

WHAT ARE WE DOING TO PREVENT ENTRY OF POTENTIALLY  
CATASTROPHIC FOREIGN ANIMAL DISEASES INTO THE U.S.A.

By Gary C. Smith  
Center for Red Meat Safety  
Department of Animal Sciences  
Colorado State University  
Fort Collins, CO 80523-1171

What are Foreign Animal Diseases? By definition, a Foreign Animal Disease (FAD) is one which originates in another country and can, or does, enter the USA. An agency of our federal government, the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA), is charged with responsibility for preventing entry of FADs into our country and is especially vigilant regarding those FADs which would have potentially catastrophic effects on farm-animal populations, the agricultural economy and/or the public (human) health. Activities of APHIS specifically related to FADs include (USDA-APHIS, 2001): (a) Guarding our borders against foreign agricultural pests and diseases through activities at U.S. ports and overseas in foreign countries. (b) Detecting and monitoring animal and plant diseases in this country. (c) Carrying out emergency operations if foreign pests or diseases get past our border defenses.

Why are we concerned about FAD? Horn (2001) described our concerns about FADs as: (a) These diseases are common overseas. (b) Because these diseases are spread by natural means, constant efforts are needed to exclude their entry into the USA. (c) Our livestock would be unbelievably susceptible to these FADs. (d) An outbreak of an FAD would cripple agricultural trade, would be devastating economically and would have psychologically depressing societal effects. Examples of effects of four FAD outbreaks follow:

- (a) Foot-and-Mouth Disease (FMD), in swine, in Taiwan, in 1997—FMD was diagnosed in one tiny area of the country in March and, in three months, had spread throughout the entire country (Horn, 2001). Four million hogs died or were killed, there was huge societal impact generated by dead/rottening pigs and smoke from hog funeral pyres and Taiwan lost \$7 billion in agricultural and export trade. Some believe that Taiwan may never recapture their export markets for pork (Horn, 2001).
- (b) Classical Swine Fever (CSF), in swine, in the Netherlands, in 1997-1998—CSF was diagnosed in February 1997 and brought under control in May 1998 (Horn, 2001). CSF was ultimately found on 60% of pig farms, resulted in death or slaughter of 11 million hogs, cost the Netherlands \$2.3 billion in agricultural and export-trade losses, and ultimately spread to Italy, Spain and Belgium (Horn, 2001).
- (c) Foot-and-Mouth Disease (FMD), in cattle/sheep/swine, in Great Britain, in 2001—FMD was detected on one pig farm on February 28, had spread throughout England and into France and Ireland two weeks later, and was occurring at the rate of 350 new

cases per week in the UK and EU by April 1 (Horn, 2001). As of October 17, 2001, animals that have died or been slaughtered total 600,000 cattle, 150,000 swine and 3,000,000 sheep. Psychological and social impacts have been huge; American Express reported that tourism in the UK has been reduced by 85% since outbreak of the disease (Horn, 2001). Beef (2001) reported that: (a) The UK recorded its 2,000<sup>th</sup> case of FMD in early September 2001. (b) Government scientists now say the outbreak could last, at least, until January 2002. (c) To date, 3.8 million head of livestock have been destroyed with another 19,000 awaiting euthanasia. For purposes of analogy, Horn (2001) said “Great Britain is the size of Oregon; if an FMD outbreak of the same magnitude as has occurred in the UK were to occur in the USA, probable numbers of dead or slaughtered U.S. livestock would be 4 million cattle, 1 million swine and 1 million sheep.

- (d) Mad Cow Disease (MCD), in a single cow, in Japan, in 2001—An example of results of a single case, not an outbreak, of an FAD provides further support for catastrophic effects on domestic and export demand for beef (National Meat Association, 2001a). Japan announced on September 10, 2001 that a Holstein dairy cow tested positive for MCD in an area near Tokyo. Three weeks later, Junichiro Koizumi (Japan Prime Minister) said: People are saying they don’t want to even eat safe beef products. This is a frightening thing!” Confusion over the disposal of the infected cow, which was ground into meat-and-bone meal (MBM), has deepened consumer mistrust, with some 2,000 schools nationwide clearing beef from their lunch menus. Widespread news coverage of the BSE outbreak has taken a toll on the shares of some restaurant chains, as well as beef prices and sales in Japan, possibly denting the outlook for its Kobe beef exports. Photographs have circulated of workers standing next to literally tons and tons of unused beef product (National Meat Association, 2001a). Domestic prices for beef in Japan have fallen about 60% and, Clayton (2001) reported that demand for U.S. beef in Japan has declined by 50%.

