Transmissible spongiform encephalopathies surveillance programme

Transmissible spongiform encephalopathies (TSE) are a group of neurodegenerative diseases caused by the proliferation in the central nervous system of an altered form of a normal intracellular protein called a prion. The main TSEs of interest in New Zealand are bovine spongiform encephalopathy (BSE), which affects cattle; classical scrapie (sheep and goats), and chronic wasting disease (CWD) (deer and elk/wapiti). New Zealand is free from these diseases.

Aims of TSE surveillance

This programme is designed to ensure early detection of any TSE incursion, and to ensure early containment and successful eradication.

The TSE surveillance and risk management measures implemented in New Zealand have been described in previous annual reports (McIntyre, 2009). Surveillance for CWD is not mandated by the World Organisation for Animal Health (OIE) but is carried out to assure NZ's trade partners of freedom from this disease.

As a country with a negligible BSE risk, New Zealand performs surveillance type B, as specified by Chapter 11.4 of the OIE Terrestrial Animal Health Code (OIE, 2019a). This relies on the passive surveillance scheme described below. BSE points have been accumulated since 2005 and New Zealand has consistently maintained well in excess of the required 150,000 points.

How the programme works

TSE surveillance combines passive and active surveillance activities. Passive surveillance is carried out for all three TSEs through a targeted scheme under which veterinary practitioners submit neurological material (brain and spinal cord) from animals showing clinical signs of neurological disease. Veterinarians and farmers are compensated for supplying the samples. Submissions to the programme occur year-round, with a seasonal increase in submissions from August to October.

Active surveillance for classical scrapie and CWD has been carried out since 2010, to complement the small numbers of submissions made to the passive scheme for sheep and deer. As part of this, medial retropharyngeal lymph nodes are routinely collected for testing, from clinically healthy adult animals sent to meat processing plants across the country. The required sample size (320 sheep and 320 deer per year) is designed to detect disease at a low prevalence in the population. A maximum of two animals can be collected from any one farm, to help ensure that the sampled population is geographically representative.

Spinal cord tissues of cattle, deer and sheep collected during passive surveillance are tested at the MPI Animal Health Laboratory (AHL) (Wallaceville), using the EU-approved Herd Check BSE-scrapie ELISA (IDEXX Laboratories Inc., Westbrook, Maine, USA). Lymph nodes from deer and sheep collected under the active surveillance scheme are tested using the Herd Check BSE-scrapie ELISA rapid test at the AHL. Moreover, brains collected by veterinarians under the passive surveillance scheme undergo histopathological examination at accredited veterinary diagnostic laboratories for additional exclusion of TSE specific lesions and to provide an alternative diagnosis where possible.

Results

In total, 725 cases from all species had samples collected by both passive and active TSE surveillance in New Zealand in 2019. All tests were negative (**Table 1**).

The level of passive surveillance of the cattle population achieved in 2019 is eligible for 21,320 BSE points, corresponding to 56 spinal cords of cattle tested by rapid ELISA test.

For active surveillance of scrapie and CWD through meat plants, the sampling distribution was widespread throughout New Zealand, thus reasonably representative of the population at risk (**Figure 1**).

Trends in TSE passive surveillance

The passive surveillance scheme for TSE is focused on submissions of clinically suspect animals (or fallen cattle) from veterinarians. Although these occur year-round, there is a clear seasonal trend, with a peak from August to October each year (**Figure 2**).

The numbers of samples submitted to this programme have declined since 2005 but remain stable throughout the past 10 years, with a moderate increase between 2018 and 2019 (**Figures 2 and 3**). From this year onwards, the annual number of TSE cases is enumerated using the sample collection date rather than the date recorded in the TSE database. This is a more accurate method and accounts for the slight discrepancy in the numbers reported in Figures 2 and 3, compared with previous years' reports.

Trends in TSE active surveillance

In October 2009, the first detection of a case of atypical scrapie/Nor98

Table 1: Number of samples collected in 2019 for TSE screening, by passive and active surveillance

Surveillance stream	Tissue	Test type	Species	Number
Passive	Brain	Histopathology	Cattle	70
Passive	Brain	Histopathology	Goats	1
Passive	Brain	Histopathology	Deer	7
Passive	Brain	Histopathology	Sheep	3
Passive	Spinal cord	Rapid Test IDEXX	Cattle	56
Passive	Spinal cord	Rapid Test IDEXX	Goats	1
Passive	Spinal cord	Rapid Test IDEXX	Deer	5
Passive	Spinal cord	Rapid Test IDEXX	Sheep	3
Active	MRLN†	Rapid Test IDEXX	Deer	322
Active	MRLN†	Rapid Test IDEXX	Sheep	322

