THE HUMANE SOCIETY
OF THE UNITED STATES

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The Humane Society of the United States
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Mr. Chairman and members of the subcommittee, thank you for the opportunity to testify in the wake of a hidden-camera investigation of a dairy cow slaughter plant in southern California conducted by The Humane Society of the United States. The Humane Society of the United States, as you know, is the nation's largest animal protection organization with 10.5 million supporters nationwide, and I serve as president and CEO of the organization.

Our undercover investigator worked at the Hallmark/Westland Meat Packing Company for approximately six weeks at the end of 2007. The investigator witnessed and documented egregious mistreatment of animals, particularly downed cows too sick or injured even to stand or walk. He filmed workers ramming cows with the blades of a forklift, jabbing them in the eyes, applying painful electrical shocks often in sensitive areas, dragging them with chains pulled by heavy machinery, and torturing them with a high-pressure water hose to simulate drowning, all in attempts to force crippled animals to walk to slaughter. In one case, he videotaped a cow who collapsed on her way into the stunning box. After she was electrically shocked and still could not stand, she was shot in the head with a captive bolt gun to stun her and then dragged on her knees into slaughter.

This investigation has done more than expose one company's abusive practices. It has led us to the inescapable conclusion that there are serious shortcomings in the U.S. Department of Agriculture's (USDA's) policy on handling downer cattle and the agency's ante-mortem inspection program.

Downed cattle are more likely to be infected with BSE – bovine spongiform encephalopathy or "mad cow disease." Studies also suggest that they may be more likely to harbor foodborne bacteria, such as *E. coli* and *Salmonella*, which kill hundreds of Americans every year, as these non-ambulatory animals often lie in bacteria-laden waste and may have higher levels of intestinal pathogens due to stress. Children and the elderly are more likely to fall victim to severe illness requiring treatment and hospitalization as a result of both of these pathogens. For a more detailed discussion of the human health risks associated with the slaughter of downed cattle, please see the addendum to this testimony.

The Investigation

In fall 2007, our investigator applied for a position with the Chino, California-based Hallmark Meat Packing Company, a federally inspected slaughter plant, which supplied carcasses to Westland Meat Company, which, in turn, processed the carcasses into ground beef. The companies were affiliated and essentially treated as one entity; they operated from the same building and shared the same USDA registration number. From USDA's own records, we learned that in 2007 Westland was the second-largest supplier of beef to USDA's Agricultural Marketing Service (AMS). As you know, AMS purchases beef for distribution to needy families, the elderly, and also to schools through programs, including the National School Lunch Program, administered by the Food and Nutrition Service. Westland was named the USDA "supplier of the year" for the 2004-2005 academic year.

It is critical to point out that we did not do a broad risk assessment of a large number of plants and then conduct a more thorough examination of a high-risk facility. The plant was selected at random, and during the course of the investigation, we learned that Westland was the number-two beef supplier to the National School Lunch Program and to other USDA commodity distribution programs. We learned after the field portion of the investigation that Hallmark/Westland had previously been cited for mishandling animals.

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The investigator's job at Hallmark was to help drive cattle from transport trucks and holding pens into a chute that led to the killing floor. He regularly worked grueling ten-hour days, five or six days a week. The job of getting tired, bewildered, and hungry cattle to move is challenging and made even more difficult when the animals are primarily end-of-production, or "spent," dairy cows, who are often sick, injured, and suffering.

Every day, he witnessed blatant and commonplace cruelties inflicted on animals by employees who purposefully ignored regulations meant to prevent the torment and abuse of downed animals simply so they could get these cattle who could not even walk into the kill box. These were not isolated incidents of mistreatment of downed cattle, but deliberate acts that happened routinely at the plant. They were part of the culture of the operation.

A USDA inspector was only present in the live animal area twice daily at 6:30 a.m. and 12.30 p.m. – predictable times at which he merely noted those animals who could not stand and then approved the remainder for slaughter. Let me emphasize the lack of rigor in the approval-for-slaughter process. The veterinarian did not make an animal-by-animal inspection, but simply took a look at large groups of animals, 30 or 35 at one time, as they passed by him, and if the animals could stand or walk, he would approve them. The inspector typically approved 350 animals for slaughter in the morning and then about 150 animals in the afternoon inspection.

