USDA's Mad Cow Disease Surveillance Program: A Comparison of State Cattle-Testing Rates

A Report by

Public Citizen
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EXECUTIVE SUMMARY

? Mad cow disease or bovine spongiform encephalopathy (BSE) has been diagnosed in cattle in over a dozen European countries.

? Over 100 people have been diagnosed with the human form of BSE, known as variant Creutzfeldt-Jakob disease of vCJD

? No cases of either BSE or vCJD have been diagnosed in the U.S.

? The U.S. Department of Agriculture (USDA) is responsible for conducting surveillance for BSE through testing of cattle brains; it claims that tests are occurring on a random basis

? We used data from the USDA to compare the cattle testing rates between states for the period August 1997-December 2000.

? The testing rate ranged from 1,004 brains per million cattle slaughtered (New York) to 0.5 brains per million cattle (Kansas). The median testing rate was 21 brains per million cattle.

? Attempts to adjust for the age of the cattle slaughtered or their feed do not account for the massive variations in testing rates between states.

? The report made four recommendations:

1. Increase the transparency of the testing
2. Develop clear criteria for the selection of animals for testing
3. Provide the states with specific goals for the number of cattle to test
4. Conducting unannounced inspections to monitor compliance

Bovine spongiform encephalopathy (BSE) or "mad cow disease" is a degenerative, irreversible, invariably fatal neurological disease that was first identified in British cattle in 1986. Since then, cases of the disease have been diagnosed in cattle in over a dozen European countries, including France, Germany and Italy.[1] BSE is widely assumed to have caused a related fatal disease, variant Creutzfeldt Jakob disease (vCJD), which was first detected in Britain in 1996. Approximately 100 people in Britain, France, Ireland[2] and now Hong Kong have fallen ill, and most have already died. The cases in Ireland and Hong Kong are thought to have resulted from exposure while the patients were living in England. To date, there have been no cases of vCJD diagnosed in the U.S.

In order to protect American consumers from BSE, the federal government has implemented several protective measures. These include a ban on imports of ruminants and feed from Europe and a ban on the feeding of most types of mammalian protein to ruminants. In addition, a surveillance program that tests cattle brains for signs of the disease was initiated in May, 1990 by the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA). As of March 31, 2001 the surveillance program had tested 12,341 bovine brains. None of these tested positive for BSE.[3]

In recent years, the surveillance program has expanded substantially, although so far not to an extent we believe adequate. Between 1990 and 1992, fewer than 100 brain submissions per year were received by the National Veterinary Services Laboratory (NVSL), the main agency doing BSE testing in the U.S. From 1993 to 1995, NVSL recorded between 400 and 500 tests per year. Since then tests have steadily increased, with approximately 2,300 in 2000.[3]

For the purposes of detection of BSE, there are three populations of cattle that might be tested: 1. Cattle suffering from central nervous system disorders (e.g., tumors, listeria); 2. Cattle that are unable to ambulate ("downer" cattle); and 3. Normal cattle. Logically, one would first assure that all cattle with central nervous system signs are tested, since neurological symptoms are a hallmark of BSE. The number of such cattle tested has remained stable at about 400 per year. . While it is not necessarily true that cattle with neurological symptoms are being sampled consistently temporally and geographically, the similar numbers of such cattle tested per year provides a measure of assurance that this is so. Next one would begin to test downer cattle. The total number of downer cattle tested has increased from almost 200 in 1994 to about 1900 in 2000. Particularly because there is no clear definition of what constitutes a downer animal, any variations in overall BSE testing rates (either geographically or temporally) would most likely be the result of variability in downer cattle testing rates. The annual number of downer cattle slaughtered

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1 European Union. Bovine Spongiform Encephalopathy. Available at: http://europa.eu.int/comm/food/fs/bse/index_en.html. Downloaded on July 16, 2001.

2 Monthly Creutzfeldt-Jakob Disease Statistics. Available at: http://www.doh.gov.uk/cjd/stats/jul01.htm. Downloaded on July 16, 2001.

