Surveillance programmes for terrestrial and aquatic animals in Norway
Norwegian Veterinary Institute

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All 6,294 samples, originating from 4,323 herds, were tested negative for BSE in 2014.

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 onwards the samples were examined by an Enzyme-Linked ImmunoSorbent Assay (ELISA) method for detection of resistant prion protein (PrP^{Sc}). In addition, clinically suspected animals were also investigated by Western blot investigation for the detection of Pr^{Sc} and/or histopathological/immunohistochemical examination according to the protocol of the Office International des Epizooties (OIE) (1). The number of samples examined in each category in the period 1998-2014 is presented in Table 1. 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.

Surveillance programme

Programme outline

For 2014 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, or which died at the abattoir or during transport (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. 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, Oslo. Inspectors from the Norwegian Food Safety Authority 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 Norwegian Veterinary Institute in Oslo.

Laboratory methods

Clinically suspected animals

The usual 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 eosin (HE). 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 by ELISA for detection of PrP^{Sc} (TeSeE®, Bio-Rad) and by Western blot (TeSeE® WESTERN BLOT, Bio-Rad) for detection of PrP^{SC} as described by the manufacturer.

Table 1. Number of samples from cattle collected for BSE examination by the Norwegian surveillance programme according to categories from 2004-2014.

Reason for submission	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Clinically suspected animals	3	1	0	0	0	1	0	1	1	1	1
Fallen stock	2 145	2 318	2 364	2 213	2 391	2 435	2 788	3 078	2 936	3 239	1 946
Emergency slaughtered anmal	9 217	8 462	8 177	7 304	8 358	8 320	7 438	7 241	6 841	7 887	4 270
Ante-mortem animals	1 355	102	36	48	16	27	11	23	7	9	12
Imported slaughtered animals	24	10	4	9	5	3	1	1	0	4	1
Healthy slaughtered animals*	10 443	10 486	10 455	10 000	9 373	9 451	127	7 878	8 744	9 421	264
Total	23 187	21 379	21 036	19 574	20 143	20 237	10 365	18 221	18 529	20 561	6 494

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

Risk population and routine slaughtered animals

Non-fixed brain tissue from the obex area was analysed by ELISA for detection of PrP^{Sc} (TeSeE®, Bio-Rad) as described by the manufacturer. In cases with positive or inconclusive test results, the remaining half obex was fixed in 10% neutral buffered formalin, embedded in paraffin, sectioned at 4 μm, and stained with Hematoxylin and eosin (H&E stain) HE. Subsequently, the sections were analysed by immunohistochemical detection of PrP^{Sc} using the same protocol as for specimens from clinical suspects.

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

Results and discussion

The Norwegian Veterinary Institute received samples from 6,494 cattle. Of these, 200 (3%) samples were unsuitable for examination (187 from fallen stock and 13 from emergency slaughter).

For 47 samples (0.7%) the herd of origin was not reported. However, it is important to note that in case of a positive test result from such a herd, the identity could be traced via the carcass number. The remaining 6,447 samples originated from 3,562 dairy cattle herds and 761 beef cattle herds. The mean number of examined animals per herd was 1.49.

Clinically suspected animals (passive surveillance)

In 2014, one animal was 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. It is likely that animals with diseases related to the central nervous system have been examined either as fallen stock, emergency slaughtered animals or ante-mortem animals, and thus included in these categories.

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). From 2014 Norway joined the EU25 and stopped the testing of healthy slaughtered animals.

The age limit for including cattle in the categories "Fallen stock", "Emergency slaughter" and "Ante mortem" has been changed to 48 months. This amendment has resulted in a reduced number of sampled animals in the categories fallen stock and emergency slaughter in 2014 compared to 2013.

The geographical distributions of the cattle population and the animals of different categories tested, are presented in Table 2. There is a 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. The proportion of sampled animals above 48 months of age is much larger than the corresponding proportion in the population, due to the lower age limits in this programme (Table 3).