The horrific treatment of animals we documented is being downplayed as an unconscionable aberration – the work of just a handful of rogue employees. We do not believe this is an accurate characterization. It has come to light that Hallmark/Westland had a long, documented history of abusing downed cattle. In fact, the Food Safety and Inspection Service (FSIS) cited Westland in 2005 for mishandling animals, and the local Pomona Valley Humane Society and SPCA notified USDA three times about possible violations in 1996 and 1997. In 1996, the Pomona Valley Humane Society sent a letter to Hallmark, with a copy to USDA, stating: "We have had numerous incidents with your facility in the past involving downer animals and loose animals creating public safety issues." In 1993, Farm Sanctuary produced undercover footage of downers being lifted by forklift at Hallmark, prompting introduction of a California downer cattle law the next year. Either management provided instructions to get the downers moving or was asleep at the wheel and let employees run wild – in either case, it's an indictment of management.

USDA Policy

In terms of the larger picture of USDA oversight, we also know that slaughtering nonambulatory cattle was not isolated to this plant. It is, in fact, allowed under current USDA rules. A shift in policy to allow downed cattle in the food chain marks a retreat from a strict no-downer policy that USDA had in place on the books since the beginning of 2004.

Specifically, on December 30, 2003, USDA announced: "Effective immediately, the USDA will ban all downer cattle from the human food chain." This announcement came one week after public disclosure of the first U.S. case of BSE – a dairy cow in Washington State who was identified by a USDA veterinarian as downed due to calving injuries and later tested positive for BSE.

USDA has broadcast its no-downer policy as a key protective firewall against BSE. Most Americans had no idea that meat from animals too sick or injured to walk on their own could end up on their dinner plates. The agency's announcement helped ease public panic in the United States over the first domestic BSE case and maintain consumer confidence both in the safety of the food supply and in the basic humane treatment of animals at slaughter plants. The announcements were also widely publicized to provide assurances to America's trading partners, dozens of which had closed their markets to U.S.-produced beef after the BSE finding.

Unacceptable Loophole

In January 2006, the USDA's own Office of the Inspector General (OIG) chastised the agency for its inconsistent application of policies and regulations related to downed animals after observing downers processed at two facilities. The use of a forklift was observed to transport the animals to the slaughter area. The OIG found that 29 downer cattle were slaughtered for human food at a sample of 12 slaughter plants checked during a 10-month period. If this were a representative sample it would suggest that more than 100 slaughter plants may be processing downed cattle across the country. The OIG audit noted the lack of documentation on the animals' fitness for consumption.

For years, USDA has publicly boasted about its comprehensive no-downer policy but circumvented it behind the scenes with a loophole that permitted slaughter of some cattle unable to walk. The agency has failed to follow its official interim policy published on January 12, 2004, which specified that all downer cattle would be excluded from the human food supply, "regardless of the reason for their nonambulatory status or the time at which they became non-ambulatory. Thus, if an animal becomes nonambulatory in route to the establishment due to an acute injury, it must be humanely removed from the truck, humanely euthanized, and the carcass properly disposed of. Likewise, cattle that become nonambulatory on the establishment premises, such as an animal that breaks its leg as it is unloaded from the truck, are also required to be humanely moved, humanely euthanized, and the carcass properly disposed of."

The agency's January 12, 2004 regulation defined "nonambulatory disabled" cattle as any who "cannot rise from a recumbent position or…cannot walk, including, but not limited to, those with broken appendages, severed tendons or ligaments, nerve paralysis, fractured vertebral column, or metabolic conditions."[1] Since BSE can result in an animal going down either directly, because of brain damage, or indirectly, by predisposing an animal to injury, these downed cattle were to be euthanized rather than slaughtered for human consumption.

The same day that the regulations were published, however, the USDA issued Notice 5-04 behind-the-scenes, instructing inspecting veterinarians how to carry out the regulations. In contrast to both the public claims by USDA and the interim rule itself, the agency instructed inspectors to allow downed cattle to be slaughtered for human consumption if they initially appeared otherwise healthy but went down within the slaughter plant itself due to an acute injury.[2]

In July 2007, USDA finally made permanent its so-called "ban" on slaughtering downer cattle. But instead of closing the loophole identified by the OIG, the agency codified it, acknowledging that some downer cattle have been, and will continue to be, processed for human food. USDA's final rule specifies that "FSIS inspection personnel will determine the disposition of cattle that become non-ambulatory after they have passed ante-mortem inspection on a case-by-case basis." In other words, those who are able to walk when initially inspected by USDA but then keel over and cannot stand up again can nevertheless be slaughtered, and the meat can be sold.