3 USDA. BSE Surveillance. http://www.aphis.usda.gov/oa/bse/bsesurvey.html. Downloaded on June 13, 2001.

in the U.S. is usually estimated at 100,000. No normal cattle are tested in the U.S. at the present time. Western European countries, which are considered to generally have BSE, are now conducting tests of normal cattle. A total of 76 positive tests occurred in 1.8 million healthy cattle tested between January and April 2001, for a rate of 0.004%.[4]

The USDA claims that the surveillance program has included a "random sampling of … 'downer cattle' at slaughter."[3] Presumably, this means that any one "downer" animal is as likely as any other to be selected for testing. This is an appropriate goal, because one would want any surveillance system to be about as likely to detect the disease wherever it arose.[5] A truly random sampling scheme should, all things being equal, produce approximately equal testing rates across states. The purpose of this study was to determine if this is true.

METHODS

The goal of the research was to compare cattle testing rates across states. To determine testing rates, one needs a numerator (the number of cattle tested) and a denominator (the number of cattle slaughtered) for each state.

The analysis was restricted to the period between August 1997 and December 2000. We excluded the period prior to 1997 because the numbers of cattle tested have increased so substantially in recent years. See below for further justification for the August cutoff.

Data on cattle tested

There are three sources of cattle testing data for USDA's active surveillance system. First, there are the state Veterinary Diagnostic Laboratories (VDLs), which accounted for 36% of brain samples collected between May 1990 and March 31, 2001 and 23% of brain samples during the study period. These are primarily from animals suspected of having rabies or other domestic diseases, primarily in the field, not in slaughterhouses, and are not ordered primarily for the detection of BSE. Second, the largest source (62% of brain samples) is APHIS's National Veterinary Services Laboratory (NVSL). NVSL conducts brain biopsies on cattle presented for slaughter with signs of central nervous symptom disorders, "downer" cattle and cattle in which domestic diseases such as rabies had been ruled out. Over 70% of NVSL testing has occurred since 1997. Finally, a small fraction (1%) of brains were tested by the Centers for Disease Control and Prevention (CDC). The CDC project involved BSE surveillance associated with rabies diagnosis, but was

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4 Donnelly C. Mathematical modeling of potential BSE exposures in various BSE countries. Presented at U.S. Food and Drug Administration Transmissible Spongiform Encephalopathy Advisory Committee meeting, June 28, 2001.

5 An exception would be if there were strong reasons to believe that BSE would be substantially more likely to occur in one geographic region than another. But there are no strong reasons of this sort.

discontinued prior to the period of study here. The USDA does not provide data for testing broken down by the various categories of cattle (stags, heifers, etc.).

This analysis focuses on the NVSL data.[6] NVSL is probably most likely to detect a case of BSE than VDL because it tests the highest-risk animals. Moreover, because the NVSL is a federal program, it is more susceptible to federal policies. In addition, because the rates of suspected rabies or other domestic diseases (the indication for many of the VDL tests) may have varied by state, the NVSL-only testing rates should, in theory, be essentially independent of geography, for any category of cattle.

In 1997, the Government Accountability Project (GAP) submitted a Freedom of Information Request to the USDA asking for BSE testing information, broken down by state, and received data covering the period from May 1990 through July 31, 1997. Until recently, USDA's website[3] provided testing data only for the period May 10, 1990 to December 31, 2000. We therefore determined the number of tests conducted between August 1997 and December 2000 by subtracting the GAP data from the USDA website data.

Data on cattle slaughtered

Data on bovines slaughtered at federally inspected establishments in each state, broken down by year and category of bovine, are available at the USDA's National Agriculture Statistics Service website.[7] In those few states where data were missing for some part of the study period, data were generated by extrapolation from the months for which data were available. We conducted three separate analyses: 1 All cattle, excluding calves[8] (steers,[9] heifers,[10] all cows,[11] bulls[12] and stags[13]); 2. "Old animals" (cows, bulls and stags); and 3. Dairy cows. In 2000, for example, the total number of cattle slaughtered was 35.6 million, of which 6.0 million (16.9%) were old animals. In that same year, 2.6 million dairy cows were slaughtered (7.3% of all cattle and 43.3% of old animals).

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6 We conducted similar analyses using both the NVSL and the VDL data. These generated similar results to the NVSL-only analyses, but are not presented here. These results can be obtained from Public Citizen.

