



The surveillance programme for bovine spongiform encephalopathy (BSE) in Norway 2021



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Authors

Ståle Sviland, Sylvie Lafond Benestad, Petter Hopp

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Summary

Brain samples from 7,588 bovine animals from 3,282 dairy herds and 1,026 beef cattle herds were submitted for examination in the surveillance and control programme for BSE in Norway 2021. A total of 554 samples were rejected. All the 7,034 tested brain samples were negative for BSE.

Introduction

The BSE surveillance programme was initially based on passive surveillance (1998-2000), with active surveillance introduced in May 2000. In the period 1998 - 2000 the samples were investigated by histopathological examination. From 2001 and onwards, the samples were examined by an Enzyme-Linked ImmunoSorbent Assay (ELISA) method for detection of resistant prion protein (PrP^{Sc}).

The number of samples collected in each category in the period 1998 - 2021 is presented in Table 1. Except for one positive atypical H-BSE case in 2015, BSE has never been detected in any of the examined animals.

Aim

The aim of the surveillance programme is to document that the Norwegian cattle population is free from classical BSE.

Table 1: Number of collected samples for BSE examination by the Norwegian surveillance programme according to categories from 1998-2021.

Year	Clinically suspected animals	Fallen stock	Emergency slaughtered animals	Ante-mortem animals	Imported slaughtered animals	Healthy slaughtered animals*	Total
1998 - 2000	78	0	0	0	19	0	97
2001	14	1 352	7 073	2 612	88	2 400	13 539
2002	2	1 482	7 246	3 562	39	9 907	22 238
2003	2	1 936	7 334	4 107	39	10 727	24 145
2004	3	2 145	9 217	1 355	24	10 443	23 187
2005	1	2 318	8 462	102	10	10 486	21 379
2006	0	2 364	8 177	36	4	10 455	21 036
2007	0	2 213	7 304	48	9	10 000	19 574
2008	0	2 391	8 358	16	5	9 373	20 143
2009	1	2 435	8 320	27	3	9 451	20 237
2010	0	2 788	7 438	11	1	127	10 365
2011	1	3 078	7 241	23	1	7 878	18 222
2012	1	2 936	6 841	7	0	8 744	18 529
2013	1	3 239	7 887	9	4	9 421	20 561
2014	1	1 946	4 270	12	1	264	6 494
2015	0	1 793	5 088	48	1	0	6 930
2016	1	1 918	5 108	74	1	0	7 102
2017	2	1 640	5 227	89	1	0	6 959
2018	1	1 333	5 073	88	1	0	6 496**
2019	0	1 977	5 168	154	1	1	7 301**
2020	0	1 914	4 950	115	1	123	7 103**
2021	0	2 171	5 309	66	2	40	7 588**
Total	109	45 369	141 091	12 561	255	109 840	309 225

* Healthy slaughtered animals were excluded from the surveillance programme in 2010 and from 2014 and onwards.

** Including 169, 417, 412 and 554 samples unsuitable for examination in 2018, 2019, 2020 and 2021, respectively.

Materials and methods

Programme outline

For 2021, the surveillance programme included examination of the following categories:

- Clinically suspected cattle irrespective of age.
- All cattle older than 48 months of age, which have died or been culled, but not slaughtered for human consumption (fallen stock).
- All emergency slaughtered cattle older than 48 months.
- All cattle older than 48 months, with abnormal findings at ante-mortem examination, rejected for human consumption, (referred to as ante-mortem animals).
- All slaughtered cattle with unknown age or origin irrespective of age.
- All slaughtered imported cattle from any country irrespective of age.

Implementation

The farmers were requested to report all cases of clinically suspected cattle irrespective of age, fallen stock older than 48 months and when delivering imported cattle to slaughter, to the Norwegian Food Safety Authority (NFSA). Since 2019, the company “Biosirk”, a nationwide company collecting and rendering fallen stock, are performing the sampling of brains from “Fallen Stock” on behalf of the NFSA. The employees involved, mainly truck drivers, have been trained in the sampling by attending courses arranged by the NFSA.

The brain or head from clinically suspected cattle or a spoon sample from the medulla oblongata from fallen stock were submitted and analysed at the Norwegian Veterinary Institute (NVI). Inspectors from the NFSA collected the spoon samples of the medulla oblongata from the other categories at the abattoirs and sent them within 24 hours in a cool insulated container to the NVI.