This loophole is reckless from a public health perspective and promotes the inhumane handling of downer cattle. It is unacceptable on both counts.

A food safety system that relies on inspectors evaluating downers on a case-by-case basis is unworkable. Determining why an animal is down is challenging if not impossible for inspectors because injury and illness are often interrelated – e.g., a broken leg may simply be the observable result of the weakness, abnormal gait, or disorientation associated with an underlying disease. At least three of the documented cases of BSE in North America were identified as downers due to injury, not illness, showing how difficult it is for inspectors to reliably sort out which non-ambulatory animals are "safe." The first case of BSE discovered in Canada was thought to be "suffering from a broken leg."[3] The first identified case in

the U.S. similarly did not seem to display any BSE symptoms, but was reported down due to a calving injury.[4] She was seemingly picked at random as one of perhaps less than 1% of the downed cattle tested for mad cow disease in the United States up until that time.[5] Another Canadian case was suspected of injury rather than disease. The farmer reportedly "didn't suspect anything was seriously wrong when one of his cows slipped on the ice and hurt itself…."[6]

Even if "only" a broken leg is involved, dragging an animal with a fracture is just as cruel, if not more so. If you've ever suffered a broken bone, you can imagine the pain of being pulled by chains or rammed with a forklift in that condition.

Lack of Enforcement

The problems engendered by USDA's loophole are exacerbated by its lax enforcement of the downer rules. As documented by our undercover investigation, USDA inspectors may only conduct cursory observations, coming to check on animals just once or twice a day and disregarding their condition for the remaining hours. While USDA inspectors are required to monitor and verify humane handling in connection with slaughter, including offloading, holding and driving animals in pens and chutes, a USDA inspector was rarely present during offloading and never observed by our investigator in the pens, except during the aforementioned predetermined twice-daily times of 6:30 a.m. and 12:30 p.m., or by the chutes.

Despite all the media attention surrounding our investigation and the subsequent beef recall and criminal charges against plant workers, sick and injured cattle can and likely will still be slaughtered and put into the American food supply unless changes are implemented to protect animal welfare and protect human health and that of the nation's most vulnerable citizens.

Needed Steps

1) Close Loophole: An unequivocal, truly comprehensive ban on the slaughter of downed animals for human consumption is needed to protect food safety and animal welfare. The current protocol that allows inspection personnel to "determine on a case-by-case basis the disposition of cattle that become nonambulatory after they have passed antemortem inspection" is unrealistic and unworkable, and places an impossible expectation on the inspector. It also creates financial incentives for precisely those abuses that we witnessed in the undercover footage.

A highly visible and vigorously enforced total no-downer rule is the right policy. For the animals, removing current incentives that encourage workers to try every cruel tactic imaginable to move downers to the kill box would alleviate suffering. If crippled animals cannot be sold for food, slaughter plants have no reason to prolong their misery to try to get them through the slaughter process. Closing the loophole would also help create an incentive for all involved in the production chain to minimize hazards that can cause animals to become downed in the first place.

USDA can revise its rule immediately, restoring the language it promulgated in January 2004. And the Congress can pass the Downed Animal and Food Safety Protection Act (S. 394/H.R. 661) to codify a national no-downer policy.

2) Strengthen Enforcement: The USDA must rework its inspection program to ensure meaningful compliance. We recommend a combination of measures. More inspectors observing live animals are needed, and all inspectors should be trained and directed to monitor the treatment of live animals to ensure that they are handled humanely. Inspectors must understand that their oversight responsibilities begin at the moment animals arrive at slaughter premises, including when the animals are on trucks at slaughter facilities. An inspector should meet each truck when it arrives on the premises and should order the immediate humane euthanasia and condemnation of any cattle who are non-ambulatory. Egregious

conduct such as forcefully striking an animal with an object, dragging an animal, ramming or otherwise attempting to move an animal with heavy machinery, or using electric shock, water pressure, or other extreme methods, should be explicitly prohibited and those policies established in a formal rule to take effect immediately. Inspections should be unannounced and not on a predictable schedule. They should include undetectable inspections on hidden catwalks close enough to the animals to allow accurate observation or through video surveillance accessible for viewing by independent third parties. Slaughter plants should be encouraged to install video cameras that would allow for viewing of all of the animal handling prior to slaughter. Finally, it would be helpful to rotate inspectors to ensure that they do not become too close with plant personnel.

