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Technical Overview of BSE in Canada

March 2005

Government of Canada

Canada

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Introduction

Following the confirmation of a case of *bovine spongiform encephalopathy* (BSE) in a Canadian-born cow on January 11, 2005, the Government of Canada wants to provide Canadians and other consumers of Canadian beef, as well as purchasers of live cattle, with comprehensive information about the actions the Government of Canada has taken to minimize the risks that BSE poses to human health, food safety and animal health. This report reaffirms that Canada's BSE controls and risk-mitigation measures continue to deliver extensive consumer protection.

The Government of Canada has worked hard in consultation with its provinces and territories and the entire Canadian cattle and beef industry to take effective science-based measures to minimize risks to human and animal health, and to provide consumers with information in an open and transparent manner. The latter enables consumers to make informed decisions about eating Canadian beef. Canadians have responded by continuing to choose Canadian beef for themselves and their families, and have even increased their per capita beef consumption since BSE was first detected in 2003. Based on scientific risk analysis, thirteen other countries (see Annex A), including the U.S., continue to permit imports of Canadian beef and in three cases, live cattle. The Government of Canada wants to reassure all of these consumers that their confidence is well-placed.

Given the long history of integration in our beef, cattle and feed industries, and the shared risk this implies in regard to BSE, the Canadian Government has cooperated closely with the United States to take a consistent approach in North America in managing BSE and its associated health risks.

The material in this document is grouped into two chapters:

1. Canada's commitment to public health, food safety and animal health
2. Canada's BSE risk mitigation activities and investigations

Information on specific topics can be found by consulting the Table of Contents. References to source documents are provided to facilitate further investigation. A complete list of references is provided at the end of the document.

1. CANADA'S COMMITMENT TO PUBLIC HEALTH, FOOD SAFETY AND ANIMAL HEALTH

The protection of public health, food safety and animal health has been and continues to be a fundamental concern for the Government of Canada. In relation to BSE, the Government of Canada, through Health Canada and the Canadian Food Inspection Agency (CFIA), have responded to the challenges presented by developing a comprehensive suite of internationally-recognized, science-based measures to effectively minimize the likelihood of exposure, amplification and spread of BSE within the cattle population and to protect consumers from the associated human health risks. These measures were progressively implemented beginning in the 1980's following the initial detection of BSE in the UK in 1986 and as a growing understanding was gained within the international community of the threats posed by BSE. These measures consist of import policies and practices, and domestic controls including a feed ban, awareness programs, surveillance programs, animal identification and the exclusion of specified risk material (SRM)[1] from human food. This chapter briefly describes what BSE is, the risk this disease presents to human health and relevant topics of interest to consumers of Canadian beef and purchasers of live cattle.

A. What are BSE and vCJD?

BSE or "mad cow disease" is a progressive, fatal disease of the central nervous system of cattle. It is not contagious, rather, it is transmitted through the consumption of feed contaminated with meat and bone meal (MBM) derived from BSE-infected cattle.[2] Although the exact mode of transmission is still unknown, it is associated with the presence of an abnormal protein called a prion. The time between an animal's exposure to the disease and the onset of clinical symptoms normally ranges from between four to five years, but this interval increases as the level of exposure decreases, e.g, lower exposure levels result in longer incubation periods. Animals show symptoms of central nervous system disorders that may appear two to six months before the animal dies.

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[1] SRM will be discussed more fully later in this chapter.

[2] Final Opinion of the 5th Scientific Steering Committee on the Geographical Risk of Bovine Spongiform Encephalopathy (GBR) adopted on 6 July 2000. p5. http://europa.eu.int/comm/food/fs/sc/ssc/out113_en.pdf

Although the origin of BSE in cattle remains unconfirmed, the epidemic in the UK is believed to have resulted from feeding cattle MBM containing the tissues of BSE infected animals, beginning in the 1970's. One of the challenges BSE poses is that the infective agent is resistant to normal industrial processes such as heat. This means that it may not be completely destroyed by the rendering process used by modern abattoirs to produce byproducts from slaughter wastes. In 1988, the UK banned the use of rendered ruminant material in ruminant feeds, hoping to remove potentially contaminated material from the animal food chain. Four to five years later, the number of BSE cases began to decrease dramatically. Contaminated feed has since become accepted internationally as being the most likely method of transmission of BSE, although other possibilities are still being researched.

The human equivalent of BSE, called variant Creutzfeldt-Jakob disease (vCJD), has been linked to eating beef products contaminated with central nervous system tissues of cattle infected with BSE. vCJD is extremely rare, approximately 150 cases have been reported worldwide. Like BSE, there is no treatment currently available and therefore prevention is the only control.

Cases of vCJD are presently reported using the country where the onset of illness occurred rather than the country where exposure to infection has taken place.[3] In this context, there have been two "North American cases". In the single case of vCJD identified in Canada in April of 2002, all evidence indicates that the disease was not contracted in Canada, but in the UK. The patient stayed in the UK for prolonged periods on multiple occasions during the 1980's and 1990's and ate processed meat products that carried a high risk of transmission of vCJD.[4] No cases of vCJD have ever been linked to eating Canadian Beef. The U.S. case involved a young woman who resided in the UK during its BSE epidemic. The symptoms of vCJD appeared years later after the woman had moved to the U.S.[5]

To put the risk of vCJD in perspective, in the UK, where the potential human exposure to the BSE infective agent was higher than any other country in the world, there have been approximately 140 definite or probable vCJD cases to date. At the height of the UK BSE epidemic in 1992, the annual incidence rate was over 7,500 BSE cases per million adult cattle.[6] At the height of Switzerland's BSE epidemic in 1995, the BSE incidence rate was over 100 times

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[3] "Variant Creutzfeldt-Jakob disease in a Canadian resident". Eurosurveillance. 15 August 2002. www.eurosurveillance.org/ew/2002/020815.asp

[4] " First Canadian Case of vCJD". Health Canada. April 2002. www.hc-sc.gc.ca/english/diseases/cjd/index.html

[5] "Probable vCJD in a U.S. Resident". CDC. October 2002. www.cdc.gov/mmwr/preview/mmwrhtml/mm5141a3.htm

[6] "Annual incidence rate of bovine spongiform encephalopathy (BSE) in the United Kingdom". OIE. March 2004. http://www.oie.int/eng/info/en_esbruincidence.htm

less than that of the UK (68 cases,[7] out of a population of 800,000 adult cattle resulting in a incidence rate of 73.6 per million[8]) and not a single case of vCJD has been detected to date.

In 2004, Canada had a BSE incidence rate of only 0.15 cases per million adult cattle. The incidence of BSE in Canadian cattle is low and the tissues that could potentially harbor BSE infectivity (SRM)[9] are removed from the human food chain at slaughter. The latter eliminates more than 99% of the potential infectivity from an infected animal. As a result, the potential for consumer exposure through foods in Canada has been effectively eliminated.[10] [11]

Table 1.0 Canada's annual incidence rate of BSE based on reporting requirements of the OIE.