Were lessons learned from recent FAD outbreaks? Lessons learned from the FMD outbreak in Taiwan (Horn, 2001) were: (a) The source of the virus was probably pigs smuggled in from mainland China. (b) It took several weeks to identify it as FMD (it was first thought to be Vesicular Stomatitis). (c) Officials did not initiate preventive slaughter of at-risk animals soon enough. Lessons learned from the CSF outbreak in the Netherlands (Horn, 2001) were: (a) The source of the virus was food brought from Bosnia by returning soldiers. (b) Officials allowed uncooked garbage to be fed to swine. (c) Officials did not require proper cleaning of trucks between loads of hogs. Lessons learned from the FMD outbreak in Great Britain (Horn, 2001) were: (a) The source of the virus was probably pork smuggled in from China. (b) Officials allowed uncooked garbage to be fed to swine. (c) The virus was present for some weeks before FMD was diagnosed. (d) The measures taken to control spread of the virus were not sufficient. The lesson learned from the BSE incident in Japan (National Meat Association, 2001a) was the extent of the danger associated with feeding at-risk animal protein (meat-and-bone meal) imported from a country that had an epidemic of MCD. Obviously, traffic across the borders of the USA creates opportunities for inadvertent entry of FAD-infected foods that could trigger potentially catastrophic effects on

our food-animal and human populations; Horn (2001) reported that, in 1999, 475 million people, 125 million vehicles and 21.4 million import shipments crossed U.S. borders.

What measures are being taken to minimize risk that BSE will enter the U.S.? According to American Meat Institute (2001a), National Cattlemen's Beef Association (2001b), U.S. Meat Export Federation (2001a), Smith (2001b) and Lazar (2001): (1) The U.S. has not imported beef from the U.K. since 1985; the U.S. has not imported ruminant animals or at-risk ruminant products from countries with confirmed cases of BSE since 1989. (2) More than 60 veterinary diagnostic laboratories throughout the U.S. participate in a BSE surveillance program with the National Veterinary Services Laboratory (Ames, IA). (3) In 1997, a Food and Drug Administration (FDA) regulation banned the use of at-risk, mammalian-derived animal protein byproducts in cattle feed (Meat Processing, 1997) to ensure that, if the rogue-protein prion causing BSE ever entered the U.S., it would be prevented from spreading through cattle feed. (4) In 1997, the USDA banned imports of all live ruminants and certain ruminant products from European countries until BSE is more fully understood. (5) In 1998, the USDA asked the School of Public Health, Harvard University to analyze and evaluate the USDA's BSE prevention measures. (6) In 2000, APHIS prohibited all imports of rendered animal protein products, regardless of species, from Europe. (7) In 2000, the USDA issued a Declaration of Extraordinary Emergency, obtained some sheep from three flocks imported from Europe, euthanized these sheep and examined—diagnostically—their brains. (None had BSE.) (8) In 2000, APHIS prohibited all imports of rendered animal protein products from Europe, regardless of species. (9) In 2001, USDA seized the remaining sheep imported from Europe, euthanized them and examined their brains but none had BSE.

What steps are being taken to keep the U.S. free of FMD? The U.S. has been free of FMD since 1929 (Crews, 2001), when the last of 9 outbreaks here was eradicated, because of the superb monitoring and surveillance system of Animal and Plant Health Inspection Services (APHIS) of USDA. The last two FMD outbreaks in the U.S., in 1924 and 1929 (U.S. Meat Export Federation, 2001b), were both caused by feeding raw or unrecooked garbage from steamships to swine and were quickly contained; the February 2001 outbreak of FMD in the UK is believed to have been caused by feeding raw or unrecooked garbage from illegally smuggled meat served in Chinese-style restaurants to swine in northern England (National Meat Association, 2001b). In that outbreak, one case on one pig farm was detected on February 28; FMD had spread throughout England and into France and Ireland two weeks later and was occurring at the rate of 350 new cases per week in the UK and EU by April 1, 2001. The pivotal importance of swine in development of an FMD outbreak cannot be overemphasized. Although the virus replicates in the blisters of infected animals and erupts—as infected particles—when blisters burst, swine infected with FMD shed the virus in exhaled air—as infected aerosols—before they exhibit clinical signs of the disease. Torres (2001) says there is enough FMD virus in one breath of exhaled air from an FMD-infected pig to generate 10,000 infectious doses of the disease. FMD is so feared in the U.S. that our Congress passed legislation in the 1950s making it illegal to possess live virus anywhere (except at the USDA Plum Island Animal Disease Center which houses the North American FMD Vaccine Bank) in our country (Torres, 2001).