3) Establish Criminal Penalties: Current federal law does not provide for criminal penalties, even in cases of repeat or egregious offenses, for violations of humane handling standards.

4) Ensure Humane Federal Procurement: H.R. 1726, the Farm Animal Stewardship Purchasing Act, would set basic animal welfare standards for producers who sell food to the National School Lunch Program and other federal programs, including requiring veterinary treatment or humane euthanasia for downed animals.

Thank you for the opportunity to testify here today on this important food safety and animal welfare issue.

ADDENDA

Timing of HSUS Contact with USDA on Case

HSUS conducted a thorough investigation that took several months, with our investigator undercover at the plant for six weeks during October and November 2007, and then the investigation continuing after he left the site as we analyzed documents and compiled further evidence. These are long-term investigations, and we don't parachute in and know everything there is to know in a single day. If we are going to accuse a company of wrongdoing, with broader implications for the public, we want to make sure we collect as much evidence to support our claims as possible, and we want to be sure to present a fair and accurate picture of what went on at the plant.

Because USDA has rarely taken action against slaughter plants for violating humane handling protocols, and also because few local law enforcement agencies have ever taken on animal cruelty cases involving the mistreatment of farm animals, we thought it essential to amass a preponderance of evidence at this plant before terminating the field portion of the investigation. There were fundamental humane treatment and food safety issues at issue, and we did not want to see the proper authorities dismiss the investigation as incomplete or inconclusive, and to decide not to take corrective action.

As soon as the field portion of the investigation concluded and our team assessed and organized the enormous volume of video and other research materials, we met with staff from the San Bernardino District Attorney's office in mid-December. At that time, we provided them the evidence of criminal conduct and encouraged them to prosecute the perpetrators. Animal cruelty crimes are typically prosecuted by local and state law enforcement, and we knew the unacceptable abuses captured in the video footage showed that California animal cruelty and downer protection laws had been violated.

The D.A.'s office asked for extra time to assess this information before we released it. Staff at that office indicated to us that they planned to take action but they were unable to provide a specific time line. Because of our history of working cooperatively with local law enforcement on animal cruelty cases, and the obvious intention of the personnel in the D.A.'s office, we acceded to their request. But at the end of January, we decided that we had an obligation to make the information public and could wait no longer, even if the D.A.'s office was about to take enforcement action and file charges against the perpetrators. Although the D.A.'s office had indicated that they planned to share the information with USDA, before we released the information to the press, I personally called a senior official at USDA to make sure the agency knew what was about to be brought to public attention.

Frankly, we did not turn to the USDA first because the agency has too often ignored complaints about serious animal welfare abuses, even when they are associated with known public health risks. We didn't want to turn down a dead end with so much at stake. In fact, it's been reported during the past few weeks that other animal protection organizations had investigated downer cases at this same Hallmark plant and brought the information to USDA's attention on several occasions, yet the mistreatment persisted.

Moreover, USDA was directly implicated in the problems we uncovered at this plant. The agency has day-to-day oversight responsibility, and was complicit in the failures there. Not only was USDA on site throughout every shift when these abuses occurred, the agency was a primary purchaser of meat from the plant and had awarded the company the honor of being named USDA "Supplier of the Year" for the 2004-2005 academic year. Westland was the #2 beef supplier to the National School Lunch Program and to other USDA commodity distribution programs.

We're glad that USDA is taking this matter seriously now, and we're cooperating fully with the agency as it considers this case and the broader implications for industry oversight. I also note that we have led the effort to marshal substantial congressional support each year since 2001 to increase funding for USDA to better enforce the federal humane slaughter law and prevent this type of animal cruelty.