†MRLN: medial retropharyngeal lymph node

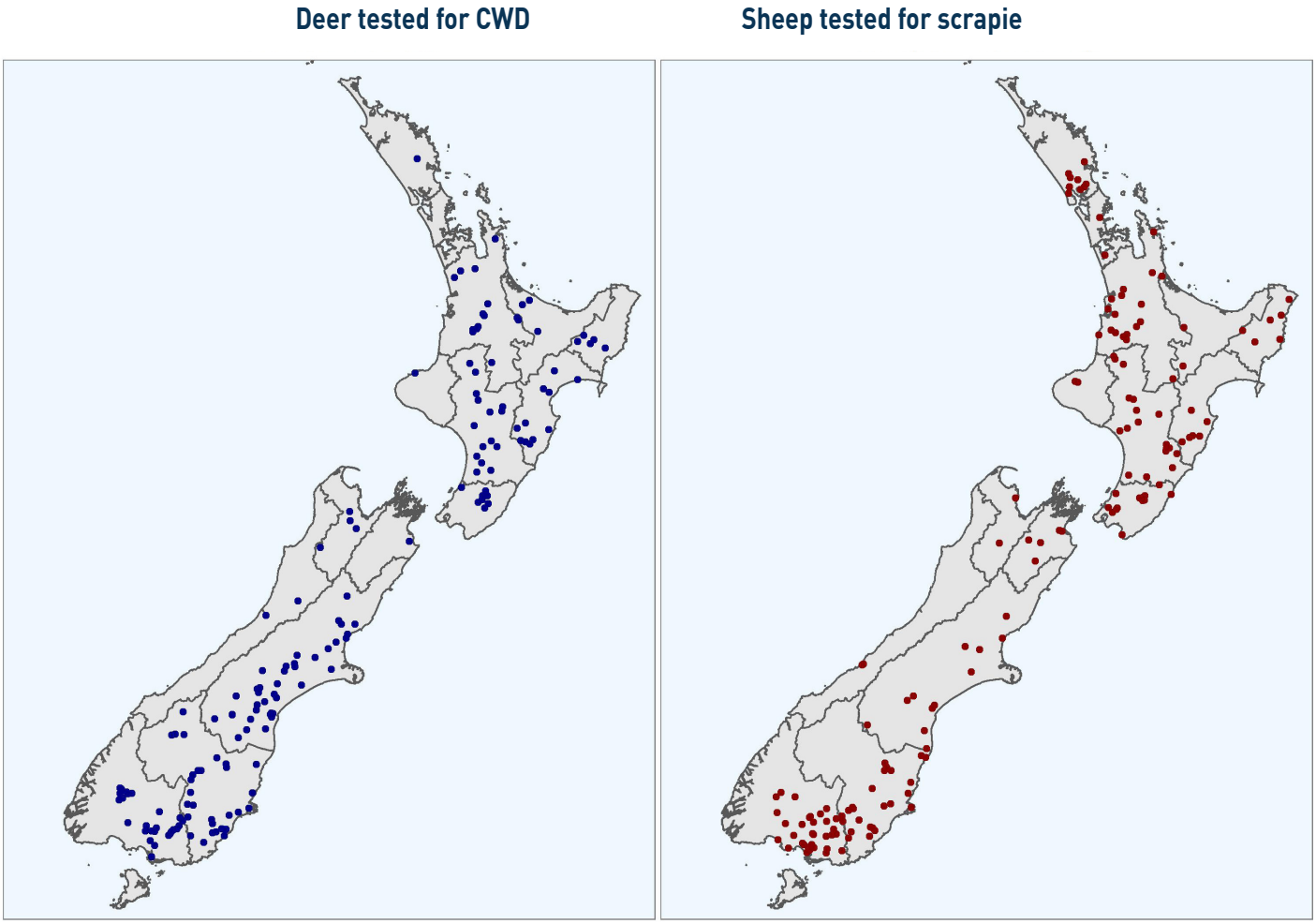

Figure 1: Locations of farms screened through active surveillance for CWD (left) and classical scrapie (right), 2019