Clinically suspected animals

The standard protocol followed for the clinically suspected animals is that the whole brain is divided mid-sagittally into equal halves. One half is formalin-fixed and processed according to a standard routine protocol, embedded in paraffin, sectioned at 2 to 4 µm and stained with haematoxylin and eosin. Immunohistochemical staining for detection of PrP^{Sc} is performed on selected sections using a monoclonal anti-PrP antibody (SAF 84, courtesy of J. Grassi, CEA, France). From the non-fixed half, tissue from the obex area is analysed for detection of PrP^{Sc} by ELISA (Herd-chek BSE-Scrapie AG Test, IDEXX) and subsequently by Western blot (TeSeE® WESTERN BLOT, Bio-Rad) as described by the manufacturer.

Risk population

Non-fixed brain tissue from the obex area was analysed for detection of PrP^{Sc} by ELISA (HerdChek BSE-Scrapie Ag test, IDEXX) as described by the manufacturer. In cases with positive or inconclusive test results, the sample was tested by Western blot (TeSeE® WESTERN BLOT, Bio-Rad)

Brain samples were evaluated as unsuitable for examination when they were severely autolysed, the obex area was totally or partially missing, or the anatomy of the sample was not recognisable.

Results and discussion

In 2021, the NVI received samples from 7,588 cattle. Of these, 554 (7.3%) samples were unsuitable for examination (538 from fallen stock, 15 from emergency slaughter and one from ante mortem control).

For 192 samples (2.5%) the herd of origin was not reported. However, it is important to note that in case of a positive test result, the identity of the herd can be traced via the carcass number. The remaining 7,396 samples originated from 3,282 dairy cattle herds and 1,026 beef cattle herds. The mean number of examined animals per herd was 1.7.

Clinically suspected animals (passive surveillance)

In 2021, there were no animals investigated as clinical suspect due to abnormal behaviour and tremor. Improved methods for clinical examination to distinguish between real suspected BSE cases and cases with central nervous disease of other causes has probably resulted in few clinical suspected cases in later years. Animals with diseases related to the central nervous system are likely to be included in the sampling of other risk groups if not identified as a clinically suspect animal.

Surveillance of slaughtered animals and fallen stock (active surveillance)

In 2013, The EU-commission decided to stop BSE testing in healthy slaughtered cattle in 25 EU-member states (decision 2013/76/EU). Norway stopped the testing of healthy slaughtered animals from 2014.

At the same time, the age limit for including cattle in the categories “Fallen stock”, “Emergency slaughter” and “Ante mortem” was increased to 48 months. This amendment has resulted in a reduced number of sampled animals in the categories fallen stock and emergency slaughter in 2014 and onwards compared to 2013.

The geographical distributions of the cattle population and the animals of different categories tested are presented in Table 2. There is relatively good correlation between the collection of samples for fallen stock and emergency slaughtered animals from different regions and the distribution of the cattle population in the regions. A corresponding comparison related to the age distribution of sampled animals is shown in Table 3.

Table 2: Regional distribution of Norwegian cattle and the cattle sampled for PrP^{Sc} in 2021.

Region	Total population (%)	Fallen stock (%)	Emergency slaughter (%)	Ante mortem animals (%)	Clinically suspected animals (%)	Total sampled (%)
Region Stor-Oslo	5.0	3.5	4.2	0,0	0,0	3.9
Region Øst	27.4	18.7	27.3	3.8	0,0	24.5
Region Sør og Vest	30.7	37.1	29.9	28.3	0,0	32.1
Region Midt	27.6	31.5	31.2	60.4	0,0	31.4
Region Nord	9.3	9.2	7.5	7.5	0,0	8.0
Total number	899 000	2 171	5 309	66	0	7 588*

There were 192 samples (2.5%) from cattle with unknown region. These samples are assumed to be distributed following the regional distribution of the cattle from known region within each target group.

* Including 40 and 2 samples from normal slaughter and imported cattle, respectively

Table 3: Age distribution of Norwegian cattle and the cattle tested for PrP^{Sc} in 2021.