Year	Adult cattle population >24 months	Number of indigenous BSE cases	Incidence rate (number of indigenous BSE cases per million head of cattle >24 months)
2001	6 million	0	0[b]
2002	6 million	0	0[b]
2003	6 million	2[a]	0.33[b]
2004	6.7 million	1	0.15[bc]

[a] One case diagnosed in Canada in May 2003 plus 1 case diagnosed in the U.S. in December 2003
[b] Source "Annual Incidence Rate of BSE in Member Countries". February 18, 2004. www.oie.int/eng/info/en_esbincidence.htm
[c] The adult cattle population increased in 2004 as older animals were retained in the national herd as a result of market conditions following the closure of the U.S. border in 2003. One case of BSE was detected in late December 2004, although confirmed in January, 2005.

[7] "Number of reported cases of BSE in farmed Cattle Worldwide". OIE. March 2004. www.oie.int/eng/info/en_esbmonde.htm

[8] "Annual Incidence Rate of BSE in Member Countries". February 18, 2004. www.oie.int/eng/info/en_esbincidence.htm

[9] The BSE-agent has a limited distribution in cattle where it is confined to certain tissues collectively referred to as specified risk materials (SRM). These tissues consist of the brain, eyes (retina), spinal cord, clusters of nerve cells closely attached to the head and vertebral column (the trigeminal and dorsal root ganglia respectively), tonsils and a part of the small intestine known as the distal ileum.

[10] "Food Directorate Policy on Specified Risk Material (SRM) in the Food Supply". Health Canada. July 24, 2003. www.hc-sc.gc.ca/food-aliment/fpi-ipa/e_policy_srm.html

[11] "Opinion of the Scientific Steering Committee on the Human Exposure Risk (HER) via food with respect to BSE". December 1999. http://europa.eu.int/comm/food/fs/sc/ssc/out67_en.pdf
and Heim D, Kihmn. Risk management of transmissable spongiform encephalopathies in Europe. Rev. sci. tech. Off. Int. Epiz., 2003,22 (1), 179-199.

Estimates of the incidence rate of BSE in the adult cattle population for each of the last four consecutive twelve month periods based on the reporting requirements of the OIE are presented in Table 1.0. Even if the case detected in early January 2005, is included in the 2004 results, the incidence rate (0.3) is still well below two in a million, which is the threshold for a minimal risk country as defined by the OIE.

B. What is the role of the World Health Organization (WHO)

The World Health Organization (WHO) is the United Nations specialized agency whose objective is the attainment of the highest possible level of health worldwide. It is governed by 192 Member States, including Canada and the U.S. Since 1991, the WHO has convened 11 scientific consultations on issues related to animal and human transmissible spongiform encephalopathies (TSE) like BSE and vCJD. These meetings have made wide-ranging recommendations aimed at protecting human and animal health. For example, in 2001, WHO, the Food and Agriculture Organization (FAO) and the World Organization for Animal Health (OIE) jointly convened a Technical Consultation on BSE: Public Health, Animal Health and Trade. The principal goal of the consultation was to provide information to Member countries, on BSE and vCJD to enable them to determine the actions necessary within their own borders to avoid or reduce the risk to human and animal populations, and to export trade.[12] WHO has made a number of recommendations on BSE and vCJD.

C. SRM removal protects consumer health

The World Health Organization (WHO) makes the following recommendation:

"The BSE agent is concentrated in certain tissues and not distributed throughout the bovine body. Measures must ensure that these infectious tissues have no opportunity to enter the food or feed chain. The brain and spinal cord account for by far the largest amount of infectivity (nearly 90%). As only a very small quantity of infectious material is believed capable of causing disease in cattle, and the infective dose for humans is unknown, all tissues suspected of containing any level of infectivity should be removed and destroyed. Use of these so-called SRM for human food or for rendering should be strictly prohibited, as is the case in numerous countries that have introduced protective measures."[13]

The removal at slaughter of SRM also protects against the risk posed by cattle that may be incubating the disease yet do not show any symptoms. Together with a ban on products such as

[12] "Joint WHO/FA/OIE Technical Consultation on BSE: Public Health, Animal Health and Trade: Conclusions and key recommendations. OIE. Paris, 11-14 June 2001. www.oie.int/esp/publicat/rapports/en_bse%20who-fao-oie.htm

[13] "Understanding the BSE threat" World Health Organization October 2002". WHO/CDS/CSR/EPH/2002.6. pp14-15. www.who.int/csr/resources/publications/bse/BSEthreat.pdf

mechanically recovered meat that could be contaminated with SRM, excluding SRM from the human food chain is the most important food safety measure to protect public health.[14]

There are also a number of other safeguards and factors that come into play in Canada. Together, these constitute a continuum of measures that ensure the risks of human exposure and infection with the BSE-agent is virtually eliminated. This continuum consists of:

1. The prevalence of BSE in Canada is extremely low:

    - All indications from intensive surveillance efforts in Canada are that the prevalence rate of BSE cases in the adult cattle population in Canada (in 2003, 0.33 per million adult cattle, in 2004, 0.15 per million adult cattle) is less than that of a minimal risk country as defined by the World Organization for Animal Health (OIE), that is, less than two cases per million adult cattle.

    - While a limited number of cattle were undoubtably exposed to the BSE-agent in the early to mid 1990's, the pre-emptive feed ban introduced in 1997 would have led to a dramatic reduction in exposure and continues to ensure that the chances of further cases of BSE in animals born after the feed ban is remote.

2. Most animals infected with BSE will not survive long enough to pose a public health threat:

    - BSE has a long incubation period (average 4-5 years). Most cattle are slaughtered for human consumption between 18-22 months of age and are therefore considerably less likely to have developed infective levels of the disease when they enter the food system.

3. Even if an animal survives long enough to develop into a BSE case, such animals are unlikely to be passed as healthy animals fit for human consumption

    - Experiences gained in Europe as a result of widespread testing demonstrate that the incidence rate of BSE is much higher in certain classes of "risk animals" compared to animals sent for healthy slaughter. These animals would not enter the human food chain as they either consist of dead animals or animals displaying certain symptoms, including downers[15] and animals with neurological signs, which would be screened out at ante and/or post mortem inspection.

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[14]Heim D, Kihmn. Risk management of transmissable spongiform encephalopathies in Europe. Rev. sci. tech. Off. Int. Epiz., 2003,22 (1), pp179-199.

[15]Downers are cattle that are unable to walk, or stand because of illness, injury or infirmity.

4. SRM are excluded from the human food chain.

   - Excluding SRM eliminates the vast majority of potential BSE-infectivity to which humans might be exposed;[16]

   - SRM are removed in such a manner so as to avoid cross-contamination of other tissues;

   - stunning techniques involving air injection and/or pithing that could result in the contamination of blood with neurological tissue are prohibited in Canada.

5. Scientific evidence to date continues to indicate that transmission of BSE to humans through food is difficult, suggesting that a significant species barrier exists.

