**Editorial – Neurological disease in ruminants**

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Working up a neurological case in farm animals is not always an easy task. One of the most useful skills is a sound understanding of the principles of characterising the abnormality and localising the lesion. Successfully mastering this aspect reduces the different possible diagnoses, typically from many to just a handful. For example, the ability to distinguish weakness from ataxia will lead to a completely different set of differentials. Equally, this skill often allows narrowing down the likely aetiology. In particular, whether the patient suffers from an acute condition (like a toxicosis or deficiency) requiring swift treatment for optimal prognosis, or a more chronic disease process where treatment may be less urgent or prognosis more guarded. Many metabolic conditions can present in animals as impaired neurological function, like D-lactic acidosis in calves (Lorenz, 2009) and drunken lamb or floppy kid syndrome, hypothermia and hypoglycaemia in neonates (Trefz and others, 2016), and hypocalcaemia and hypomagnesaemia in older animals (D'Angelo and others, 2015). If promptly recognised, early treatment often results in good clinical outcomes.

Neurological conditions often have a wider impact than just the individual case presented, including zoonotic concerns like those surrounding the transmissible spongiform encephalopathies in both cattle and sheep. For breeders, the prompt and accurate identification of inherited conditions is of utmost importance to allow identification of carrier animals and their removal from the breeding pool. Well recognised examples include Wobbler syndrome in Texel sheep (Penny and others, 2007), progressive ataxia in Charolais cattle (Millar and others, 2004), and storage diseases like mannosidosis in a range of dairy and beef breeds or citrullinaemia in Holstein-Friesian calves. The article by Giles and others in this issue of the Vet Record highlights that spastic paresis ('Elso heel') still has a relatively common occurrence, despite its long-standing recognition as a hereditary condition. With the considerable advances made in genome analysis and the increasing use of genomic selection in some breeds, such defects will be detected more promptly and possibly more frequently, such as the dominantly inherited vertebral and spinal dysplasia (VSD) in Holstein cattle first reported in 2015 (Kromik and others).

Similarly, it is important to quickly recognise the involvement of a pathogen which has the potential to infect the wider herd or flock, such as bovine herpesvirus type-1), or bovine viral diarrhoea virus and border disease virus, which may present as congenital trembling in the neonate (Otter and others, 2009). While cases with thrombotic meningo-encephalitis caused by *Histophilus somni*, or vestibular syndrome secondary to middle ear infection caused by *Mycoplasma bovis* occur relatively infrequently, both pathogens also cause economically more serious pneumonia, septic arthritis and mastitis. All these diseases highlight why a quick diagnosis is desirable.

With the changes in weather and climate, in particular the increase in environmental temperatures and the shift in rain patterns, the profession needs to be prepared for the more common occurrence of currently sporadic diseases, such as ryegrass staggers (lolitrem toxicosis) or Lyme borreliosis, as well as new vector-borne diseases like West-Nile virus in horses. But even without any environmental changes, the emergence of new pathogens and diseases continues: an example is the report of central nervous system lesions in sheep in Wales and cattle in the UK, other European countries and North America caused by an Astrovirus (APHA, 2015; Pfaff and others, 2016; Selimovic-Hamza, 2017). This virus has mostly been associated with enteritis in young people. Truchet and others (2017) highlight the role of post-mortem examination in the diagnosis of

emerging or new conditions or those with a herd- or flock-wide impact, as does the article by Giles and others (2017).

There are a number of conditions with an iatrogenic aetiology, such as closantel toxicosis reported by Giles and others (2017), or incorrect injection technique of oil-based vaccines leading to compressive lumbar myelopathy (Ubiali and others, 2011). Husbandry short-comings, in particular concerning nutrition, remain common as demonstrated by the relative frequency of listeriosis shown by Giles and others (2017), as well as their finding of cerebro-cortical necrosis (CCN), a condition commonly associated with concentrate-feeding induced thiamine deficiency. Other examples include botulism, lead or organophosphate poisoning and water intoxication after a period of water deprivation (Kawahara et al. 2016).

Personally, I revise my neurology workup periodically to maintain a sound approach. However, there are tools that can aid the diagnosis and that as practitioners we could utilise more fully. In particular, the use of lumbosacral collection of cerebrospinal fluid, which can easily and safely be carried out in the field and can provide animal-side answers in some cases, as described by Scott (1993, 1995). Adaptations to the generic work-up of a neurological case that may be required for livestock cases – to take account of their size, frequent stoicism, and lack of halter-training – has been well described by Mayhew (2008). Washburn (2017) provides a good review of neurology in food producing animals.

In conclusion, neurological disorders filter into a wide range of aspects of livestock production. Because typically the herd or flock rather than just the individual animal has to be considered, it is fitting that Giles and others (2017) emphasis the benefit of combining clinical assessment with post-mortem examination.

**Clinical importance for practitioners:**

- Being able to localise the lesion is an important skill
- Young animals are frequently affected by neurological conditions
- Metabolic diseases and infections of herd- or flock-wide importance often present with neurological disturbance. Prompt recognition is important for optimal prognosis and control
- Important adjunct tools for the diagnosis of neurological disease include cerebrospinal fluid collection and post-mortem examination

**Captions**

Image 1: Conditions like ryegrass staggers (lolitrem toxicosis) may be seen more frequently because of changes in weather patterns.

Image 3: Lumbo-sacral collection of CSF, here in a young goat, is an underutilised tool.

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