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Update on bovine spongiform encephalopathy

Abstract

Bovine Spongiform Encephalopathy, commonly called "mad cow disease" ^{bse} by members of the media, found its way into the United States and was diagnosed in December, 2003, in a Holstein dairy cow of Canadian origin. A significant disruption to the beef cattle industry immediately followed the announcement of this finding; within a matter of weeks, however, a degree of normalcy began to return to the industry. When consumers and cattle producers alike learned of the extensive firewall system that had been put in place years earlier by the USDA and the FDA to reduce the likelihood of entry of this disease into the nation's cow herd and into the human food supply, coupled with immediate further tightening of the control program requirements, their confidence that the threat of this disease was being handled properly was heightened.

Keywords

Cattlemen's Day, 2004; Kansas Agricultural Experiment Station contribution; no. 04-242-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 923; Beef; Bovine spongiform encephalopathy

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UPDATE ON BOVINE SPONGIFORM ENCEPHALOPATHY

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Bovine Spongiform Encephalopathy, commonly called "mad cow disease" by members of the media, found its way into the United States and was diagnosed in December, 2003, in a Holstein dairy cow of Canadian origin. A significant disruption to the beef cattle industry immediately followed the announcement of this finding; within a matter of weeks, however, a degree of normalcy began to return to the industry. When consumers and cattle producers alike learned of the extensive firewall system that had been put in place years earlier by the USDA and the FDA to reduce the likelihood of entry of this disease into the nation's cow herd and into the human food supply, coupled with immediate further tightening of the control program requirements, their confidence that the threat of this disease was being handled properly was heightened.

BSE History

The first case of bovine spongiform encephalopathy (BSE) was discovered in the United Kingdom (U.K.) in 1986. United States animal-health officials began following the situation as additional new cases were reported in the United Kingdom. When it was finally determined that U.K. officials were dealing with a new cattle disease that was affecting additional herds, the USDA reacted proactively to reduce the likelihood that the disease would find its way into the United States cattle herd. BSE was made a notifiable disease in the United States in 1987, months before it was made a notifiable disease in the

United Kingdom. In 1989, the United States imposed a ban on import of live ruminants and most ruminant products from countries having BSE. At that time, a trace back was also initiated on all cattle imported to the United States from the United Kingdom since 1986. Imported herds were depopulated or quarantined, and individual cattle were checked when they died or were retired from production. In 1990, the United States began a BSE surveillance program, performing histological examinations of brains of cattle. Federal and state animal diagnostic laboratories began checking for lesions of BSE any time cattle brains were submitted for other diagnostic testing. In 1997, the FDA instituted a ban on mammalian protein in ruminant feed. In 2000, the USDA began targeted, intensified surveillance of non-ambulatory cattle. In 2003, approximately 20,000 animals were tested for BSE. These firewalls were all in place before the first case of BSE was found in the United States. Routine surveillance found the BSE-positive animal from Canada when she was offered for slaughter. The system worked.

The firewalls in place in the United States are similar to those implemented in the United Kingdom after BSE began to expand in their cattle herds. The success of such firewalls in reducing new cases of BSE in the United Kingdom are shown in Figure 1.

Additional Changes

Once BSE was confirmed in the dairy cow from Canada, the USDA put additional safe-

guards in place to further ensure the safety of the human food supply. Non-ambulatory cattle were banned from the human food chain. Specific risk material (SRM), including skull, brain, trigeminal ganglia, eyes, vertebral column, spinal cord, and dorsal root ganglia of cattle more than 30 months of age, and the lower portion of the small intestine of cattle of all ages, were also banned from the human food chain. The carcasses of normal cattle being targeted or randomly tested for BSE would be held until test results indicated the cattle were negative for BSE. The air-injection stunning of cattle was banned. Mechanically separated meat was banned from human food. The head and vertebral column were banned for use in advanced meat recovery (AMR). And last, but not least, a verifiable system of national animal identification was to be instituted.

Next Steps

The USDA will continue trace-back efforts to find all animals that came from

Canada with the initial BSE cow. USDA surveillance will be stepped up at all levels of cattle production. Cattle producers, veterinarians, animal-feed manufacturers, rendering-plant operators, and processors producing food for human consumption need to assume their respective roles in keeping the firewalls up and ensuring that the effects of any incursion of BSE into the United States are minimized.