In summary, BSE is a rare disease in the cattle population in Canada, particularly amongst animals passed as fit for human consumption. The risks to human health are further mitigated by excluding SRM from the food supply and the existence of a significant species barrier, which means that even if all other safeguards failed and a person was exposed to the BSE-agent, the chances of becoming infected are extremely small.

The investigation into the January 11, 2005, BSE case provides a practical illustration of these points. The case animal was a Charolais beef cow that had remained on the farm of its birth during its entire life. The cow had separated from the herd, experienced a loss of condition and eventually hind-limb dysfunction that the owner attributed to injury. A private veterinary practitioner was consulted and the animal was euthanized and sampled for BSE testing. This animal tested positive.

The subsequent investigation identified 349 animals within the same herd that could possibly have been exposed to similar BSE risk factors. Because these cattle would have been five-to-seven years old today, most had already been slaughtered or had died of natural causes. Only 41 of these animals were still alive. These animals were euthanized and sampled. All tested negative for BSE. The disposition of the other 308 animals was as follows:

- 273 animals were confirmed to be dead or slaughtered in Canada;
- 32 animals had died on the farm of origin and three animals were deemed untraceable because of inadequate records.

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[16] "Opinion of the Scientific Steering Committee on the Human Exposure Risk (HER) via food with respect to BSE". December 1999. http://europa.eu.int/comm/food/fs/sc/ssc/out67_en.pdf

Taking a precautionary approach for the benefit of both domestic and international consumers of beef products, Canada and the U.S. remove a broader listing of SRM than the international standards recommend for a country with minimal BSE risk.[17] *Canada's Food and Drug Act* and its *Health of Animals Regulations* were amended to require removal of all SRM with the potential of harboring infectivity and to explicitly prohibit the export and use of SRM in any form as food for humans.[18] As of August 23, 2003, SRM have been defined in Canada as the skull, brain, trigeminal ganglia (nerves attached to the brain), eyes, tonsils, spinal cord and dorsal root ganglia (nerves attached to the spinal cord) of cattle aged 30 months or older, and the distal ileum (portion of the small intestine) of cattle of all ages. However, in federally-registered establishments, a CFIA directive has required SRM removal as of July 24, 2003.[19] It should be noted that until such time as suitable techniques are developed to ensure that the dorsal root ganglia can be entirely removed from the vertebral column, the Government of Canada's Meat Hygiene Directive[20] issued under the Meat Inspection Regulations, mandates that the vertebral column from all cattle aged 30 months or older must be removed and disposed of as inedible product. The directive also stipulates that the vertebral column of these cattle cannot be used in the preparation of mechanically separated meat or finely textured meat. In addition, to ensure the complete removal of the distal ileum, the entire small intestine of all cattle regardless of their age must be removed and disposed of as inedible product

The range of tissues excluded from the human food supply in Canada is the same as those tissues which are excluded from the food supply in the U.S. as required by the United States Department of Agriculture's Food Safety Inspection Service (see Table 2.3).[21]

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[17]Regulations Amending the Health of Animals Regulations. CFIA. 24 July 2003. www.inspection.gc.ca/english/reg/appro/2003/20089_e.shtml

[18]Regulations amending the Food and Drug Regulations (1389-Specified Risk Material). Health Canada. 24 July 2003. www.hc-sc.gc.ca/food-aliment/friia-raaii/food_drugs-aliments_drogues/part-partie_11/e_1389.html Regulatory Impact Analysis Statement. CFIA. 24 July 2003. www.inspection.gc.ca/english/reg/appro/2003/20089ria_e.shtml

[19]"Fact Sheet: Specified Risk Materials". Health Canada. July 2003. www.hc-sc.gc.ca/english/media/releases/2003/bse_factsheet.htm

[20]"Meat Hygiene Directive" (2003-18), effective from July 24, 2003. www.inspection.gc.ca/english/anima/meavia/mmopmmhv/direct/2003/direct18e.shtml

[21]"USDA issues new Regulations to Address BSE". FSIS. 8 January, 2004. www.fsis.usda.gov/oa/news/2004/bseregs.htm

D. What is the role of the OIE?

The World Organization for Animal Health, known commonly by its French acronym "OIE" is an international standard-setting body whose mandate includes providing a better guarantee of the safety of food of animal origin through a science-based approach.[22] For BSE it gives recommendations intended to manage the human and animal health risks associated with the presence of the BSE infective agent in cattle in order to make beef products safe for consumers. It is important to note that the OIE guidelines are not prescriptive but rather serve as a guide for countries to conduct risk assessments of their own domestic situation as well as of countries from which they may wish to source imports.

The OIE Terrestrial Animal Health Code contains standards, guidelines and recommendations for the use of national veterinary authorities to guide BSE risk analysis and the determination of specific measures to protect human health and to prevent introduction of BSE as a result of trade while avoiding unjustified sanitary barriers. Adherence to the OIE Code standards on BSE varies because of the unique circumstances with respect to the structure of each country's beef industry, the preventative measures taken in the past and the prevalence of BSE.

The OIE Terrestrial Animal Health Code describes five BSE risk categories. In order of increasing incidence of BSE these categories are:

- BSE free
- BSE provisionally free
- minimal BSE risk
- moderate BSE risk
- high BSE risk

Because many countries take action only after they themselves detect BSE or when it is reported by another country, no country can claim to be free of BSE. At the 72nd General Session of the OIE in May of 2004, the OIE Scientific Commission recommended that the International Committee recognize Argentina, Iceland, Singapore and Uruguay as 'provisionally free' from BSE in accordance with the OIE Terrestrial Code.[23] However, the OIE has not undertaken to recognize *any* country as fulfilling the requirements of any of the other three risk categories (minimum, moderate, high BSE risk) nor is there any indication that they will endeavor to do so in the future. Each level of BSE risk and the associated recommended standards serve to guide national veterinary authorities to conduct risk analysis and to determine specific measures to

[22] OIE. www.oie.int/eng/en_index.htm

[23] "Final Report 2004: 72 General Session". OIE. Paris 23-28 May 2004. pp29. www.oie.int/downld/SG/2004/A_RF2004_WP.pdf

protect human health, and to prevent introduction of BSE as a result of trade while avoiding unjustified sanitary barriers.

E. Canada is a Minimal BSE Risk Country

Although BSE has been detected in Canada, there are a number of compelling reasons to conclude that the incidence of BSE in Canada is equivalent to that of a minimal risk country as defined by the OIE's Terrestrial Animal Health Code. The Government of Canada first outlined these reasons in a statement published in December 2003, entitled "Canada: a minimal BSE risk country" as outlined below:

1.A risk assessment was undertaken by the Government of Canada in 2002[24] that discussed all the BSE risk factors identified in the OIE Code including the potential for the introduction and recycling of the BSE agent through the consumption of MBM of ruminant origin and the importation of cattle. The assessment demonstrated that:

- MBM for livestock feed has not been imported from the UK or any other countries subsequently affected by BSE since 1978.
- A ban on the feeding of ruminant derived MBM to ruminants has been in place since 1997. The level of compliance with the ban has been high as verified by routine inspections of both renderers and feed mills.
- A small number of potentially-infected cattle imported from the UK in the 1980's may have entered the animal feed system prior to 1993.

