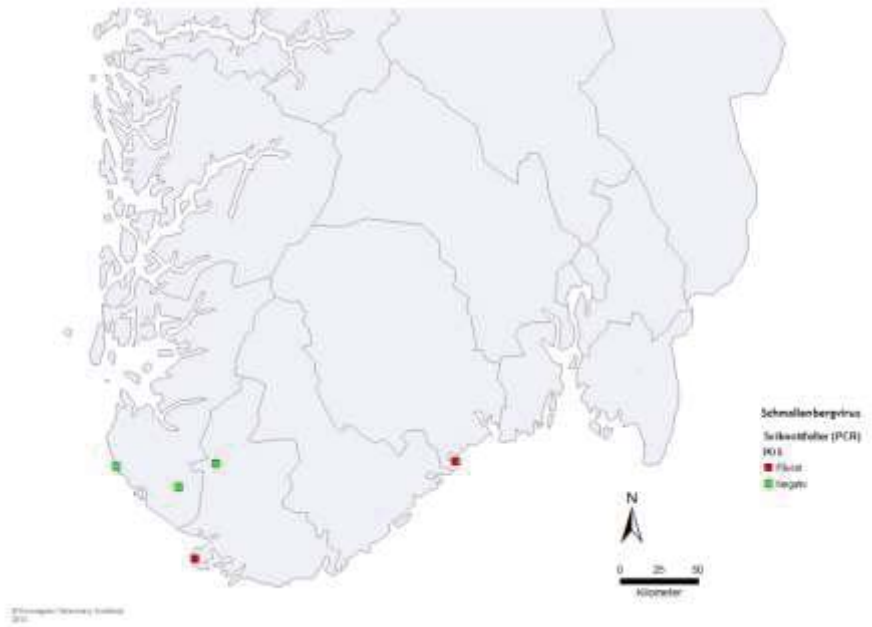

Figure 1. Map of the southern part of Norway where the locations for the midge traps in 2012 are indicated (green dots: midges (*Culicoides* spp.) without SBV; red dots: SBV was detected in the midges).

From the 2391 sampled dairy herds in November 2012 (Figure 2), 413 bulk milk samples were positive for antibodies against SBV (17.3%). Most of positive bulk milk samples came from farms located along the coast.

There were large geographical differences. In the counties of Østfold, Vestfold and Aust-Agder more than 50% of the farms were positive, whereas in Rogaland County less than 2% were positive.

Retrospective testing of bulk milk samples collected a half year previously from 54 of these seropositive herds, revealed only one (1.9%) seropositive result. This sample was collected in Vest-Agder County in March 2012. At this time of year, the temperature in Vest-Agder County is usually too low for culicoides to survive. Other studies have estimated the time period of introduction of SBV into Norway to be late summer to autumn 2012.The seropositive bulk milk sample is therefore considered to be a false positive sample.