7 National Agricultural Statistics Service. Available at: http://www.nass.usda.gov:81/ipedb/. Downloaded on July 16, 2001.

8 Bovines that are generally less than six months old (about 3% of all bovines slaughtered annually)

9 Young castrated male cattle generally less than two years of age.

10 Young female cattle generally less than two years of age that have not given birth to a calf.

11 Mature female cattle, including dairy cattle and breeding cattle.

12 Mature male cattle

13 Male cattle, castrated in maturity.

We paid particular attention to older animals because they are more likely than younger animals to show the clinical symptoms of BSE, are more likely to show evidence of the disease at autopsy and are likely to be more infectious than younger animals. It is possible that USDA might have focused its testing in that population of cattle. The higher prevalence of BSE in older animals is in part because of the long incubation period of the disease and in part because older animals have had more opportunity to be exposed to the BSE agent.

We also looked especially at dairy cows because they also tend to be somewhat older than beef cows (or any other category of cattle) at slaughter, a reason to focus disproportionately on this group for testing. Moreover, dairy cows may have been more likely to have been fed meat and bone meal which could have included – intentionally or by accident – ruminant protein (which increases the fat and protein content of milk) prior to the feeding ban. For each of the three cattle categories, we selected the 20 states with the highest numbers of animals slaughtered.

We then divided the number of brains tested from that state (the numerator) by the number of animals slaughtered in that state (the denominator). We did this analysis for the three different populations of animals slaughtered (all cattle, old animals, and dairy cows) and then ranked the states by their testing rates in these analyses. The data were entered in an Excel 97 spreadsheet and analyzed using Stata Version 6.

RESULTS

The primary outcome of interest was the ratio between the testing rate in the state with the highest testing rate to that with the lowest testing rate (among the 20 states with the highest number of slaughtered animals in that category).

A. All cattle

The top 20 cattle states accounted for 98% of all cattle slaughtered during the study period. The median number of cattle slaughtered in these states during the study period was 3.2 million (range: 250,000 (New York) – 26.6 million (Kansas)). The median number of brains tested was 23 (range: 2 (Michigan) – 1533 (Texas)).

There was enormous variation in the rates of testing by state. While the highest rate of brain testing was 1004 per million cattle in New York, it was 0.5 per million cattle in Kansas, an approximately 2000-fold difference (median testing rate: 21 per million cattle for all 20 states). Although New York's testing rate was considerably higher than for the state with the second-highest testing rate (California with 199 brains tested per million cattle), even this second place rate was 400 times higher than Kansas's rate. There was no correlation between the number of cattle slaughtered in a state and its testing rate (Kendall's $\tau = -0.26$; $p = 0.12$).

B. Old animals

The top 20 old animal states accounted for 95% of all old animals slaughtered during the study period. Seventeen of the top 20 old animal states were also in the top 20 all cattle states. The median number of old animals slaughtered in these 20 states was 603,000 (range: 129,000 (Missouri) to 3.3 million (Texas)).

Again, huge variations between the testing rates in these states were apparent. The highest ranking state (New York with 1184 brains tested per million old animals) had a testing rate about 400 times that of the lowest ranking state (Minnesota with 3 per million old animals). The median testing rate was 58 per million old animals. There was no correlation between the number of old animals slaughtered in a state and its testing rate (Kendall's $\tau = -0.06$; $p = 0.72$).

C. Dairy cows

The top 20 dairy cow states accounted for 88% of all dairy cows slaughtered during the study period. Sixteen of the top 20 dairy cow states were also in the top 20 all cattle states. The median number of dairy cows slaughtered in these 20 states was 168,000 (range: 41,000 (Florida and New Mexico) to 2.5 million (Wisconsin)).

Once more, huge variations between the testing rates in these states was apparent. The highest ranking state (Texas with 4034 brains tested per million dairy cows) had a testing rate almost 600 times that of the lowest ranking state (Minnesota with 7 per million dairy cows). The median testing rate in the 20 states was 162 per million dairy cows. There was no correlation between the number of dairy cows slaughtered in a state and its testing rate (Kendall's $\tau = -0.17$; $p = 0.31$).