2. The following criteria, as stipulated in the OIE Code, have been in place for at least seven years:

- Compulsory notification and investigation of all cattle showing clinical signs compatible with BSE.
- An education and awareness program targeting veterinarians, producers and workers in the cattle industry.
- A surveillance program for BSE, which has met or exceeded OIE targets.

3. A ruminant to ruminant feed ban has been in place for at least eight years:

[24] "Risk Assessment on Bovine Spongiform Encephalopathy in Cattle in Canada". Animal Health Risk Analysis Animal, Plant and Food Risk Analysis Network (APFRAN). December 2002. p3. http://www.inspection.gc.ca/english/sci/ahra/bseris/bserise.pdf

- Although it has only been seven complete years[25] since the introduction of a feed ban in 1997, an equivalent level of assurance to the requirement that a feed ban has been in place for at least eight years can be provided on the basis that:
- Following the introduction of a feed ban it can be expected that the number of BSE cases remaining in the cattle population after eight years would be extremely low;
- The number of BSE cases remaining in the Canadian cattle population would be extremely small as only a few animals are likely to have become infected prior to the feed ban and the majority of these would have already been culled, slaughtered or died; and
- The most likely source of BSE for Canada is associated with a limited number of live cattle imported from the UK in the 1980s. Only one or a few of these animals would have been potentially infected with BSE and introduced infectivity into the animal feed chain in the 1980s after they were slaughtered or died. Although the rendering and feeding practices at that time would have allowed BSE to cycle through cattle, considering the prolonged incubation period of BSE (average of 4-5 years), the amplification and spread of BSE would have been extremely slow reaching a peak in 1996-97, just prior to the introduction of a feed ban in 1997. The feed ban would have resulted in a dramatic reduction in exposure, effectively eliminating further spread and amplification of BSE.

4. The following animals are completely destroyed: All BSE cases, all progeny of female BSE cases born within the last two years, all cattle reared with the BSE case animals during their first year of life that could have consumed the same potentially contaminated feed or all animals born in the same herd within 12 months of their birth.[26]

    - The BSE case detected in Canada on 20 May 2003, was a six year old cow born in March 1997. It had two calves born within the 2 year period prior to the diagnosis of BSE. Both were male calves, one born in 2001 and subsequently slaughtered as a steer in 2002 while the other, born in 2002, has been destroyed.[27]

The Government of Canada has implemented the measures set out in the OIE Code for a minimal risk country to provide the most extensive protection possible to human health, food safety and animal health. The confirmation of the January 11, 2005, BSE case does not change the

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[25]Canada and the U.S. implemented nearly identical feed bans in August 1997. The document published in December 2003 read "six years" - as of March 2005, it has been almost 7 years 8 months since implementation.

[26]"Executive Summary: Canada: a mimimal BSE risk country". CFIA. December 2003. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/minrisexece.shtml

[27]Idem

assessment that Canada has proper safeguards in place that are based on international standards neither does it change Canada's status as a minimal risk country. The following information pertaining to the BSE cases identified in Canada after December 2003 is consistent with the December 2003 statement:

- The BSE case detected in Canada on 17 December, 2004, and confirmed on January 2, 2005, was an eight year old cow born in October 1996 . It gave birth in 2003 and 2004. Both calves died of causes unrelated to BSE.[28]
- The BSE case confirmed in Canada on 11 January, 2005, was a six year 9 month old cow born in March 1998. The animal had two progeny born within the previous two years: one was confirmed slaughtered and the other, too young to be tested for BSE, was euthanized and incinerated at the CFIA's Lethbridge laboratory.[29]

In reference to the January 11, 2005 case, while the feed ban is an important BSE animal health measure, the detection of this animal, born after the feed ban's introduction, does not impact on the safety of meat currently being produced in Canada. Following the initial detection of BSE, the Government of Canada moved quickly to implement the most effective public health measure that a BSE-affected country could take by requiring the SRM from all cattle slaughtered in Canada. Removal of SRM is verified by inspection staff of the CFIA and provincial and territorial counterparts. This science-based measure ensures that consumers in Canada and in importing countries are effectively protected from exposure to BSE infectivity in meat products produced in Canada.

With respect to birth cohorts slaughtered prior to the July 2003 implementation of the requirement to remove SRM from the food chain, a number of factors contribute to the very low risk associated with meat from these animals. These include the fact that the majority of animals slaughtered for beef consumption in Canada are between 18-22 months of age and are, therefore, considerably less likely to have developed infective levels of the disease, that all animals in the federal system are subjected to ante and post mortem inspection, that the "within herd" incidence of BSE is a rare event which has been reconfirmed by Canada's experience in which no additional BSE positive animals have been found upon tracing and testing, and finally, that the highest level of prions are located in the brain, spinal cord and eyes, all of which are not generally included in the diets of the majority of Canadians.

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[28] "Q&A case # 2". CFIA. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/ab2005/2queste.shtml

[29] "Q&A Case #3". CFIA. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/ab2005/3queste.shtml

F. Are some products more safe than others?

The OIE provides guidelines that ensure that a wide range of products may be safe for human consumption even though BSE has been detected in a nation's cattle herd, including fresh meat (bone-in or deboned), meat products and live cattle. What the OIE Code recommends is that as the risk category of a country moves from minimum to high risk, that the corresponding list of SRM that needs to be removed is more inclusive and that these SRM and any commodity contaminated by them should not be sold or traded.[30]

For a country or zone with minimal BSE risk, such as Canada, the OIE recommends that SRM not be sold or traded for the preparation of food, feed, fertilizers, cosmetics, pharmaceuticals including biologicals, or medical devices. Food, feed, fertilizers, cosmetics, pharmaceuticals or medical devices prepared using SRM should also not be sold or traded. Similarly, ruminant-derived MBM or greaves, or any commodities containing such products, which originate from countries with a minimal, moderate or high BSE risk should not be traded between countries.[31] This recommendation is based on the assumption that these products are or may be derived in part from SRM.