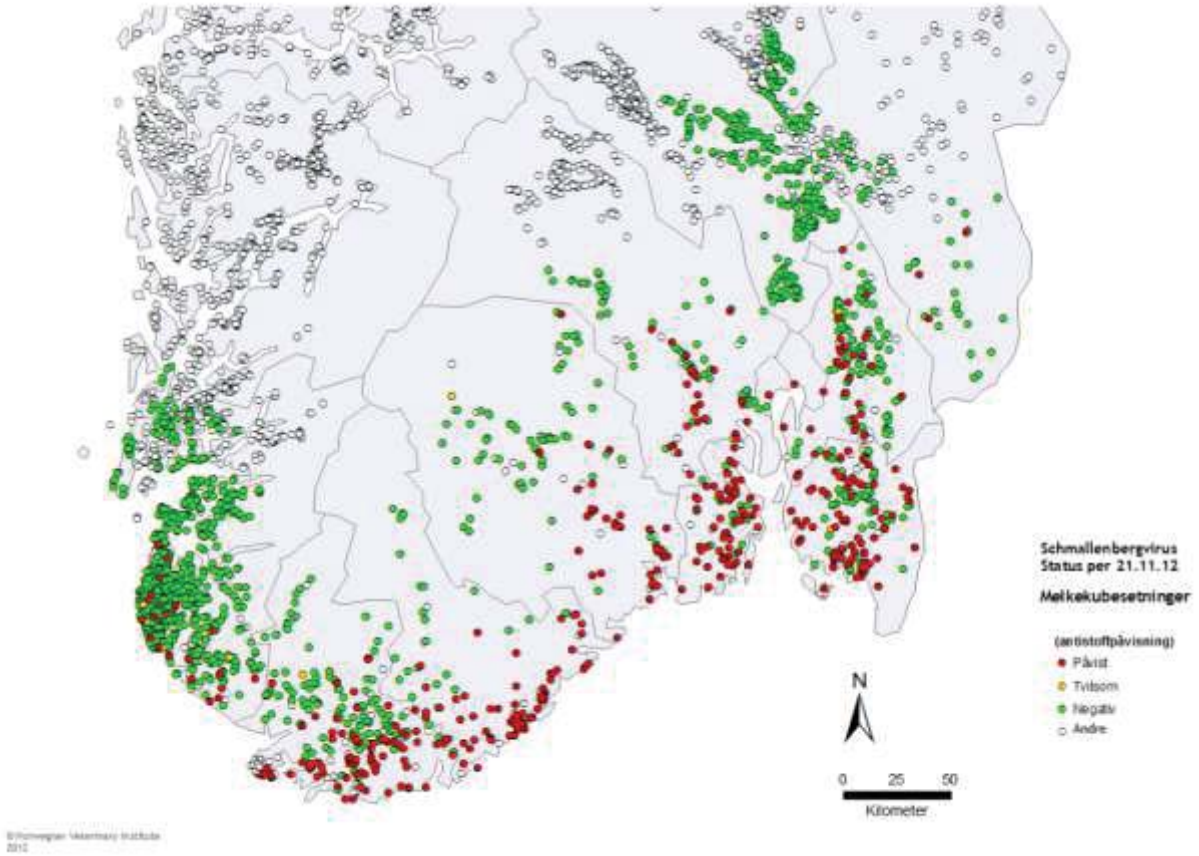

Figure 2. Map of Southern Norway with locations dairy herds and results of bulk milk testing in November 2012 (green dots: dairy farms without SBV antibodies; red dots: farms with SBV antibodies).

In dairy goats, 10 out of 86 farms (11.6%) from Southern Norway antibodies to SBV in bulk milk (Table 2). Serological test of 195 cattle from the same amount of beef cattle farms in Southern Norway resulted in 17 seropositive animals (8.7%).

Table 2. Results of bulk milk analysis of dairy goat herds for SBV in 2013.

County	No. sampled	Positive	Prevalence (%)
Akershus	3	0	0
Buskerud	14	1	7.1
Telemark	18	4	22.2
Rogaland	13	0	0
Hordaland	38	5	13.2
Total	**86**	**10**	**11.6**

Results of blood sampling for SBV in dairy, beef cattle and sheep farms in Southern Norway in 2013 are given in table 3. The highest number seropositive animals were found in beef cattle herds.

Table 3. Results of blood sampling for SBV in dairy, beef cattle and sheep farms in Southern Norway in 2013.

Herd category	No. sampled		No. seropositive		Mean prevalence in farms with seropositive animals (%)
	Herds	Animals	Herds (%)	Animals (%)	
Dairy cattle	25	624	19 (76.0)	59 (9.5)	11.8
Beef cattle	16	329	10 (62.5)	82 (24.9)	31.1
Sheep	17	154	1 (12.8)	1 (0,7)	10.0

N.D. = not determined

None of the 482 bulk milk samples collected in 2013 further north along the Norwegian coastline from the counties of Hordaland, Sogn and Fjordane, Møre and Romsdal. South Trøndelag as well as North Trøndelag, were positive for SBV antibodies.

Discussion

Schmallenberg virus was first detected in midges trapped at two locations in Norway in September 2012. Two months later a high proportion of dairy herds in Southern Norway were seropositive for SBV. Retrospective analysis of some of these seropositive herds showed that they had seroconverted later than the second quarter of 2012. Schmallenberg virus was also detected in a calf born with malformations the following winter, suggesting that the dam was naïve to SBV when the infection took place. Thus, it is probable that SBV spread to Norway in the summer of 2012.

In 2013, no midges were found positive for SBV. Thus, midges were not active vectors and SBV seem not to have survived the winter in midges. The extended serosurvey on bulk tank milk further north along the coast In Norway found no more seropositive herd. This indicates that SBV was not circulating in Norway in 2013.

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The Norwegian Veterinary Institute has its main laboratory in Oslo, with regional laboratories in Sandnes, Bergen, Trondheim, Harstad og Tromsø, with about 360 employees in total.

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The Norwegian Food Safety Authority (NFSA) is a governmental body whose aim is to ensure through regulations and controls that food and drinking water are as safe and healthy as possible for consumers and to promote plant, fish and animal health and ethical farming of fish and animals. We encourage environmentally friendly production and we also regulate and control cosmetics, veterinary medicines and animal health personnel. The NFSA drafts and provides information on legislation, performs risk-based inspections, monitors food safety, plant, fish and animal health, draws up contingency plans and provides updates on developments in our field of competence.

The NFSA comprises three administrative levels, and has some 1300 employees.

The NFSA advises and reports to the Ministry of Agriculture and Food, the Ministry of Fisheries and Coastal Affaires and the Ministry of Health and Care Services.

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