References

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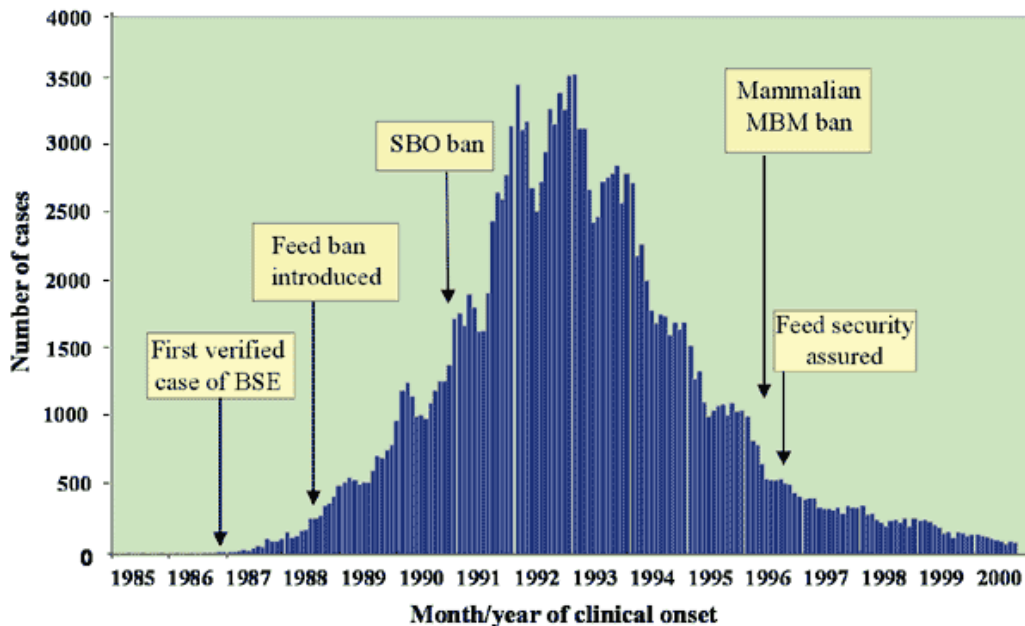


Figure 1. New Cases of BSE in the United Kingdom.

Bovine Spongiform Encephalopathy

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Bovine spongiform encephalopathy (BSE) is a slowly progressing fatal disease affecting the central nervous system of cattle. The disease was first diagnosed in Great Britain in 1986 and belongs to a family of disease known as transmissible spongiform encephalopathies (TSE's). A number of diseases of animals including scrapie, chronic wasting disease, and transmissible mink encephalopathy; as well as the human diseases, Creutzfeldt-Jacob disease, kuru, and Gerstmann-Straussler-Scheinker syndrome are other example of TSE's. The causative agent of these TSE's is an incompletely characterized infectious agent known as an unconventional virus or prion.

BSE Epidemic

Since 1986, approximately 176,000 cases of BSE have occurred among nearly 34,000 herds mostly in the United Kingdom (UK). The epidemic peaked in January 1993 with nearly 1,000 new cases reported weekly. Approximately two-thirds of the dairy herds in the UK have had at least one case of BSE, while only one in six beef herds have reported cases. The outbreaks in the UK are believed to have resulted from the feeding of scrapie-containing sheep meat-and-bone meal. Accordingly, there is general agreement that the outbreak was increased by feeding bovine meat-and-bone meal to young calves. Subsequently, in July 1988, ruminant protein in ruminant feed was banned. The ban significantly diminished the incidence of new clinical cases in five years, which is the incubation period of the disease. However, approximately 36,000 new cases have been diagnosed since the ban, which indicates the ban was not totally effective. Consequently, a ban from feeding any mammalian protein to any farm animal species was implemented in the United Kingdom in 1996. The number of new cases continues to decline at a steady rate.

Clinical Signs

Affected animals may display changes in temperament, such as nervousness or aggression, abnormal posture, incoordination, difficulty in rising, and decreased milk production despite continued appetite. Initial clinical signs may be quite subtle and mainly behavioral in nature. The signs progress over weeks to months with the animals condition deteriorating from 2 to 6 months and most reaching a terminal state by 3 months. Upon clinical diagnosis with some certainty, euthanasia is advisable as animals may become unmanageable and their welfare is at risk.

Diagnosis

There is no reliable test to detect the disease in live animals. Microscopic examination of brain tissue at necropsy is the primary laboratory method used to confirm a diagnosis of bovine spongiform encephalopathy. Also, immunohistochemistry and immunoblotting are used to detect the disease agent.

PREVENTION

There has not been one reported case of BSE in native cattle in North America, although Canada has one confirmed case of an infected

cow imported from Great Britain. Because treatment of BSE has proved ineffective, the infected cow was destroyed as well as all herd mates and any animals that were determined at risk.

Many countries and governmental agencies have implemented programs to slow and prevent the spread of the disease. The United States Department of Agriculture (USDA) has formed a proactive and preventive policy, which has taken measures in surveillance, prevention, education, and response. The Animal Plant Health Inspection Service (APHIS) has created a TSE working group to analyze risks to the United States and is sharing information with the Center for Disease Control, Food and Drug Administration, the National Institute

of Health, and the Food Safety and Inspection Service.

Restrictions began in 1989 with the banning of importation of ruminants, bovine serum, embryos, and meat-and-bone meal from the United Kingdom. Surveillance began in 1990 with a program including histological examination of brain tissue of high risk cattle, and the traceback of cattle imported from the UK. Accordingly, on August 4, 1997, the FDA established guidelines that prohibit the feeding of most mammalian proteins to ruminants. As of December 1997, APHIS has prohibited the importation of live ruminants and most ruminant products from Europe until a thorough assessment of the risk is made.

Under title 9 code of federal regulations, parts 71

and 161, BSE is a reportable disease by accredited veterinarians. The USDA has trained more than 250 state and federal veterinarians located throughout the United States in the recognition of BSE. Any person or veterinarian suspecting an animal of BSE should report the animal immediately to the nearest diagnostic laboratory and the state veterinarian.

Further Reading

Center for Disease Control
<http://www.cdc.gov/>

European Government
<http://www.maff.goc.uk/animal/bse>

Food and Drug Administration
<http://www.fda.gov/cvm>

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