On both sides of the Canada-U.S. border, these SRM are removed from cattle. To reflect an abundance of caution, additional tissues demonstrated to have the potential to harbour BSE infectivity are also removed, including most of those listed for cattle originating from a country with a moderate BSE risk and even certain additional tissues listed for cattle from a country with a high BSE risk.[32]

Fresh meat from a country of any BSE status can be safe for human consumption but increased restrictions may have to be imposed. For countries presenting a high BSE risk, more severe measures are applied to the cattle from which the meat was derived and to the meat itself than for minimal risk countries. For example, the OIE recommends deboning fresh meat and meat products only when a country or zone has a high BSE risk. Since Canada is a minimal BSE risk country, this condition is not relevant to Canadian beef. The experts consider that as long as the appropriate measures are taken for the risk level identified, the meat is safe. Similarly, live cattle

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[30] "Chapter 2.3.13 Bovine Spongiform Encephalopathy. Terrestrial Animal Health Code". 12th Edition-2004. www.oie.int/eng/normes/mcode/en_chapitre_2.3.13.htm#rubrique_encephalopathie_spongiforme_bovine

[31] Idem

[32] For Canada see: "Food Directorate Policy on Specified Risk Materials in the Food Supply". 22 July 2003. Health Canada. www.hc-sc.gc.ca/food-aliment/fpi-ipa/e_policy_srm.html For the U.S. see: "USDA issues new Regulations to Address BSE". FSIS. 8 Jan 2004. www.fsis.usda.gov/oa/news/2004/bseregs.htm

may be imported safely from a country of any BSE status, provided certain measures are applied.[33]

G. Communicating risk: Public and animal health

The challenge in public risk communication is to simplify scientific messages while maintaining accuracy.[34] The Canadian government has worked hard with its provinces and territories and the Canadian beef industry to provide consumers with information about BSE and its associated risks and to address misperceptions in an open and transparent manner, so that consumers can make informed decisions about Canadian beef.

Health Canada says that BSE poses an "extremely low risk to human health".[35] The Public Heath Agency of Canada characterizes the risk of contracting vCDJ as "extremely small", given the low incidence of BSE in cattle in Canada.[36] The use of these terms is not arbitrary. They are chosen after comprehensive evaluation of the circumstances and risk factors which exist in Canada. The terms also take into account the effect that the animal and human health control measures, implemented by Canada over the past fifteen years, have had in protecting human health and food safety.

H. Why are Canadians and other consumers still eating Canadian beef?

Canada and the U.S. have clearly distinguished themselves as being different than other regions of the world that have detected BSE. Firstly, because they heeded the counsel of the OIE and the

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[33]"Chapter 2.3.13 Bovine Spongiform Encephalopathy. Terrestrial Animal Health Code". 12th Edition-2004. www.oie.int/eng/normes/mcode/en_chapitre_2.3.13.htm#rubrique_encephalopathie_spongiforme_bovine

[34]The"Joint WHO/FAO/OIE Technical Consultation on BSE: public health, animal health and trade", held in Paris 11-14 June 2001, described the issues as follows:

"Consumer risk perceptions often differ dramatically from those of the experts. For this reason, an important task of risk communication is to develop a clear understanding, through consultation, of the aspects of the risk that are of greatest concern to stakeholders. These may not be aspects of the risk that experts would be most likely to identify or respond to. Experts, for example, tend to focus on the quantifiable aspects of risks, while non-experts tend to be more concerned about qualitative aspects of risks (the degree to which risks are voluntary, who takes the risk versus who gets the benefits, the degree of certainty in the knowledge about risk, as well as its familiarity and controllability). Experts prefer to withhold judgement on potential hazards when there is a lack of scientific evidence, but to the lay person this gives the appearance of favouring industry and looks like a preference for risk-taking rather than safety. See pp15-16. www.oie.int/esp/publicat/rapports/en_bse%20who-fao-oie.htm

[35]"BSE (Mad Cow Disease) and Food Safety". Health Canada. January 19, 2005. www.hc-sc.gc.ca/english/diseases/bse/factsheet.html

[36]"Variant Creutzfeldt-Jakob Disease (vCJD) in Canada". Public Health Safety Agency. January 27, 2005. www.phac-aspc.gc.ca/cjd-mcj/vcjd-faq_e.html

WHO and took a wide range of precautionary measures well in advance of detecting BSE. As a result, BSE in North America will be limited to isolated cases, there will be no BSE epidemic. Secondly, because the measures taken were science-based and adhered to international standards, domestic consumers did not lose confidence in the safety of the beef supply or the food inspection system.

Public opinion polls (Earnscliffe) taken in Canada in May 2003 shortly after the first BSE case, determined that 80% of Canadians polled were confident that eating beef was safe. This same question was asked in January 2004 (EKOS), shortly after the BSE case animal in Washington state had been traced to Canada. In this second survey 78% of respondents continued to affirm that they were confident that eating beef was safe. Not only did Canadians say that beef was safe, Statistics Canada reports that the Canadian public rallied around the cause of Canada's beef farmers by increasing their purchases of beef. Between the detection of BSE in May 2003 and when trade in boneless beef resumed with the U.S. and Mexico in September 2003, domestic retail prices for higher-valued beef cuts remained strong because of high demand by Canadian consumers during the barbeque season and also high food-service demand. In 2003, each Canadian ate on average 5% more beef than the year before, 14.2 kg per person, up from 13.5 kg per person.[37]

64% of respondents to the January 2004 (EKOS) survey were confident in the food safety system. A year later, shortly after the detection and confirmation of the January 11, 2005 case, 73% of respondents to a followup survey (EKOS) continued to express that they were confident in the food safety system, an increase of nearly 10 points.

This confidence in the safety of Canadian beef has gone beyond Canadian consumers. A number of countries, that had initially reacted to the May detection of BSE by banning imports of Canadian beef and cattle, have subsequently concluded that these products are safe and have restored market access (see Annex A). This confidence has not wavered since the January 11, 2005, BSE case.

Canadian boneless beef exports to the U.S. resumed in early September 2003 and by October 2003 had reached historic volume levels. There was no negative U.S. consumer reaction to the resumption of trade with Canada at that time nor has there been since. U.S. demand for beef continued to increase throughout 2003. Consumer demand for beef showed continued strength in the first quarter of 2004, with preliminary data showing the Beef Demand Index increased by

[37] "Food Consumption 2003". Statistics Canada. 26 May 2004. www.statcan.ca/Daily/English/040526/d040526e.htm

10.4 percent compared to the first quarter of 2003.[38] U.S. industry response to the reports of the growing demand for beef included the following:

"Consumers remain confident in the safety of U.S. beef, despite the discovery of this country's first case of Bovine Spongiform Encephalopathy (BSE) at the end of last year and the closure of key export markets," said Nelson Curry, chairman of the Cattlemen's Beef Board (CBB) and beef producer from Paris, Kentucky. "Looking ahead, this is good news for cattlemen and the beef industry in this critical time in our industry's history."[39]

"The robust economy coupled with strong consumer spending and the changing perception of protein in the American diet have all contributed to this increase," said Gregg Doud, chief economist for the National Cattlemen's Beef Association, which is one of the CBB's contractors on beef checkoff programs aimed at building demand for beef. "This demand figure confirms the public opinion polling CBB conducted most recently showing that more than 89 percent of the U.S. population said they felt the beef supply is safe."[40]

After the January 11, 2005, BSE case, international consumer demand for Canadian beef remained robust.