USDA monitors diseases among U.S. cattle herds and takes aggressive action to prevent animal diseases (including FMD) from entering the U.S. whenever an outbreak occurs in another country (Veterinary Services, APHIS-USDA, 2001; American Meat Institute, 2001b). Examples of actions that have been taken since the February 2001 FMD outbreak in England, Ireland and the UK include (National Cattlemen's Beef Association, 2001c; Walloch, 2001; Crews, 2001; National Meat Association, 2001c): (a) USDA issued an interim rule in February 2001 prohibiting or restricting the importation into the U.S. of live swine and ruminants and of any fresh swine or ruminant meat (chilled or frozen) or animal products from Great Britain or Northern Ireland. (b) In March 2001, USDA expanded the earlier ban to temporarily prohibit the importation of animals and animal products from the entire EU due to concerns about FMD there. (c) USDA dispatched teams of experts to England and to Argentina in March 2001 in response to FMD outbreaks (Argentina announced an FMD outbreak there in March 2001); these experts help to stem the tide in affected countries and guard against introduction of the disease into the USA. (d) In March 2001, heightened alerts were enacted at ports of entry and airports to ensure that passengers, luggage and cargo are checked; this included deploying additional inspectors and dog teams (to detect meat and other food in parcels, luggage, baggage and cargo) at airports to check incoming flights and passengers. (e) In April 2001, USDA authorized an additional \$32 million to hire 350 additional staff members to work at critical ports and airports. (f) In April 2001, USDA initiated an aggressive public education campaign that included additional signage in airports, public service announcements, a Web site and other means to inform the public about this important issue and steps they can take to prevent the virus from entering the U.S. (g) In May 2001, President George W. Bush signed the Mad Cow and Related Disease Prevention Act of 2001 (S. 700) which established an interagency task force with oversight by Secretary of Agriculture Ann Veneman, to prevent the introduction of foreign animal disease—particularly BSE and FMD—into the U.S.

What are the general prospects of BSE and/or FMD leaping from one continent to another and occurring in cattle (BSE) or cattle/sheep/swine (FMD) in the United States? Smith (2001c,d) said “Having recently spoken to two of the most respected experts on the subject (Dr. Will Hueston, University of Minnesota, about BSE; Dr. Alfonso Torres, APHIS-USDA, about FMD): (a) I do not believe we will have outbreaks of either disease within the next 12 months, and perhaps never, and (b) If either disease does occur in the U.S. during the next year, or ever, I believe the response to the incident by those in industry and government will be so rapid that it will be of minimal consequence to the livestock industry but of variable consequence to the meat and food industries—depending on how the media reports the incident and how consumers react to such reports.”

If BSE and/or FMD were to breach our defenses, how damaging could this be to the U.S. meat supply and what would be the impact on consumer buying decisions? Smith (2001c) reported that “We do not believe we have BSE in the USA and we have not had a human death attributable to nvCJD. The federal government has erected three firewalls to preclude entry, and prevent spread—if it does occur—of BSE: (1) The U.S. bans cattle and beef products from countries where BSE has been detected. (2) The U.S. bans the feeding of certain animal products back to animals. (3) The U.S. has a surveillance program that includes examination of brain tissue from suspected animals.” Chandler (2001) reported that

Dr. George Gray (School of Public Health, Harvard University) said “Mad Cow Disease is not likely to occur here. And, even if it does occur, it is virtually impossible to imagine how we could have a UK-like epidemic. So long as brain, spinal cord and ileum (which carry the rogue-protein prions of BSE) are carefully avoided, only small incremental changes in government policy and regulations will be needed.” Gray (2001) said the final report of their risk assessment would be released in the next few months.

Smith (2001d) said “A U.S. outbreak of FMD would cause loss of productivity and closing of U.S. borders to export of meat and byproducts, especially edible offal, and would lead to great economic loss. Outbreaks of FMD in the UK, EU and other countries have heightened awareness and concern of U.S. consumers but the actual effect, should an outbreak occur in the USA, would be economic—decreasing profitability of farmers/ranchers and packers and, perhaps, increasing meat prices to consumers.”