Human Health Risks Associated with the Slaughter of Downed Cattle

The slaughter of downed cattle raises several serious food safety issues. Some studies have shown that nonambulatory cattle may suffer from higher rates of foodborne pathogens.[7]

Texas A&M University researchers were among the first to alert the medical community of the potential for downed cattle to present a vehicle to contaminate the human food supply with bacterial pathogens. They studied 30 downed cattle who had no outward signs of illness, except for inability to rise, and had all passed antemortem inspection. Even though these nonambulatory animals appeared otherwise healthy, when the researchers took bacterial cultures, they found cows infected with *Salmonella* and *E. coli*. The researchers concluded: "Results of this study of 30 cattle indicate that pathogens may be circulating in the blood of some recumbent cattle at the time of slaughter."[8] Commenting on areas of concern, the scientists noted:

> It should be remembered that much of the meat from recumbent cattle goes into the production of ground beef, which, because of the grinding process and extra time it spends at a temperature higher than the whole carcasses, usually attains a high bacterial cell count per gram by the time processing is finished. Contaminated meat used to make ground beef would also contaminate subsequent clean meat exposed to common machinery (e.g., grinders) and, thus, would increase the danger of contamination.[8]

This research shows that even when downed animals appear otherwise healthy, they may be harboring dangerous pathogens.

The majority of nonambulatory cattle are dairy cows.[7] Virtually all dairy cows are ultimately slaughtered for human consumption in the United States.[9] Annually, 6 million culled dairy cows enter the food chain as ground beef,[10] accounting for at least 17% of the ground beef produced in the United States.[9] Since the muscles of dairy cows have a lower fat content, they are commonly used in producing the more expensive "lean" hamburger.[11]

According to a 2003 review, downed dairy cattle "may harbor greater numbers of pathogens, and their slaughter may increase spread of pathogens at the slaughter establishment."[12] In *Meat & Poultry*, research is cited to explain why nonambulatory cattle tend to have higher levels of bacteria on their carcasses: "Lame animals spend more time lying down, which increases the likelihood they will be contaminated with fecal matter."[13] In addition to the potential for contamination of the meat with fecal pathogens, when dairy cows are slaughtered, "[k]nives, carcasses and the hands of personnel may be contaminated by contents of the mammary gland when this is removed from the cow during processing."[9] Intramammary infections (mastitis) affect up to nearly two-thirds of cows in U.S. dairy herds[14] and are one of the most common reasons dairy cows are sent to slaughter.[9] Inappropriate excision of the udder during the slaughter process can contaminate the rest of the carcass with milk that could contain *Listeria* and other milk-borne pathogens. A 1997 review of the microbiological hazards of eating meat from culled dairy cows concluded: "In the USA, dairy cattle are raised and managed with increasing intensification, and this intensification may promote the maintenance of a variety of micro-organisms which could be pathogenic to humans through food."[9]

***E. coli* O157:H7**

In 2003, a study funded by the USDA was published that investigated the "potential impact to human health that may occur following consumption of meat derived from downer dairy cattle" by measuring infection rates of one of the most virulent foodborne pathogens, *E. coli* O157:H7. The investigators found

that downed cows were 3.3 times more likely to harbor the potentially deadly *E. coli* strain than walking culled dairy cows. The researchers concluded that "downer dairy cattle harboring *E. coli* O157:H7 at slaughter may be an important source of contamination and may contribute to the health risk associated with ground beef."[15] The results of this study led USDA Microbial Food Safety Research Unit Research Leader John B. Luchansky to question whether, based on *E. coli* alone, nonambulatory cattle should be excluded from the U.S. meat supply.[16]

E. coli O157:H7 infects tens of thousands of Americans every year, causes dozens of deaths,[17] and may be the leading cause of acute kidney failure in previously healthy U.S. children.[18] Speculatively blamed in part on the increasing intensification of dairy farming,[19] prevalence rates in U.S. dairy herds have ranged up to 100%.[20] Quoting USDA researcher Caitriona Byrne and colleagues: "Due to the ubiquity of *E. coli* O157:H7 among cattle, as well as its low infective dose and the severity of the resistant illness in humans, effective control of the pathogen may be possible only by eliminating this microorganism at its source rather than by relying on proper food handling and cooking thereafter."[15]