[38] "Beef Demand Exhibits Continuing Strength in First Quarter of 2004". NCBA. 20 May 2004. www.beefusa.org/dsp/dsp_content.cfm?locationId=1474&contentTypeId=2&contentId=2648

[39] Idem

[40] Idem

2. CANADA'S RISK MITIGATION ACTIVITIES AND BSE INVESTIGATION

A. Assessing BSE Risks

The source of BSE

Prior to the discovery of how BSE was transmitted, materials from the UK that were potentially contaminated with the BSE infective agent were distributed throughout the world through trade in live cattle and their by-products (including feed). Given that ruminant MBM for use in livestock feed has not been imported by Canada from the UK or any of the other countries subsequently affected by BSE since 1978, the most likely source of BSE in North America is associated with a limited number of live cattle imported into Canada and the U.S. from the UK in the 1980's. After their productive lives had expired, these UK cattle may have entered the animal feed chain through accepted industry practices at that time, whereby cattle bones and inedible tissues were rendered and then fed back to cattle as protein supplements. This in effect, would have recycled the source of BSE infectivity back into Canada's cattle herd.[41]

The U.S. and Canada had both imported live animals from the UK in the early stages of its BSE epidemic. Of the 334 UK animals imported by the U.S. between 1980 and 1989, the disposition of 173 animals is not known and it is possible that their remains ended up in either animal feed, human food, or both and were recycled.[42] Although Canada imported 191 cattle from the UK between 1982 and 1989, tissues from only 68 of these animals could potentially have been rendered after they were slaughtered (59) or died (9). Only 12 of these 68 animals were imported in 1988 to 1989, the period of greatest risk identified by the European Commission's Assessment

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[41] "GBR of Canada". European Food Safety Authority. September 2004. www.efsa.eu.int/science/efsa_scientific_reports/gbr_assessments/564_en.html and "GBR of U.S." European Food Safety Authority. September 2004. www.efsa.eu.int/science/efsa_scientific_reports/gbr_assessments/573_en.html

[42] "Evaluation of the Potential for Bovine Spongiform Encephalopathy in the United States" Joshua T. Cohen et al. Harvard Center for Risk Analysis, Harvard School of Public Health. Hatim Abdelrahman et al. Center for Computational Epidemiology, College of Veterinary Medicine Tuskegee University. 26 November 2001. pp21-22. http://www.aphis.usda.gov/lpa/issues/bse/bse-riskassmt.html

of the Geographical BSE-Risk of Canada.[43] One or more of the cattle imported from the UK into either Canada or the U.S. prior to 1993[44] is likely to have been infected and introduced the BSE-agent into the animal feed system, leading to one or more first generation cases in either or both countries. Considering the lengthy incubation period of BSE, only some of the animals subsequently infected would have survived long enough to introduce the BSE-agent back into the feed system, leading to the exposure of the cases identified to date, most likely as calves in their first years of life just prior to or as the feed ban was implemented and existing feed stocks were consumed. Regardless of which pathway BSE may have entered into the animal feed system, the detection of BSE in Canadian-born animals is a sentinel for the presence of BSE in North America. The U.S. has not allowed further ruminant imports from the UK since 1989. Canada has not allowed further imports since1990.

In 1990, all UK-origin animals that had been imported into Canada were successfully traced and placed under a monitoring program for clinical signs of BSE. In 1993 BSE was found in a beef cow that had been imported from the UK in 1987. In response, Canada took the decision to eliminate all UK-origin animals that were still alive from the Canadian herd. These animals were removed, sampled and tested and all returned negative results for BSE.

Although these UK-origin animals were widely dispersed across Canada, only 10 had come from farms in the UK where BSE was eventually detected. Two of these animals were birth cohorts of the 1993 imported case.[45] Birth cohorts are members of the same herd that were born in the year before or the year after the birth of a BSE case. They are considered to pose a greater BSE risk than other animals from the same herd, as it is much more likely they would have been exposed to the same contaminated batch of feed at an age when they would have been most susceptible. Even so, from observations in Europe and the UK, the actual number of BSE cases that have arisen in such cohort animals has been extremely small. In the vast majority of cohorts, either none or just one or two such animals have been detected with BSE.[46]

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[43]"GBR of Canada". European Food Safety Authority. September 2004. www.efsa.eu.int/science/efsa_scientific_reports/gbr_assessments/564_en.html

[44]Although both Canada and the U.S. banned the importation of cattle from the UK in 1989 and 1990 respectively, 10 animals imported into Canada were re-exported to the U.S. between 1990 and 1993. "Report on the Assessment of the Geographical BSE-Risk (GBR) of the United States of America. July 2000. p40. http://europa.eu.int/comm/food/fs/sc/ssc/out137_en.pdf

[45]"Risk Assessment on Bovine Spongiform Encephalopathy in Cattle in Canada". Part C: Risk Estimation. Animal Health Risk Analysis Animal, Plant and Food Risk Analysis Network (APFRAN). December 2002. http://www.inspection.gc.ca/english/sci/ahra/bseris/bserise.pdf

[46]"Opinion of the Scientific Steering Committee on BSE-related culling in Cattle". September 2000. www.europa.eu.int/comm/food/fs/sc/ssc/out138_en.pdf

Although the rendering and feeding practices at that time would have allowed the BSE-agent to cycle within Canada's cattle population, its rate of spread and amplification would have been extremely slow prior to the introduction of the feed ban in 1997. This would have been the result of a number of factors:

- Unlike many European countries, widespread exposure to the BSE-agent within the cattle population would not have occurred through the feeding of contaminated MBM, as Canada had not imported MBM for use in livestock feed from any country affected by BSE since 1978.
- The initial challenge arising from the BSE-agent entering the feed chain from just one or a few imported animals would have been extremely small and limited to a restricted portion of the national herd.
- Any animals that became infected after the initial introduction would not have re-introduced the BSE-agent back into the feed chain for many years since BSE has such a prolonged incubation period[47] (average 4-5 years):
  - the actual levels of the BSE-agent in an infected animal are below the limits of detection for all but the last few months prior to an animal developing clinical signs;[48]
  - the majority of animals would not survive long enough to reach the end of this incubation period as they would have been sent to slaughter or died.
- It is anticipated that this low level of BSE would have reached a peak at the time of the introduction of the feed ban in 1997.[49] After the implementation of the feed ban, the science indicates that there would have been a dramatic reduction in the incidence of BSE (see explanation in the discussion on the feed bans in Section 2 B on page 31).

So far three of the four BSE cases attributed to Canada were born in the Province of Alberta while the other was born just over the border in Saskatchewan. Alberta has a small number of rendering facilities that have historically processed dead stock and non-edible materials derived at slaughter. It is possible that the BSE-agent may have entered the animal feed chain and was subsequently confined to a somewhat geographically-restricted area around Alberta and Saskatchewan. However, while such a possibility is subject to ongoing investigations, it is highly speculative and it is far too premature to draw any conclusions.