Would an actual outbreak of either BSE or FMD—or even concern about such outbreak—have the eventual impact of promoting greater use of food safety programs throughout the meat supply chain? Hueston (2001) has said that “Healthy livestock is the basis for a safe food supply.” *Drovers Journal* (2001) reported that the case is made that U.S. beef consumption could drop by 50% and major export markets (U.S. beef export values, including variety meats, totaled more than \$4 billion in 2000) could suddenly close if either BSE or FMD were to occur in this country. Because these diseases have wreaked such havoc in other parts of the world, it is imperative that we do everything possible to prevent entry into the U.S. But, if they do, what will be the most valuable arrow in our quiver to minimize spread of the disease? It is “traceability” (Smith, 2001a).

Smith (2001a) reported that: (a) Traceability, or trace-back, in this context refers to the ability to identify the source of meat from farm-to-fork and/or from fork, back to the farm on which the animal source originated. (b) It is now possible to follow cattle, through harvest, to the carcass form by using retinal scanning, plastic/metal tags and trolley-tracking. (c) It is more difficult to follow carcasses through fabrication (into primal/subprimal cuts and trimmings), distribution and retail-cut preparation in foodservice and supermarket operations. (d) Meat at retail can though—as is being done in Ireland, New Zealand and Australia—be traced back to carcasses of origin by use of DNA-fingerprinting technology (Smith, 2001a).

The Scientific Steering Committee (SSC) of the European Commission (2001) has recently developed (May, 2001) A “Rapid Response” program of action, in the event that BSE occurs in the sheep population of the EU; included in that program are: (1) An EU-wide culling program. (2) A long list of BSE-risk parts which should be removed from carcasses. (3) Culling of all suspect animals, their offspring, all traceable relatives and all animals with TSE susceptibility in the affected and contact flocks. “Traceability of individual animals is an essential part of the plan, hopefully also enabling identification of the parents; certification of flocks as TSE-free would then be possible” (Fleischwirtschaft International, 2001).

What Are Government Agencies Doing To Help Prevent Entry/Spread of FADs? Principles of FAD Management involve Preparedness, Prevention, Discovery and Response and were characterized by Torres (2001) as follows: (I) Preparedness—(a) Characterization

of FADs worldwide, (b) Foreign intelligence and activities, (c) Education and training, and (d) Emergency management systems. (II) Prevention—(a) Strict regulations on importations of animals and animal products, (b) Control of foreign-origin garbage, (c) Control of domestic feeding of garbage (33 states allow such feeding but federal and state regulators make sure it is cooked prior to feeding), (d) Restrictions on feeding animal byproducts, (e) Maintain a strong animal health infrastructure, (f) Active surveillance and monitoring, and (g) Prompt diagnosis (there are FAD diagnosticians located in all states and territories, and there are federal diagnostic laboratories). (III) Discovery—(a) Producer (via awareness and previous education) “observes it,” (b) Private veterinarian “suspects it,” (c) State or federal veterinarian “investigates it,” (d) State or federal veterinarian accurately/promptly “reports it” (“red-flags it”), and (e) National Emergency Management Response is activated (and, hopefully, “stops it”). Response—(a) Quarantine; stop movement of animals, (b) Disinfect vehicles and personnel, (c) Slaughter all affected animals, cohorts and progeny, (d) Destruction of affected carcasses, (e) If appropriate, vaccination, and (f) Surveillance and tracking (Torres, 2001).

What Can U.S. Beef Producers Do To Help Prevent Entry/Spread Of BSE?  
Producers must comply with the Food and Drug Administration (FDA) requirement that anyone feeding ruminant animals must save copies of invoices and labeling of all feed they receive that contains animal protein (National Cattlemen’s Beef Association, 2001a); feed that does not have an invoice or label from the manufacturer or distributor does not comply with the law, and the feed cannot be fed to cattle. National Cattlemen’s Beef Association (2001a) urges that: (a) Producers have written documentation from their feed suppliers that the premixes, supplements and complete feeds they buy are free of prohibited materials. (b) Cattle feeders/producers should consider buying feeds exclusively from feed mills that do not handle prohibited materials. While this is not a part of FDA regulations, NCBA believes this is a reasonable step to reduce the risk of prohibited materials being incorporated in premixes, supplements and complete feeds destined for cattle. Wren (2001) quoted Dr. Linda Detwiler of USDA-APHIS as responding to the question “What can the U.S. meat protein industry do to help prevent BSE from occurring?” with the answer “Compliance. Any person or company that imports products should strictly comply with the regulations for importation. Domestically, producers should comply with feed ban regulations, as they are critical. If we can learn nothing else from the situation in Europe, it is that compliance with live animal and feed ban regulations is essential.