Age groups (months)	Total population (%)	Fallen stock (%)	Emergency slaughter (%)	Ante mortem animals (%)	Clinically suspected animals (%)	Total tested (%)
< 24	54.3	0.1	0.3	6.7	0.0	0.3
24-35	12.8	0.2	0.1	4.4	0.0	0.2
36-47	9.4	0.1	0.2	8.9	0.0	0.2
48-59	6.9	0.3	1.4	28.9	0.0	1.2
60-71	4.7	26.8	26.6	15.6	0.0	26.6
72-83	3.1	27.4	27.4	6.7	0.0	27.3
84-95	2.3	19.9	19.9	13.3	0.0	19.8
96-107	1.8	11.6	10.8	2.2	0.0	11.0
108-119	1.4	5.6	5.7	6.7	0.0	5.6
120-131	0.9	2.1	2.6	2.2	0.0	2.5
132-143	0.7	2	1.8	0.0	0.0	1.8
144-155	0.5	1	1.2	2.2	0.0	1.1
≥ 156	1.0	0.5	0.7	2.2	0.0	0.7
Total number	899 000	1 633	5 294	65	0	7 034*

There were 138 examined samples (2.0%) from cattle with unknown age. The age of these cattle are assumed to be distributed like the age distribution of the cattle with known age within each target group.

* Excluding 554 samples unsuitable for examination and including 40 and 2 samples from normal slaughter and imported cattle, respectively.

Conclusions

In 2015, the first and only atypical case of BSE (H-BSE) was detected in Norway. No case of classical BSE has ever been detected, including the 7,034 animals tested in 2021.

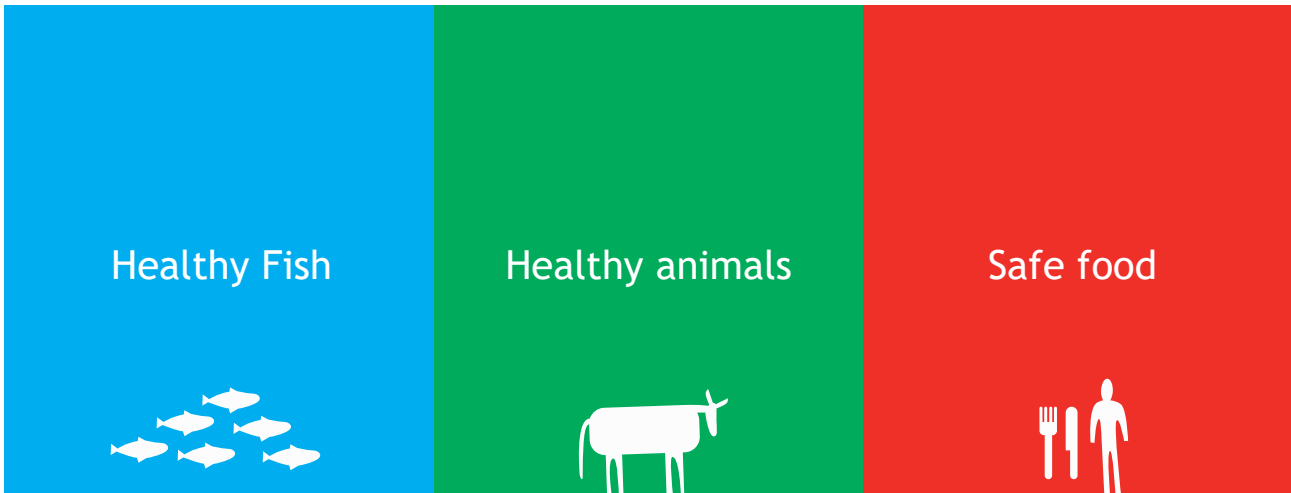
It is considered highly probable with increasing certainty that the Norwegian cattle population never has been infected with classical BSE-agent. This is mainly due to few imports to Norway of cattle and products potentially infected with the BSE-agent, limited use of meat and bone meal in concentrates intended for ruminants, and the use of high temperature and pressure in the domestic production of meat and bone meal (1). The main causes of no detected cases of classical BSE are supported by a risk assessment for BSE in Norway (2) and by the compiled results from the surveillance programme for BSE in the years 2001 to 2021.

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Veterinærinstituttet
Norwegian Veterinary Institute

Ås

Trondheim

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postmottak@vetinst.no
www.vetinst.no