A 2005 review in the *Journal of Dairy Science* likewise concentrated on the risk of contracting virulent strains of *E. coli* from eating ground beef from dairy cows that may be tainted with fecal material. These toxin-producing strains can cause hemorrhagic colitis and progress to kidney failure, coma, and death, particularly in young children.[18] Dairy cattle "enter the food chain as ground beef," the review reports, and "[a]s a result, downer dairy cows harboring STEC [Shiga toxin-producing *E. coli*] at slaughter can be a health risk to humans."[10] Meat from diseased and disabled cattle has also been implicated in a similar life-threatening disease in dogs.[19]

Salmonella

Salmonella infection hospitalizes thousands of Americans every year, kills hundreds, and can lead to chronic conditions such as arthritis, bone infections, cardiac inflammation, and neurological disorders.[21] According to the Centers for Disease Control and Prevention, *Salmonella* strains in the United States are growing resistant to nine different antibiotics.[22] One strain, known as *Salmonella* Newport MDR-AmpC, is even growing resistant to ceftriaxone, a powerful antibiotic vital for combating serious infections in children.[22]

Multiple outbreaks of this new multidrug-resistant *Salmonella* strain have been tied to dairy farms,[23] ground beef made from dairy cows,[24] and dairy products.[25] Investigating one deadly outbreak of antibiotic-resistant *Salmonella* involving hundreds of people, California public health officials traced the cases back to meat from infected dairy cows slaughtered for hamburger. In their report published in the *New England Journal of Medicine*, they were able to correlate risk of contamination with the slaughter plants that received the most moribund and dead cattle. The researchers noted: "Stressed animals are more likely to shed *Salmonella* in large numbers."[11]

In addition to the immunosuppressive effect of stress, nonambulatory animals may also be more likely to shed pathogenic bacteria, "[s]ince animals going to slaughter are generally in a temporary state of starvation, and it is known that starvation causes *E. coli* and *Salmonella* to proliferate" due to changes that occur in the animal's rumen. By the time most cattle are slaughtered, they have been starved for variable periods of time, in part because empty rumena are easier to eviscerate.[19] This may be particularly relevant to downed cattle populations who may be left to starve for extended periods before they are finally slaughtered.

Carolyn Stull of the University of California-Davis School of Veterinary Medicine has studied *Salmonella* infection in downed cows and reported results at a 2004 American Meat Institute conference. Fifty downed cows were sampled and seven were found to be infected with *Salmonella*. Despite infection, however, five of the seven infected cows, including at least one cow who was septicemic, were known to

have passed USDA antemortem inspection for human consumption.[26] Stull and colleagues reportedly identified 6 out of 20 nonambulatory cattle sent to a slaughter facility to be fecal shedders of *Salmonella*.[27]

Anthrax

Anthrax is a farm animal disease that can infect, though very rarely, the human meat supply.[28] In 2000, 32 farms were quarantined for anthrax in the United States.[29] That summer, at least five people were exposed to meat "highly contaminated" with anthrax from a downed cow who was approved for slaughter and human consumption. These cases were reported by the Centers for Disease Control and Prevention as "Human Ingestion of *Bacillus Anthracis*-Contaminated Meat."[30] Had a ban on the slaughter of downed cattle been in effect, these people may have been spared. Subsequently, a family stricken with gastrointestinal, oropharyngeal, and meningeal anthrax tied to the consumption of a sick sheep was reported,[31] suggesting it may be prudent to exclude all nonambulatory animals – not just cattle – from the human food supply.

Frank Garry, the coordinator for the Integrated Livestock Management Program in the College of Veterinary Medicine and Biomedical Sciences at Colorado State University, reportedly suggests that the slaughter of nonambulatory farm animals may present a threat to national security:

> The threat of bioterrorism adds one more reason to end the use of nonambulatory animals in human food. An animal that is unable to walk because of illness should probably not be processed for human food consumption, regardless of whether the animal was intentionally or unintentionally contaminated. As long as the USDA continues to slaughter diseased livestock, it is possible that a bioterrorist attack could make people very sick and undermine confidence in American agriculture.[32]

