Vet Call

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Brain disease in the livestock industry

Chronic wasting disease (CWD) is a brain disease of deer and elk that belongs to a group of diseases known as transmissible spongiform encephalopathies (TSEs). TSEs have been described in cattle, sheep, goats, humans, mink, exotic ruminants and cats. Within each species the modes of disease transmission vary, but regardless of host species, the outcome of infection is similar.

Cause for concern

In each case, disease results when a normal host cellular protein, called a prion (PrPC), is changed into an abnormal form, which is resistant to destruction by an enzyme called a protease (PrPres). Scientists do not know with certainty what incites the normal prion to change into its abnormal form, but some believe that the abnormal form of the prion serves as the infectious agent and causes normal host prions to become abnormal.

The protease-resistant form of the prion accumulates in brain tissue causing the tissue to become sponge-like (spongiform). The spongiform changes that occur in brain tissue lead to nervous system problems and observed clinical signs, which include behavioral changes, incoordination, altered posture (splay-legged or head down), weight loss, excessive drinking and, ultimately, death. Most infected animals show clinical signs after a long period without symptoms, which varies from 18 months to three or more years after infection.

Currently, there are two TSEs recognized in domestic ruminants — bovine spongiform encephalopathy (BSE) of cattle and scrapie of sheep and goats. Scrapie has been recognized in North America since 1937. BSE was first recognized in North America in 1993 in a beef cow imported from Great Britain to Canada, and has since been diagnosed in a native-born beef cow in Canada and in a dairy cow in the United States that was originally imported from Canada.

CWD was first recognized in 1967 in wild deer orphans raised in captivity in Colorado. The disease has since been recognized in wild deer and elk in northern Colorado, eastern Wyoming, western Nebraska, and parts of Utah, New Mexico and western Canada. In addition, the disease has been recognized in farmed deer and elk in Colorado, Wyoming, Montana, South Dakota, Nebraska, Kansas, Oklahoma, Wisconsin, Minnesota, and in the Canadian provinces of Alberta and Saskatchewan.

Mode of transmission

While BSE, scrapie and CWD are all TSEs, they differ with regard to which species is affected and how the disease is passed from animal to animal (see Table 1). BSE has received a great deal of press in recent years, not only because of its devastating effects on the British cattle industry, but also because it has been implicated as the cause of a new form of human spongiform encephalopathy called variant Creutzfeldt-Jakob disease (vCJD). This form of CJD has affected about 150 people worldwide, and it is believed that these individuals contracted the disease by eating tissues from cattle infected with BSE.

Unlike BSE, CWD and scrapie appear to affect very few animal species. Scrapie has only been recognized in sheep and goats. Likewise, CWD has only been recognized in deer and elk, and the disease has not been passed to domestic ruminants (cattle, sheep or goats) or to humans.

The recognition of BSE's ability to cross species barriers has, however, raised concern about the potential for other TSEs to cross species barriers. CWD is of particular concern because it occurs in free-ranging deer and elk that not only share fencelines and rangeland with farmed deer and elk, but also with cattle and sheep.

The major route of infection for all TSEs is through consumption of infected material. However, the infectious material differs by TSE disease. The only documented means of infection for BSE is through eating feedstuffs that contain brain and spinal cord tissue from other cattle infected with BSE. Hence, BSE is easily controlled by eliminating high-risk materials (HRMs), such as meat and bonemeal, from the cattle food chain.

CWD, on the other hand, is not easily controlled because the disease appears to transmit from infected deer and elk to uninfected deer and elk by materials other than just brain and spinal cord. Proposed materials for animal-to-animal transmission of CWD include urine, feces, saliva and nervous tissue from decaying carcasses. It has been proposed that healthy deer and elk

Table 1: Similarities and differences between TSE diseases of ruminants

	Spontaneous appearance	Animal-to-animal transmission	Mother-to-offspring transmission	Assisted transmission	Species barrier
BSE (cattle)	Possible	No	No	Yes	Incomplete
Scrapie (sheep and goats)	Possible	Yes	Yes	Unknown	Strong
CWD (deer and elk)	Possible	Possible	Possible	Unknown	Strong

contract CWD through the consumption of pasture/range forage contaminated with these infectious materials. Similar methods of passing scrapie from infected sheep or goats to healthy sheep and goats is suspected, but this method is not suspected in the transfer of BSE to healthy cattle.

Investigations by the Centers for Disease Control (CDC) and the Colorado Department of Public Health have found no evidence that CWD poses a threat to humans or cattle. However, given the relationship between BSE and vCJD, state and federal regulatory agencies have focused attention on CWD surveillance to identify areas of the country that are free of the disease and to estimate the percentage of the deer and elk that are affected in areas of the country where CWD has been identified. These surveillance programs collect brain tissues for CWD testing from deer and elk brought to wildlife check stations during hunting seasons.

Additionally, it is recommended that no part of a deer or elk with evidence of CWD be consumed by people or animals, and that brain, spinal cord, eyes, spleen, tonsils and lymph nodes of healthy deer and elk not be consumed. Hunters should take precautions, such as wearing latex gloves when field dressing deer and elk carcasses, and they should wash their hands and instruments thoroughly after field dressing is complete.

CWD is an important disease for cattlemen to be knowledgeable about because of its similarities to BSE and because of consumer interest in all TSE (prion) diseases.