Table 2. Regional distribution of Norwegian cattle and the cattle tested for PrP^{Sc} in 2014. There were 39 samples (0.7%) 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.

Region	Total population (%)	Fallen stock (%)	Emergency slaughter (%)	Ante mortem animals (%)	Clinically suspected animals (%)	Total (%)
Troms and Finnmark	2.7	3.3	2.1	0.0	0.0	2.5
Nordland	7.3	6.2	6.0	0.0	0.0	6.1
Trøndelag, Møre and Romsdal	28.3	37.4	36.3	25.0	0.0	36.6
Hordaland, Sogn and Fjordane	9.6	9.5	9.6	25.0	0.0	9.6
Rogaland and Agder	21.7	18.6	19.0	41.7	0.0	18.9
Buskerud, Vestfold and Telemark	7.1	7.4	4.1	0.0	100	5.1
Oslo, Akershus and Østfold	4.9	7.0	4.3	0.0	0.0	5.1
Hedmark and Oppland	18.5	10.4	18.6	8.3	0.0	16.2
Total number of animals	883 380	1 759	4 257	12	1	6 294*

* Including 1 imported cattle and 264 healthy slaughtered animals.

Table 3. Age distribution of Norwegian cattle and the cattle tested for PrP^{Sc} in 2014. There were 471 samples (7.5%) 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.

Age groups (months)	Total population (%)	Fallen stock (%)	Emergency slaughter (%)	Ante mortem animals (%)	Clinically suspected animals (%)	Total (%)
< 24	57.2	0.1	0.3	0.0	0.0	0,2
24-29	7.5	1.8	0.7	9.1	0.0	1,0
30-35	6.1	1.9	0.7	0.0	0.0	1,1
36-47	10.1	5.2	3.4	9.1	0.0	3,9
48-59	6.9	29.8	28.5	9.1	0.0	28,8
60-71	4.6	25.2	26.6	27.3	100	26,2
72-83	3.0	14.1	18.0	36.4	0.0	16,9
84-95	1.8	10.4	10.9	0.0	0.0	10,7
96-107	1.0	5.1	5.1	0.0	0.0	5,1
108-119	0.7	2.2	2.7	0.0	0.0	2,5
120-131	0.4	2.2	1.3	0.0	0.0	1,6
132-143	0.3	0.9	0.8	0.0	0.0	0,8
144-155	0.2	0.4	0.3	9.1	0.0	0,3
≥ 156	0.3	0.5	0.7	0.0	0.0	0,6
Total number of animals	883 380	1 759	4 257	12	1	6 294*

* Including 1 imported cattle and 264 healthy slaughtered animals

Conclusion

It is considered highly probable that the Norwegian cattle population never has been infected with BSE-agent 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 (2). This is supported by a quantitative risk assessment for BSE in Norway (3) and by the compiled results from the surveillance programme for BSE in the years 2001 to 2014 with approximately 260,000 negative samples.

Acknowledgment

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References

1. http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/2.04.06_BSE.pdf

2. Mørk T, Bratberg B, Hopp P, Benestad S, Høgåsen H, Bruheim T. The surveillance and control programme for bovine spongiform encephalopathy (BSE) in Norway. In: Fredriksen B, Mørk T (editors). Surveillance and control programmes for terrestrial and aquatic animals in Norway. Annual report 2001. Oslo: National Veterinary Institute; 2002. p. 55-66.

3. Høgåsen HR, de Koeijer AA. Quantitative risk assessment for bovine spongiform encephalopathy in low- or zero-prevalence countries: the example of Norway. Risk Anal. 2007; 27:1105-17.

The Norwegian Veterinary Institute (NVI) is a nation-wide research institute in the fields of animal health, fish health, and food safety. The primary mission of the NVI is to give research-based independent advisory support to ministries and governing authorities. Preparedness, diagnostics, surveillance, reference functions, risk assessments, and advisory and educational functions are the most important areas of operation.

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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