What Can U.S. Beef Producers Do To Help Prevent Entry/Spread Of FMD?  
California Department of Food and Agriculture (2001) says “Visitors from FMD affected countries may unknowingly introduce the virus into the U.S., and meat and dairy products from affected countries may harbor the virus.” Beef Today (2001) says in order to protect your operation and the U.S. cattle industry from FMD, follow the guidelines listed below: (1) Learn all you can, and provide diagnostic training to employees to facilitate early detection. (2) Minimize exposure by asking visitors and employees to register, declare animals at home and exposed to, change clothes/footwear and wash hands thoroughly, disinfect via foot-bath or wear booties, and consider restricting animals/equipment entering and leaving the premise. (3) Discourage contact with livestock by international visitors and do not allow meat or animal products from FMD-infected countries to enter your facility. (4)

Park all arriving vehicles in a restricted area; have vehicles available for on-premise transport. (5) Receive incoming cattle only during daylight hours, make sure health papers match the cattle and record truck license numbers. (6) Maintain vigilance on livestock and susceptible wildlife (Beef Today, 2001).

National Cattlemen's Beef Association (2001a,c) in answer to the question "What can beef producers in the U.S. do to help prevent FMD?" said: (a) Know who is on your farms/ranches/property at all times. If people from other countries where confirmed cases of FMD have been found are scheduled to visit your property, make sure they wear freshly cleaned clothing and footwear. Make sure people wash their clothes and footwear before traveling to another farm/ranch/property. (b) As always, farmers should watch for excessive salivating, lameness, and other signs of FMD in their herd and immediately report any unusual or suspicious signs of disease to their veterinarian, state or federal animal disease control officials, or their country agricultural agent. (c) Food waste used as feedstuffs is required to be fully cooked before feeding to livestock (National Cattlemen's Beef Association, 2001a).

Are we at risk to agricultural bioterrorism? Peter Chalk, a policy analyst with RAND Corporation, in remarks at the World Food Prize Annual Symposium (Reuters, 2001a), said: (a) More must be done to protect the U.S. agriculture industry and food supply from attacks by extremists. (b) We have a highly critical sector that is vulnerable, and it's not that difficult to exploit that vulnerability. (c) An attack on the nation's food supply could have a devastating impact on the economy and damage consumer confidence. (d) The introduction of an FAD into a cattle feedlot (e.g., BSE) or large hog farm (e.g., FMD) would set off a tidal wave of effects. (e) The concentration of many animals that makes U.S. livestock facilities so efficient is also a security liability. (f) USDA would not be able to quickly and effectively contain an outbreak because they don't have the ability to institute local preparedness programs (Reuters, 2001a).

What should cattle producers do about agricultural bioterrorism? Reuters (2001b) reported that Texas Agriculture Commissioner Susan Combs held an emergency meeting of farm and ranch producers and said "An assault on our food supply through either biological weapons or the introduction of a foreign animal or crop disease or pest would be a highly destructive force that could be used against agriculture and America." At that meeting, Texas State Veterinarian Linda Logan said: (a) We're urging producers to keep a closer watch on their animals. (b) The cattle industry could be severely disrupted if diseases such as Brucellosis or Mad Cow Disease were to break out. (c) A reaction, including quarantine, would be led by a Texas rapid response force of state and federal agencies. Max Coats (Texas Animal Health Commission) added "The key is prompt identification and rapid diagnosis, so a prompt response can be mounted to contain any possible outbreaks" (Reuters, 2001b).

