

## **TSE'S – U.S. ENFORCEMENT STRATEGIES AND WHAT THEY MEAN TO YOU.**

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In response to concerns by the World Health Organization, and various other authorities around the globe, over the threat of additional transmissible spongiform encephalopathy epidemics, Federal regulation now prohibits the use of proteins derived from mammalian tissue in feed for ruminant animals. This regulation removes those animal proteins from Generally Recognized As Safe status and relocates them as food additives subject to the various restrictions imposed by the regulation. This regulation has aspects that potentially affect all animal feeds. As new evidence surfaces regarding both the causal agent(s) and the scope of the diseases, suggesting that more zoo animals may be susceptible than previously thought, understanding the regulation and its individual elements for compliance becomes increasingly important for zoo personnel.

### **BACKGROUND**

Bovine spongiform encephalopathy (BSE), popularized in the recent press coverage of the European epidemic as “mad cow disease,” belongs to a group of progressively degenerative neurological diseases, collectively known as transmissible spongiform encephalopathies (TSE's)(See Table 1.) TSE's are characterized by long incubation periods, short clinical course, 100% fatality, and no known course of treatment. The causative agent has not been fully characterized; however, resistance to physical and chemical agents that destroy nucleic acids essentially rules out conventional microbial and viral agents. The scientific community is increasingly referring to the “prion” theory as the most likely source of infection. The infection seems to be dependent on the infected animal's own proteins, while the lack of foreign proteins allows the infectivity to remain invisible to the host's immune system. This “invisibility” fails to provoke an antibody response, which causes the development of typical vaccines and simple detection techniques to likely be improbable. The current test, other than post-mortem histopathology, involves the isolation of the appropriate suspected infected tissue (brain and other nervous tissue being best), injecting it into mice and waiting about 700 days for any symptoms to develop. The peculiar nature, invisibility, of the disease explains the possibility of spontaneous mutation as well as the spread from exposure, as this disease has the peculiarity of being both an acquired infection and a Mendelian inherited disease, generally considered inconsistent with an infectious agent. Additionally, the vulnerability of one species versus another varies considerably. A number of domestic cats (>86) in Great Britain have contracted encephalopathy; however, not a single dog, pig or horse have, despite exposure to the same agents thought to have transmitted the disease to the cats.

Generally, the human forms of the diseases are extremely rare: CJD affects about 1 in 1,000,000 worldwide, GSS occurs at about 2% of the rate of CJD, and only about 2600

**TABLE 1. Known TSE's.**

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ANIMAL TSE's

Sheep scrapie

Bovine spongiform encephalopathy (BSE)

Transmissible mink encephalopathy

Feline spongiform encephalopathy

Chronic wasting disease in deer and elk

Also reported in exotic ruminants including nyala, oryx, eland, gemsbock, and kudu, exotic primates including rhesus monkey, spider monkey, and lemur, and exotic cats including cheetah, ocelot, tiger and puma.

HUMAN TSE's

Creutzfeldt-Jakob disease (CJD) *now referred to as sporadic Creutzfeldt-Jakob disease*

New variant Creutzfeldt-Jakob disease (nvCJD)

Gerstmann-Straussler-Scheinker syndrome (GSS)

Kuru

Alpers Syndrome

Fatal familial insomnia

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cases of kuru in all. BSE, however, first observed in Great Britain in 1985 and diagnosed in 1986, peaked as an epidemic averaging approximately 1,000 new cases per week and involving more than 176,000 cattle. And although 95% of these were in the U.K., BSE has been reported in native cattle in France, Switzerland, Netherlands, Belgium, Portugal, Luxembourg, Liechtenstein, the Republic of Ireland, Northern Ireland and the U.K. Epidemiological studies have characterized the outbreak of BSE in the U.K. as an extended common source epidemic.

This devastating epidemic of BSE was followed by an even more startling discovery that the prion protein found in the infected tissue of patients with nvCJD is the same prion protein associated with BSE. Currently, there have been 40 confirmed cases of nvCJD in the U.K. and one in France.

## **REGULATION**

The regulation is designed to prevent the establishment and amplification of BSE through animal feed in the U.S. by prohibiting the use of certain mammalian proteins from being fed to ruminants. Products identified in Table 2 are typically used in the manufacture of animal feeds, but are no longer considered GRAS and are referred to under the regulations as "Prohibited Materials." Products identified in Table 3 are "Non-Prohibited Materials," and are considered exempt from the regulation due either to their not being protein or tissue or being considered low risk products.

**TABLE 2. The Association of American Feed Control Officials (AAFCO) has identified the following definitions from the Official Publication as “Prohibited Materials.”**

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· Meat	· Meat and Bone Meal
· Meat Meal	· Meat and Bone Meal Tankage
· Meat Meal Tankage	· Bone Meal, cooked
· Dried Meat Solubles	· Bone Meal, steamed
· Meat Protein Isolate	· Fleshings Hydrolysate
· Meat By-Products	· Hydrolyzed Leather Meal
· Animal By-Product Meal	· Leather Hydrolysate
· Animal Liver	· Hydrolyzed Hair
· Glandular Meal and Extracted Glandular Meal	· Unborn Calf Carcasses
· Animal Digest	· Stock
· Cooked Bone Marrow	· Food Processing Waste
· Mechanically Separated Bone marrow	· Restaurant Food Waste

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**TABLE 3. “Nonprohibited Materials” derived from mammals include:**

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• Blood and blood products
• Milk products (including milk proteins)
• Gelatin
• Pure porcine (pork) or pure equine (horse) protein products
• Inspected meat products, such as “Food Processing Waste” or “Restaurant Food Waste,” which have been cooked and offered for human food and further heat processed for animal feed.
• Grease, tallow, fats, and oils
• Amino Acids

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Critical components of the regulations that should be considered in utilization of feedstuffs within your feeding operations include:

1. Do not feed products labeled with the caution statement: “Do not feed to cattle or other ruminants” to ruminant animals.
2. Maintain copies of all purchase invoices for all feeds received that contain animal protein.
3. Maintain copies of labeling for all feeds received containing animal protein products.
4. Keep invoices and labeling available for inspection and copying.
5. Maintain the records for a minimum of one year.

Additionally, renderers, protein blenders, and feed manufacturers are required to label products containing prohibited materials with the cautionary statement “Do not feed to cattle or other ruminants.” If you intend to use a feed containing prohibited material for non-ruminant animals, you must take steps to insure that the feed will not be fed to ruminants.

## **CONCLUSIONS**

Although the risk for BSE in the United States is small, there are a few measures that can prevent BSE from occurring due to the possible spontaneous occurrence as observed in other TSE's. The consequences and cost to the U.S. cattle market would be devastating and this consideration, along with the potential exposure to the human public, has played a major role in developing this regulation. We must learn from the U.K. experience and prevent at all costs the transmission of undiagnosed BSE. The provisions and requirements of the regulation represent the current science, but since TSE's are emerging diseases, the science is limited and additional research is needed. What the regulation does not fully address is the consideration and impact of all exotic species. Zoos and other exotic animal facilities were clearly considered by both FDA and USDA in the regulation development process, but protection is not provided to the extent of the food and livestock markets. As the science becomes clearer, particularly regarding zoo primates, caution should be taken in evaluating diets for these animals.

## **SOURCES OF INFORMATION**

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