Culled dairy cows may present particularly vulnerable agroterrorist targets as they are slaughtered and ground into hamburger. "Given that only a single infected carcass can contaminate a large lot of ground beef," wrote USDA researchers in a 1996 review, "it is possible that, whereas in the past an infected animal would produce only a small number of cases, such an animal could now cause a large, widespread outbreak."[19] According to Robert Tauxe, Chief of the Foodborne and Diarrheal Diseases Branch of the Centers for Disease Control and Prevention, each burger may reportedly be made from the flesh of hundreds or even thousands of different cows.[33] One hypothetical model suggests that a single downed cow infected with a pathogen such as *E. coli* O157:H7 could theoretically contaminate more than 100,000 hamburgers with an infectious dose.[19]

Bovine Spongiform Encephalopathy

Bovine spongiform encephalopathy is a transmissible spongiform encephalopathy (TSE) of cattle that may manifest with behavioral symptoms, earning the disease its colloquial name "mad cow disease." The rendering of sheep infected with an ovine spongiform encephalopathy (known as scrapie) into cattle feed may have led to the emergence of BSE.[34] In modern animal agriculture, protein concentrates, or "meat and bone meal" – terms that encompass "trimmings that originate on the killing floor, inedible parts and organs, cleaned entrails, fetuses"[35] – are fed to dairy cows, for example, to improve milk production.[36] According to the World Health Organization, nearly 10 million metric tons of slaughter plant waste is fed to farm animals every year.[37]

Although the first case of BSE was documented in the United Kingdom in 1986, there reportedly exists "very sound" evidence that a rare form of the disease was already circulating in the United States.[38] One year before BSE was initially reported in Britain, Richard Marsh, chair of the Department of Veterinary Science at the University of Wisconsin-Madison, was alerting dairy producers of the possibility that a

"previously unrecognized scrapie-like disease in cattle" existed in the United States[39] – a concern borne out of investigations of sick mink.

Mink have proven to be sentinel animals, like canaries in coal mines. They were reportedly the first, for example, to show toxicity from the vaginal cancer-causing synthetic estrogen diethylstilbestrol (DES) and the industrial carcinogens polychlorinated biphenyls (PCBs).[40] Since 1960, there have been four outbreaks of mink spongiform encephalopathy known as transmissible mink encephalopathy (TME) on U.S. fur farms.[41] This was perplexing, as researchers had been unable to orally infect mink with scrapie-infected sheep brains.[42]

A clue to the origin of the disease came in 1985, when TME devastated a population of farmed mink in Wisconsin who had reportedly not been fed any sheep.[43] The meat portion of their diet evidently consisted almost exclusively of downed dairy cows.[44] Marsh hypothesized that there was a form of BSE in the United States that manifested itself as more of a "downer" cow disease than a "mad" cow disease.[42]

Mink were found to be experimentally susceptible to BSE; when mink were fed BSE-infected brains from British cattle, they died from a spongiform encephalopathy.[41] The disease was experimentally spread from mink to cows and from cows back to mink.[44] The critical experiments, though, involved inoculating the brains of U.S. sheep infected with scrapie into U.S. cattle.[45] In England, scrapie-infected cows go "mad," twitching and kicking. But, in the United States, the "real surprise,"[38] as Marsh recounted, was that scrapie-infected cattle instead developed difficulty in rising and terminal recumbancy[46] like downed cattle do.[45] "The signs that these cattle showed were not the widely recognized signs of BSE – not signs of mad cow disease," Marsh reportedly said. "What they showed was what you might expect from a downer cow."[47] Scientists have identified multiple strains of scrapie.[48] Marsh posited that one of the U.S. strains may have jumped to cattle, creating a form of BSE native to the United States.[40] Said Marsh to a reporter: "That's the only conclusion you can draw."[38]

Every year in the United States, estimates range from 195,000[49] to 1.8 million[50] cattle who collapse for a variety of metabolic, infectious, toxic, and/or musculoskeletal reasons and are too sick or injured to rise.[7] Extrapolating from the proportion of nonambulatory cattle found in European[51] and U.S.[7] surveys, the number of nonambulatory cattle in the United States may be on the order of 500,000 a year. A governmental survey of dairy producers across 21 states reportedly found that 78.2% of dairy operations had nonambulatory cows during 2004.[52] Though these animals may not have been fit enough to stand, a limited investigation of USDA slaughter plant records between January 1999 and June 2001 showed that most were still ruled fit for human consumption.[53]

Based on findings in Europe[51] and the speculative evidence of a rare form of mad cow disease striking downed cows for decades in the United States,[54] nonambulatory cattle should considered to be a particularly high-risk population. According to the Food and Drug Association (FDA): "Experience has shown that nonambulatory disabled cattle…are the population at greatest risk for harboring BSE."[55] The FDA cites Swiss data showing a 49-58 times higher chance of finding BSE in downed cattle than in cattle reported to veterinary authorities as BSE-suspect under passive surveillance.[56] Indeed, 12 of the 15 BSE-infected cattle discovered in North America by February 1, 2008, have reportedly been nonambulatory.[3] And the 16th BSE-infected case found in North America, a cow in Canada reported on February 26, 2008, was reported to the HSUS as being a downer.

