

Director's Digest



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BOVINE SPONGIFORM ENCEPHALOPATHY: CONSIDERATIONS FOR THE AMERICAN RENDERING INDUSTRY

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In 1987 a new disease of cattle was described in Great Britain which was very similar to sheep scrapie (1). The first affected animals were observed in 1985 with the incidence gradually increasing to a present plateau of 1400 cases per month. Studies on the epidemiology of bovine spongiform encephalopathy (BSE) indicate that exposure was via a feed ingredient and began in 1982 with a 3-8 year incubation period. Assuming no cattle to cattle transmission, BSE is projected to continue at its present incidence until 1992 then decline to zero over a 2-3 year period.

Examination of the brains of affected cattle quickly revealed neuropathologic lesions like those seen in scrapie-infected sheep. Was this a new disease, or were cattle being infected with the scrapie agent by contact with sheep? Studies soon indicated that cattle could not have been infected by co-mingling with scrapie-infected sheep. Although Great Britain makes no attempt to control scrapie, with as many as 20,000 affected sheep a year, there was clear evidence that many BSE affected herds had no contact with sheep. The only common denominator was the feed.

Most compounded cattle feed in Great Britain from 1982 to 1988 contained 4% meat and bone meal. This was the most likely source of contamination since it was the only animal protein in the diet and considering the extreme resistance of the

scrapie agent to heat inactivation. Because of the high prevalence of scrapie in Great Britain, it is certain that many scrapie-infected sheep carcasses and butchershop trimmings are processed at rendering plants. Investigators believe that the reason why BSE had not occurred earlier was due to changes in the rendering process which began 10-12 years ago. At this time most plants changed from batch to continuous processing and eliminated a hydrocarbon extraction step. Although the scrapie agent is extremely resistant to heat treatment, it is sensitive to organic solvents and it is the elimination of the extraction step which may have provided the increased titer (amount of agent) necessary to infect cattle. The Ministry of Agriculture suspended the feeding to ruminants of rations containing animal protein in 1988.

Scrapie agent associates mostly with cellular residue, not tallow. There is no evidence that there is a human health problem. Humans cannot be infected from handling infected sheep or their parts.

What can we do in the United States to prevent the occurrence of BSE? The most effective means is to break the cycle of transmission by either discontinuing the use of animal protein in cattle feed or by preventing the rendering of scrapie-infected animals. The Animal Protein Producers Industry (APPI) took a big step in December toward addressing the latter issue by suggesting that "all renderers refrain from picking up diseased, dying, disabled and dead sheep until further notice". Although this action has caused havoc among sheep producers and veterinary regulatory officials, I believe it is a prudent policy. However, many APPI members and other renderers have questions that I will try to address in the remainder of this article.

How can I detect a scrapie-infected sheep?

You cannot. The only way to diagnose scrapie is by histopathologic examination of brain tissue, inoculation of susceptible animals (1-2 year incubation period), or biochemical demonstration of the prion protein.

Can I rely on veterinary regulatory officials to inform me of all scrapie-infected flocks?

No. It is not possible to detect scrapie infection in sheep during the long incubation periods of 2-5 years. Regulatory officials can only assume that flocks exposed to known scrapie-affected sheep are likely to be infected. However, many cases of scrapie are not reported making this an unsatisfactory method of surveillance.

Does scrapie occur more often in one breed of sheep than others?

Yes. Ninety-eight percent of all scrapie in the United States is found in blackface sheep (mainly Suffolk and Hampshire).

Is the age of a sheep an important consideration?

Yes, Scrapie is a slow virus infection which begins in the digestive system during the first few months after birth. The agent slowly replicates in lymph node tissues and spleen, then gradually spreads to the spinal cord and brain after 1 year of age (2). The important point to remember is that the concentrations of the scrapie agent become much higher in brain tissue (10 million infectious units per gram) than in lymph tissue (seldom exceed 10 thousand infectious units per gram). Therefore, the carcass (minus offal) of a sheep less than 1 year of age represents a minimal risk because the transmissible agent has not yet reached the central nervous system.

Can I safely render lamb offal?

Probably. As mentioned above, the lymph tissue have a much lower concentration of the scrapie agent. Even heating these tissues to the relatively low temperatures of continuous processing would inactivate 90% to 99% of the infectivity (3). It is unlikely that 100 or even 1000 infectious units are sufficient enough to effectively cross a species barrier (sheep to cattle) when exposure is by feeding.

COMMENT - Since our drivers would have a difficult time identifying lamb from older sheep offal, we suggest not processing the heads of any sheep.

Can I safely render sheep heads?

Yes, if the animal is less than one year of age. No, if older.

COMMENT - Same as above. Don't process any sheep heads as many people will certify to anything to get sheep processed.

Can I safely render whole carcasses?

No, if the animal is over one year of age. Probably, if the animal is younger (REMEMBER: The agent accumulates first in the lymphoid tissues, then gradually proceeds to the spinal cord and brain where it reaches its highest concentration just before the onset of clinical signs of disease at 2-6 years of age).

Is it possible to develop a rendering process which would completely kill the scrapie agent?

No. Studies have shown that the scrapie agent can survive ashing of infected tissues at 360°C (4).

COMMENT: Most scientists believe scrapie agent cannot be inactivated or killed by heat. U.K. data suggest that agent can survive up to 212°F for eight hours. One scientist reported he inactivated agent at 20 lb psi and 259°F for 45 minutes, but I rather doubt this information.

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