It is also worth noting that the highest cattle density in Canada is found in the Province of Alberta, which accounts for approximately 40% of all cattle in Canada and almost 35% of the

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[47] The incubation period is the time interval from when an animal becomes infected with a disease agent to when it develops clinical signs.

[48] "Manual of Diagnostic Tests and Vaccines for Terrestrial Animals Chapter 2.3.13. Bovine Spongiform Encephalopathy". 2004. OIE. www.oie.int/eng/normes/mmanual/A_00064.htm

[49] "Canada: a Minimal Risk Country". CFIA. December 2003. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/minrise.shtml

overall mature cattle population. The recent trend of retaining older cattle on-farm and the current enhanced national surveillance program that incorporates an additional financial reimbursement from the Government of Alberta may have combined to increase the likelihood of BSE being detected in Alberta as opposed to elsewhere in North America.

BSE in North America

The history of the integration of the Canadian and the American beef, cattle and feed markets predates the first observation of BSE in the UK in the mid-1980's, the discovery of how this disease is transmitted and all international mitigation measures implemented specifically to prevent its introduction and spread. The Canadian and American beef, cattle and feed complex has been functioning much like a single North American market since the late 1970's. Evidence of this is that prices in the two countries move together, and shocks in one market are transmitted to the other market through adjustments of supply and demand, as shown in Figure 1.[50] Prior to the U.S. border closure in May 2003, price differences between Canada and the U.S. were largely a reflection of transportation costs and exchange rates. This continues to be the case for Canadian boneless beef and liver and most feed ingredients, all of which have continued to be traded at normal volumes since the 2003 detection of BSE in Canada. Since free trade was formalized 15 years ago e.g., the signing of the U.S. Canada Free Trade Agreement, the two countries have become each other's largest trading partners in agricultural products, deepening the level of integration. Over the five years previous to the border closure in 2003, 7.3 million head of live cattle had crossed the border in one direction or the other as breeding stock, dairy animals, veal calves, feeders and slaughter animals. Both Canada and the U.S. recognize that the long history of integration in the North American market must be the starting point for any discussion on BSE risk and mitigation activities related to human health, food safety and animal health.

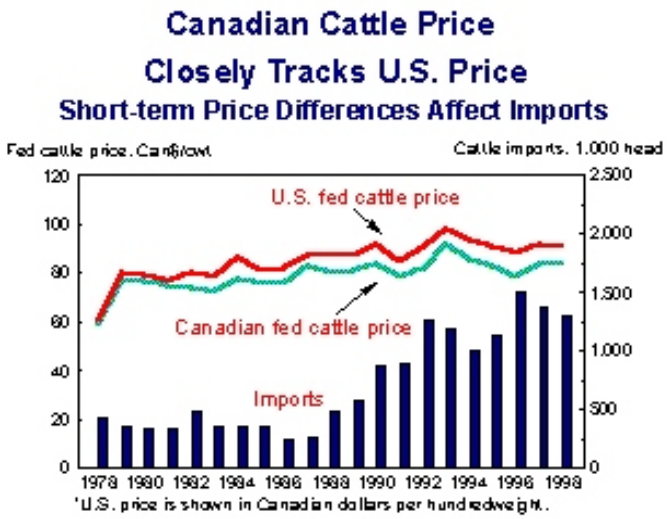

Figure 3 Prices as an indicator of market integration
Source: www.fas.usda.gov/dlp/Canada/questions.htm

[50] Young, Linda M. "U.S. Canadian Agricultural Trade Conflicts: Time for a New Pardigm" Montana State University. http://cafri.usask.ca/estey/j_html/young1-1.htm. See also: FAQs Regarding U.S. beef imports from Canada. FAS Online. 24 October 2003. www.fas.usda.gov/dlp/Canada/questions.htm.

Considering their geographic proximity, management practices and their long history of integration, the structure of the cattle industries in both the U.S. and Canada are virtually identical and share the same BSE risk factors.[51] This has led to import practices, policies and domestic controls for BSE that are equivalent (see Table 2.3). As North American Free Trade Agreement (NAFTA) partners, Canada, the U.S. and Mexico have applied independent but harmonized transmissible spongiform encephalopathy (TSE)[52] risk-management strategies that are aligned with the OIE.[53] Since 1998 they have worked closely together on TSEs through an ongoing series of tri-lateral technical meetings involving disease surveillance, import/export and diagnostic and research working groups. These meetings have also had participation from the respective public health agencies as a separate working group.

This enhanced continental relationship has served to facilitate reciprocal BSE status evaluations and the implementation of mutually acceptable TSE-related trading provisions that comply with the OIE guidelines. Table 2.1 records the BSE status of the three NAFTA members, as judged

Table 2.1 Comparative assessment of 2003 BSE status in North America

	Assessment assigned to		
Assessed by	**Canada**	**United States**	**Mexico**
Canada	Free	Free	undetermined
United States	Not infected with or at high risk of BSE	Not infected with or at high risk of BSE	Not infected with or at high risk of BSE
Mexico	Free	Free	Free
European Union	GBR Level II	GBR Level II	undetermined

From "Risk Management of TSE in North America". Kellar & Lees. OIE . 15 May 2003. p208. http://www.oie.int/eng/publicat/rt/2201/12.%20Kellar.pdf

by themselves and their neighbours in North America just prior to the detection of BSE in Canada in 2003. The continuing goal is that of a unified position on TSE issues in North America.[54]

[51] Risk Management of transmissible spongiform encephalopathies in North America". J.A. Kellar & V.W. Lees. Rev.sci.tech.OIE. 2003. p208. http://www.oie.int/eng/publicat/rt/2201/12.%20Kellar.pdf

[52] BSE is an example of a TSE affecting cattle, others include chronic wasting disease in deer and scrapies in sheep.

[53] "Chapter 2.3.13 Bovine Spongiform Encephalopathy. Terrestrial Animal Health Code". 12th Edition-2004. www.oie.int/eng/normes/mcode/en_chapitre_2.3.13.htm#rubrique_encephalopathie_spongiforme_bovine

[54] Risk Management of transmissible spongiform encephalopathies in North America". J.A. Kellar & V.W. Lees. Rev.sci.tech.OIE. 2003. p208. http://www.oie.int/eng/publicat/rt/2201/12.%20Kellar.pdf.