Though the riskiest tissues – the brains, eyes, and spinal cords – of most cattle are now excluded from most food items in the United States,[57] there may be contamination of muscle meat via aerolization of the spinal cord during carcass splitting.[58] Significant amounts of central nervous system debris found accumulating in the splitting saws used to halve the carcasses may have the potential to then transfer contagion from one carcass to the next.[59] Although, technically, processors are instructed to knife-trim "material grossly identifiable as brain material, spinal cord, or fluid from punctured eyes,"[60] researchers

have reported finding nervous tissue contaminating muscle in a commercial slaughter plant.[61] Contamination of meat derived from cattle cheeks with brain tissue can also occur if the cheek meat is not removed before the skull is fragmented or split.[62]

Captive bolt stunning, the predominant method used to render cattle insensible before exsanguination,[1] may blow a shower of embolic brain tissue into the animals' bloodstream. In one experiment, a biological marker applied onto a stunner bolt was later detected within the muscle meat of the stunned animal. The researchers concluded:

> This study demonstrates that material present in...the CNS [central nervous system] of cattle during commercial captive bolt stunning may become widely dispersed across the many animate and inanimate elements of the slaughter-dressing environment and within derived carcasses including meat entering the human food chain.[63]

Captive bolt stunning may also lead to ejection of brain tissue into the abattoir from the hole made by the captive bolt onto slaughter plant equipment, as well as the hands and aprons of workers removing the animals' heads.[61] A follow-up study published 2004 in the *Journal of Food Protection* determined that "this method of slaughter of an animal infected with bovine spongiform encephalopathy would be likely to contaminate edible parts of the carcass with infective material."[64] Texas A&M University researchers found bodily brain fragments as large as 14 cm (5.5 in). The researchers concluded that it was likely that BSE pathogens could potentially be "found throughout the bodies of animals stunned for slaughter."[65]

Despite the potential for CNS contamination and the fact that peripheral nerves[66] and blood[67] found in all muscles may carry infection, the USDA[68] and the National Cattlemen's Beef Association[69] have attempted to assure consumers that beef is safe to eat, arguing that the infectious agent is not found in muscle meat. However, Stanley Prusiner, the director of the Institute for Neurodegenerative Diseases at the University of California, San Francisco, and winner of the Nobel Prize in Medicine for his discovery of prions, the cause of the BSE and other TSEs, proved in mice that muscle cells themselves were capable of forming the potentially infectious agent.[70] "I found prions in the hind limb muscles of mice," Prusiner stated, "at a level approximately 100,000-fold higher than that found in blood."[67] Prusiner reportedly described the studies relied upon by the Cattlemen's Association as "extraordinarily inadequate,"[71] and follow-up studies in Germany confirmed his findings, showing that animals who are orally infected may indeed end up with prion contamination throughout the muscles of their bodies.[72]

Although the risk of contracting BSE appears vanishingly small in the United States given how few cattle have tested positive, the neurodegenerative disease it can cause in the consumers of contaminated beef is likely invariably fatal. Because cooking temperatures do not adequately destroy prions, the onus of responsibility must rest with the beef industry or, if unable or unwilling to police itself, the federal government, to ensure infected cattle are not slaughtered for human consumption. There is evidence that the infectious proteins that cause BSE can survive incineration[73] at temperatures hot enough to melt lead.[74] In response to a question from Cornell University's Food Science Department asking what food preparation methods could eliminate the risk of contracting BSE, then National Institutes of Health Laboratory of Central Nervous System Studies chief Joseph Gibbs remarked tongue-in-cheek that one of the only ways to ensure a BSE-free burger would be to marinate it in a concentrated alkali such as Drain-O™.[75]

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