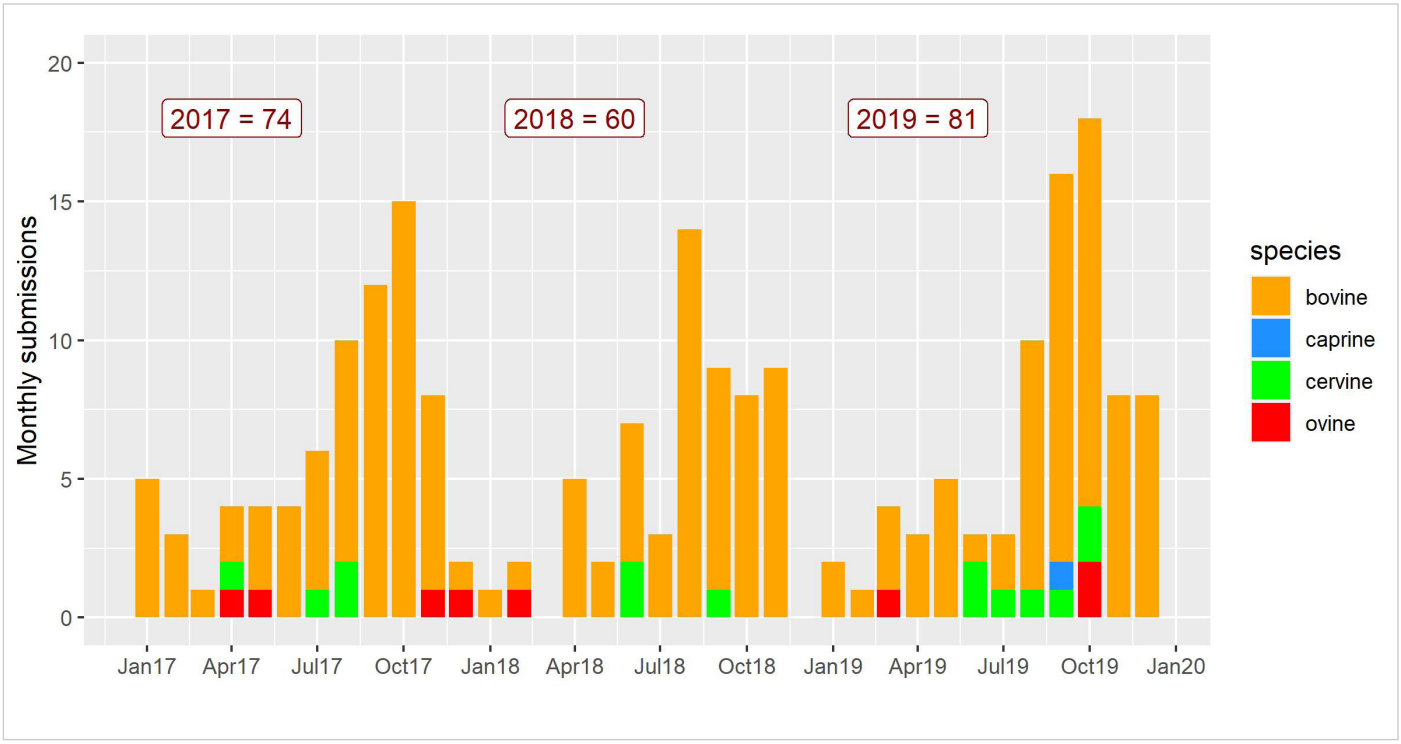

Figure 2: Passive surveillance through the incentivised scheme: monthly numbers, 2017–2019 (Total numbers submitted each year are shown at top.)