## REFERENCES

- American Meat Institute. 2001a. Questions And Answers On Bovine Spongiform Encephalopathy (BSE). Memorandum for AMI Members, January 23.
- American Meat Institute. 2001b. Questions And Answers About Foot-And-Mouth Disease (FMD). Fact Sheet.
- Beef Today. 2001. Food And Mouth Disease Information Guide: What Every Cattle Producer Should Know About Foot And Mouth Disease. (May Issue) Insert, pp. 1-8.
- Beef. 2001. The UK Recorded Its 2,000th Case Of Foot-And-Mouth Disease In Early September. (October Issue).
- California Department of Food and Agriculture. 2001. Foot And Mouth Disease Alert! Livestock Producers, Allied Industries And Foreign Travelers & Visitors. State of California, Sacramento, CA.
- Chandler, D.L. 2001. Study: U.S. Mad Cow Outbreak Is Unlikely. The Boston Globe. (February 6 Issue).
- Clayton, P. 2001. Personal Communication. (Paul Clayton is a Vice President of the U.S. Meat Export Federation, Denver, CO).
- Crews, J. 2001. Keeping Foot-And-Mouth In Hand. Meat & Poultry. (April Issue).
- Drovers Journal. 2001. Keeping Devastating Diseases At Bay, Everyone's Help Is Needed To Prevent Foreign Animal Diseases From Entering The United States. (January Issue).
- European Commission. 2001. Rapid Response Program Of Action In The Event That BSE Occurs In The Sheep Population Of The EU. Scientific Steering Committee of the European Commission. (May Release).
- Fleischwirtschaft International. 2001. Traceability And Certification Of TSE-Free Flocks. (May Issue).
- Gray, G. 2001. Analysis Of The Harvard Risk Assessment. Proc. 2001 Meat Industry Research Conference (Chicago, IL). pp. 9-18.
- Horn, F. 2001. Bio Security And Animal Disease. Proc. 2001 Meat Industry Research Conference (Chicago, IL). pp. 21-22.
- Hueston, W. 2001. Bovine Spongiform Encephalopathy: Update. Presented at the Annual Meat Marketing Conference (Charlotte, NC).

Lazar, V. 2001. Should You Worry About BSE? Meat Processing. (February Issue).

Meat Processing. 1997. FDA Bans Mammalian Protein From Feed. (July Issue).

National Cattlemen's Beef Association. 2001a. FMD & BSE: What Every Producer Needs To Know. National Cattlemen's Beef Association, Englewood, CO.

National Cattlemen's Beef Association. 2001b. CJD, BSE, vCJD Information. National Cattlemen's Beef Association, Englewood, CO.

National Cattlemen's Beef Association. 2001c. Foot-and-Mouth Disease. National Cattlemen's Beef Association, Englewood, CO.

National Meat Association. 2001a. Japan BSE Worries Grow. NMA/Lean Trimmings. (October 1 Issue).

National Meat Association. 2001b. FMD Traced To Illegal Imports. NMA/Lean Trimmings. (April 2 Issue).

National Meat Association. 2001c. Foot In Mouth Disease. NMA/Lean Trimmings. (March 19 Issue).

Reuters. 2001a. Farm Sector Seen Vulnerable To Bioterrorism. Reuters Online. (October 18)

Reuters. 2001b. Texas Warns Ranchers To Watch For Diseases. Reuters Online. (October 17)

Smith, G.C. 2001a. The Likelihood And Consequences Of Occurrence of "Mad Cow Disease" And "Foot-And-Mouth Disease" In The United States. pp. 1-22. Packaging Strategies, West Chester, PA.

Smith, G.C. 2001b. BSE, CJD and nvCJD. Presented at the American Society of Microbiology (Orlando, FL).

Smith, G.C. 2001c. What's Hot And What's Not In U.S. Supermarkets. Presented at the Wakefern Food Corporation Food Show (Edison, NJ).

Smith, G.C. 2001d. Should U.S. Supermarkets Fear Outbreaks Of Either BSE Or FMD In the USA? Presented at the Annual Meat Marketing Conference (Charlotte, NC).

Torres, A. 2001. U.S. Policy On Preventing Animal Disease. Proc. 2001 Meat Industry Research Conference (Chicago, IL). pp. 19-20.

U.S. Meat Export Federation. 2001a. BSE—Frequently Asked Questions. U.S. Meat

Export Federation, Denver, CO

U.S. Meat Export Federation. 2001b. FMD—Frequently Asked Questions. U.S. Meat Export Federation, Denver, CO.

USDA-APHIS. 2001. APHIS Activities. Animal and Plant Health Inspection Service, United States Department of Agriculture, Washington, DC.

Veterinary Services, APHIS-USDA. 2001. Foot-And-Mouth Disease Q's and A's. Fact Sheet. Animal and Plant Health Inspection Service, U.S. Department of Agriculture, Washington, DC.

Walloch, B. 2001. Under Siege: As Europe Works To Eradicate Foot-And-Mouth Disease, The United States Builds Protection Barriers. Meat Processing. (April Issue).

Wren, G. 2001. BSE: How Safe Is Our Beef? Food Systems Insider. (May Issue).