CONCLUSIONS

This report clearly demonstrates that there are enormous variations in the BSE testing rates between states. States with the highest rates of testing had rates 400 to 2000 times those of the lowest states. This enormous variability suggests that the USDA's testing program is being administered in a haphazard fashion. Moreover, USDA's claim that there have been no cows detected with BSE in the U.S. is not very compelling for states with low testing rates.

Alternative explanations for these findings are essentially ruled out by the data. Because extremely large variations between states persist even when older animals and even dairy cows are used as the denominator, it is not likely that targeting testing at older cattle explains these findings. (The findings are fairly similar across the three cattle categories: seven states are among the 10 states with the highest testing rates in all three categories.) Differences in state laboratory practices also do not explain the data because we focused on the federal NVSL data. High testing rates in smaller cattle states (one can get very high ratios when dividing by small numbers) are also not the cause of the findings, because in each category of cattle, we only looked at the 20 states with the largest

numbers of cattle slaughtered. Moreover, in each category of cattle, there was no correlation between the number of cattle slaughtered and the testing rate. Testing variations are also not attributable to surveillance targeted according to feeding practices. The northeastern states are probably most likely to use animal protein feeds because plant protein is less available there, but these states represent only a minority of cattle slaughtered and their testing rates are not much higher than other states' testing rates. Aside from variations in feeding practices and the categories of cattle farmed (and hence their ages), there is no reason to expect BSE to be more likely to appear in one part of the country than in another. Although high or low rates of testing by large plants in small states might explain some of the findings, they cannot explain the overall variations. The basic finding is this: the variations between states, even after all these adjustments, are so large that none of these alternative explanations is viable.

We believe that much of the variability is in the testing of "downer" cattle. Even as the total number of cattle tested has increased substantially in the past several years, the number of cattle with neurological symptoms tested has remained essentially stable. The USDA has stated that it will increase the number of cattle tested annually to 5,000, presumably by expanding testing in the "downer" cattle population, but even this would represent approximately 5% of this population. Particularly when small percentages of populations are being tested, it is important that each animal be as likely as any other to be selected for testing.

But all of the evidence presented here suggests that current practices not well coordinated. USDA has no definition of exactly what constitutes a "downer" animal, and so slaughterhouse veterinarians inevitably rely upon subjective judgments. On top of this problem, there may be other cattle that would be good candidates for BSE testing that are simply never presented to slaughterhouses by the farmer (and thus cannot be reflected in our data) or slaughtered in smaller plants where a veterinarian is not always on duty.

The analyses for old animals and dairy cows represent our attempt to adjust for the possibility that USDA has conducted its testing disproportionately among these higher-risk animals. However, the USDA does not make available brain testing data that are broken down by category of cattle. It is for this reason that we have placed most emphasis in this report on the testing rates for all cattle. However, regardless of the method used, we always found interstate variations far above anything that could be considered vaguely acceptable.

The data presented here are collected by the state in which the animal was slaughtered and tested (these will be the same). However, cattle may be transported to another state for slaughter and, of course, are likely to be consumed in states other than the state in which they were slaughtered. For this reason, the data presented are not intended to provide consumers with guidance as to more or less safe states in which to consume cattle products.

This report does not address the question of what the correct testing rate is. It simply documents enormous inconsistencies in the way the current surveillance program is being

applied. We note that during the study period only three states (New York, California and Pennsylvania) tested all cattle at rates higher than the USDA is currently proposing (5,000 tests for 35.6 million cattle slaughtered in 2000, or a rate of 140 tests per million cattle slaughtered. Although we welcome the increase in BSE testing USDA has promised, this increase will be of only limited value if the testing is not spread more uniformly across the country than it has been to date. Indeed, especially for the states with lower testing rates, spreading testing more evenly across the country will have a bigger impact than increasing the national testing rate by the amount contemplated by the USDA.

RECOMMENDATIONS

? Increase the transparency of the testing process so that consumers can better understand the criteria and processes for testing

? Developing clear criteria for the selection of animals for testing, including a clearer definition of what constitutes a "downer" animal

? Provide the states with specific goals for the number of cattle from various categories that need to be tested

? Conducting unannounced inspections to monitor compliance