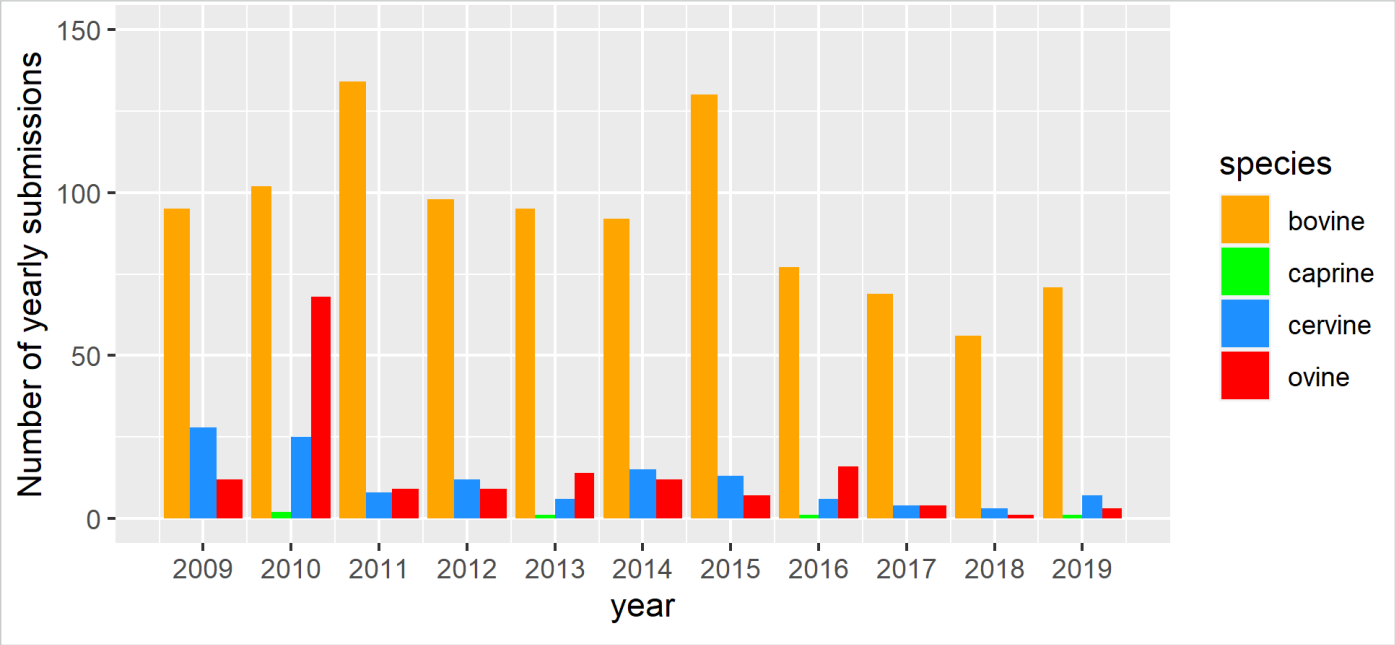

Figure 3: Annual number of cases submitted to the TSE passive surveillance scheme, 2009-2019

in a New Zealand-born sheep was confirmed (Kittelberger & McIntyre, 2009; Kittelberger et al., 2010). MPI strongly supports OIE's view that atypical scrapie is "clinically, pathologically, biochemically and epidemiologically unrelated to 'classical' scrapie, may not be contagious and may, in fact, be a spontaneous degenerative condition of older sheep". (OIE, 2019b). Accordingly, MPI considers atypical scrapie to be a negligible biosecurity risk (Vink & McIntyre, 2014). The sensitivity of detection of the prion causing classical scrapie is higher in lymphoid tissue than in brain tissue, and the atypical scrapie/Nor98 prion is not detected in lymphoid tissue (Meloni et al., 2012). Research at the AHL (Wallaceville) has shown that testing of medial retropharyngeal lymph node (MRLN) tissue from sheep and goats with the IDEXX TSE test has high diagnostic sensitivity and specificity towards classical scrapie (Kittelberger et al., 2014). This is the basis for currently using MRLN for active surveillance in sheep and deer.

References

Kittelberger R, McIntyre LH (2009). A case of atypical scrapie/Nor98 in a sheep from New Zealand. *Surveillance* 36(4), 6–10.

Kittelberger R, Chaplin MJ, Simmons MM, Ramirez-Villaescusa A, McIntyre L, MacDiarmid SC, Hannah MJ, Jenner J, Bueno R, Bayliss D, Black H, Pigott CJ, O'Keefe JS (2010). Atypical scrapie/Nor98 in a sheep in New Zealand. *Journal of Veterinary Diagnostic Investigation* 22, 863–875.

Kittelberger R, McIntyre L, Watts J, MacDiarmid S, Hannah MJ, Jenner J, Bueno R, Swainsbury R, Langeveld JP, van Keulen LJ, van Zijderveld FG, Wemheuer WM, Richt JA, Sorensen SJ, Pigott CJ, O'Keefe JS (2014). Evaluation of two commercial, rapid, scrapie ELISA kits for the testing of retro-pharyngeal lymph nodes in sheep. *New Zealand Veterinary Journal* 62(6), 343–350.

McIntyre L (2009) TSE surveillance programme. *Surveillance*, 36, 21–22.

Meloni D, Davidse A, JPM, Varello K, Casalone C, Corona C, Balkema-Buschmann A, MH, Ingravalle F, Bozzetta E (2012). EU-approved rapid tests for bovine spongiform encephalopathy detect atypical forms: A study for their sensitivities. PLOS ONE, doi: 10.1371/journal.pone.0043133.

OIE (2019a). *Terrestrial Animal Health Code* 25th Edition, Chapter 11.4.

https://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_bse.htm. Accessed 28 August 2020.

OIE (2019b). *Terrestrial Animal Health Code* 25th Edition, Chapter 14.8.

https://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_scrapie.htm. Accessed 28 August 2020.

Vink WD, McIntyre LH (2014). Active surveillance for scrapie in New Zealand: towards tissue-based testing. *New Zealand Veterinary Journal* 62(6), 361–362.

Nelly Marquetoux
TSE Programme Manager
Biosecurity Surveillance & Incursion Investigation (Animal Health)
Diagnostic & Surveillance Directorate
Biosecurity New Zealand
Ministry for Primary Industries
nelly.marquetoux@mpi.govt.nz