Bovine Spongiform Encephalopathy Epidemiologic Process and Testing Protocols

Once a cow tests positive for bovine spongiform encephalopathy (BSE), veterinarians at the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) immediately begin an epidemiologic investigation. Its purpose is to identify and locate cattle that may have been exposed to the same source of BSE prions, presumably in contaminated feed, as was the BSE-positive or index cow. It is unlikely that these animals have BSE, but by association, they are now part of the targeted population for testing.

The epidemiologic process requires we determine the origin of the index cow and locate any progeny or birth cohorts to verify there is not more than one infected animal from the same herd.

Birth Cohort

Experience in countries that have previously detected BSE indicates that it is uncommon to have more than one infected animal in the same herd. However, BSE epidemiology efforts focus on birth cohorts—all cattle born on the positive animal's birth premises within 1 year, before or after, the date of birth of the BSE-positive animal—in order to determine a common feed source as the possible mode of infectivity. (Note: If the precise date of birth of the index animal is unclear, a potential age range is used, with 1 year added to each end of that range.)

In most cases, some of the birth-cohort animals will have moved off the birth premises; others will have gone to slaughter or died. Investigators can sometimes pinpoint the current locations of these animals or where they have been in the past by thoroughly examining herd records.

Cattle of Interest

When birth cohorts cannot be definitively identified, a herd inventory and analysis of herd records are used to identify a group of cattle that includes all birth cohorts as well as any other cattle that cannot be ruled out as birth cohorts. All of these animals—birth cohorts and any additional cattle—will be defined as "cattle of interest." Any progeny of the positive animal born in the last 2 years are also considered cattle of interest.

All cattle of interest are further evaluated using a number of identification techniques. The goal is to narrow the group and eliminate all cattle that are not birth cohorts or progeny. Depending on the specific circumstances involved, several factors could be useful in identifying cattle of interest. These include age, gender, breed, color, man-made identification (eartags, tattoos, brands), and known premises of birth. Obvious factors, such as age, gender, and breed, will be used to the extent possible to limit the size of the group being evaluated. More specific information from herd-management records and any other available records will then be compared against man-made identification from the remaining potential cattle of interest. Ultimately, cattle that cannot be eliminated based on any of these factors will be included in the group of cattle that will be depopulated and tested for BSE.

While APHIS works to locate as many of the cattle of interest involved in a BSE case as possible, it is important to reiterate the safeguards in place to protect against BSE and protect public health. These policies include banning nonambulatory ("downer") animals at slaughter from the human food and animal feed chains, removing specified risk materials (tissues known to harbor the prions that cause BSE) in animals over 30 months of age, banning certain slaughter techniques, and most importantly implementation of the ruminant-to-ruminant feed ban. Cattle can become infected with BSE by eating feed contaminated with the infectious BSE agent. This is why in 1997 the U.S. Food and Drug Administration prohibited the use of most mammalian protein in the manufacture of animal feed intended for cows and other ruminants.

Testing Protocol

Brain samples from cattle suspected of having BSE will be tested at any one of the seven USDA-APHIS-approved State veterinary diagnostic laboratories and/or USDA's National Veterinary Services Laboratories (NVSL) in Ames, IA, according to the following testing protocol:

1. The BioRad® enzyme-linked immunosorbent assay (ELISA) rapid-screening test is performed at seven State veterinary diagnostic laboratories working on BSE testing under APHIS authority.
2. If a sample tests negative for BSE on the initial ELISA screening test, it is considered negative and no further diagnostic testing is performed.

3. If the sample is reactive on the initial ELISA screening test, it is considered an Initial Reactor for BSE and the ELISA screening test is repeated in duplicate by the testing laboratory.
4. If either of the repeat tests on the Initial Reactor sample is reactive, the sample is then considered "inconclusive" and will be shipped to NVSL for confirmatory testing.
5. NVSL personnel perform an immunohistochemistry (IHC) test on the samples as one of the confirmatory tests.
6. Concurrent with IHC testing at NVSL, a SAF Immunoblot (Western blot) test is run at USDA's National Animal Disease Center in Ames, IA.
7. If the sample is negative on both SAF Immunoblot and IHC, it is considered negative for BSE and for APHIS regulatory purposes.
8. If the sample tests positive from either IHC or SAF Immunoblot, it is considered positive for BSE and for APHIS regulatory purposes.
9. Further testing on that sample for the purposes of characterization and/or research may be performed only after consultation with the Secretary of Agriculture. Recommendations for further testing will be conveyed through the APHIS Deputy Administrator for Veterinary Services. If further testing is requested, NVSL will provide the Deputy Administrator with a specific testing protocol together with a written explanation of that protocol.