Internationally, Canada and the U.S. are also viewed as having the same BSE risk, both before and after the detection of BSE in 2003. The European Union's BSE risk rating tool, the Geographic Risk Assessment (GBR), placed the U.S. and Canada in the same geographical risk assessment (GBR level II -unlikely, but not excluded) in 2000 with Canada receiving a slightly more positive assessment.[55] In 2004, after the detection of BSE in both countries, the risk status of Canada and the U.S. was lowered to GBR level III (likely but not confirmed or confirmed at a lower rate).[56] In 2004 Mexico was also rated as GBR level III.[57]

The equivalency of risk status between Canada and the U.S. is not only the basis of the conclusions of the EU GBR[58] but also the basis of the U.S. BSE risk analysis, "Evaluation of the Potential for Bovine Spongiform Encephalopathy in the United States",[59] and Canada's BSE risk analysis "Risk Assessment on Bovine Spongiform Encephalopathy in Cattle in Canada".[60]

The team of scientific experts that reviewed the Washington State BSE case made important statements confirming this assertion of equivalency of BSE risk:

"Having examined the information provided on trade in live cattle and livestock feed ingredients within the North American Free Trade Agreement (NAFTA), the subcommittee firmly believes that the first case of BSE in the United States cannot be considered in isolation from the whole cattle production system in North America. The significance of this BSE case cannot be dismissed by considering it "an imported case". The first BSE case detected in the USA, and the first "indigenous case" reported in Canada in 2003, must be recognized as both being BSE cases indigenous to North America." [61]

Purpose of BSE Surveillance

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[55]"Report on the Assessment of the Geographical BSE-Risk (GBR) of the United States of America. July 2000. http://europa.eu.int/comm/food/fs/sc/ssc/out137_en.pdf

[56]"GBR of Canada". European Food Safety Authority. September 2004. www.efsa.eu.int/science/efsa_scientific_reports/gbr_assessments/564_en.html
GBR of U.S. September 2004. www.efsa.eu.int/science/efsa_scientific_reports/gbr_assessments/573_en.html

[57]"GBR of Mexico". European Food Safety Authority. August 2004. www.efsa.eu.int/science/efsa_scientific_reports/gbr_assessments/565_en.html

[58]"Report on the Assessment of the Geographical BSE-Risk (GBR) of the United States of America. July 2000. pp40-41. http://europa.eu.int/comm/food/fs/sc/ssc/out137_en.pdf

[59]See comments on imports of live animals and MBM in "Evaluation of the Potential for Bovine Spongiform Encephalopathy in the United States"Joshua T. Cohen et al. Harvard Center for Risk Analysis, Harvard School of Public Health. Hatim Abdelrahman et al. Center for Computational Epidemiology, College of Veterinary Medicine Tuskegee University. 26 November 2001. p22. http://www.aphis.usda.gov/lpa/issues/bse/bse-riskassmt.html

[60] "Risk Assessment on Bovine Spongiform Encephalopathy in Cattle in Canada". CFIA. December 2002. http://www.inspection.gc.ca/english/sci/ahra/bseris/bserise.pdf

[61]"Report on the Measures Relating to Bovine Spongiform Encephalopathy (BSE) in the United States". 2 February 2004. p4. www.aphis.usda.gov/lpa/issues/bse/US_BSE_Report.pdf

According to the OIE Code, surveillance for BSE has two goals: first, to determine whether BSE is present in the country, and, if present, to monitor its extent and evolution in order to inform decisions on the control measures required and the monitoring of their effectiveness. The OIE adds that surveillance programs should be determined by, and commensurate with the outcome of a risk assessment and should also take into account the diagnostic limitations associated with the sub-populations and the relative distributions of infected animals among them.[62] Like adherence to the OIE Code standards in general, surveillance systems vary because of the unique circumstances with respect to the structure of a country's beef industry, the preventative

Table 2.2 Annual BSE Surveillance number of cattle 24 months

Year	Canada inventory all cattle[A] (millions)	OIE BSE incidence rate[M]	Canada BSE tests (head)	U.S. inventory all cattle[A] (millions)	OIE BSE incidence rate[M]	U.S. BSE tests (head)	Mexico inventory all cattle[G]	Mexico BSE tests (head)
1997	13.4	0	712	101.7	0	2713	-	140
1998	13.1	0	926	99.7	0	1080	-	407
1999	12.9	0	895	99.1	0	1302	24.8	289
2000	12.8	0	1020	98.2	0	2681	23.6	194
2001	12.9	0	1575	97.3	0	5272	-	358
2002	13.7	0	3,377[B]	96.7	0	19,990[H]	30.6	-
2003	13.4[F]	0.33	3710	96.1	0	20,543[J]	-	-
2004	14.8[K]	0.15[N]	23,550[B]	94.9[L]	0	176,468[C]	30.8	-
2005	15.1[P]	-	11,383[B]	95.8[L]	-	106,406[C]	-	-

Source of BSE test numbers for 1997-2001: Risk Management of the TSE in North America p. 216.
Others as noted.

[A]Source: Statistics Canada and USDA www.cattle.guelph.on.ca/statistics/us_can-inventory.html
[B]BSE: Enhanced Surveillance Results". CFIA. 8 Mar, 2005 (updated weekly).
www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/surv/surve.shtml#num
[C]"USDA's BSE Testing". USDA. 13 Mar, 2005 (updated weekly)
www.aphis.usda.gov/lpa/issues/bse_testing/test_results.html
[E]An additional 2017 tests were conducted as part of the May 2003 investigation for a cumulative total of 5727 tests. Source: CFIA.
[F]Source: "United States and Canadian Cattle". NASS.
http://usda.mannlib.cornell.edu/reports/nassr/livestock/uscc/uscc0203.pdf
[G]Various sources - blank field indicates that data was not readily available from public sources.

[62]Appendix 3.8.4. Surveillance and Monitoring Systems for Bovine Spongiform Encephalopathy. OIE.
www.oie.int/eng/normes/mcode/en_chapitre_3.8.4.htm

[H] Fiscal year 2002. "USDA Actions to Prevent Bovine Spongiform Encephalopathy". USDA. www.aphis.usda.gov/lpa/issues/bse/bsechron.html
[J] Fiscal year 2003. "USDA Actions to Prevent Bovine Spongiform Encephalopathy". USDA. www.aphis.usda.gov/lpa/issues/bse/bsechron.html
[K] See "Statistical Briefer". CANFAX. January 2005. www.canfax.ca/general/StatBrf.PDF
[L] "Cattle" National Agricultural Statistics Service. January 1, 2005. http://jan.mannlib.cornell.edu/reports/nassr/livestock/pct-bb/catl0704.pdf
[M] Annual Incidence Rates. OIE www.oie.int/eng/info/en_esbincidence.htm
[N] The adult cattle population increased in 2004 as older animals were retained in the national herd as a result of market conditions following the closure of the U.S. border in 2003. One case of BSE was detected in December 2004.
[P] "Cattle Inventories by Provinces". Statistics Canada. 16 March 2005. www.statcan.ca/english/Pgdb/prim50a.htm

measures they have taken in the past and the prevalence of BSE. BSE surveillance systems need to be designed for the beef, cattle and feed production complex which they set out to evaluate or to monitor. The North American situation is distinct from that of any other region in the world and therefore it is difficult to make comparisons.

Canada's BSE surveillance program

Compulsory notification and investigation of all cattle showing clinical signs compatible with BSE have been in place in Canada since 1990.[63] Canada's BSE surveillance program was initiated in 1992 and has been expanded and enhanced since then to reflect changes in international standards, enhanced understanding of BSE and technological advances (see Table 2.3).[64] Industry education and awareness programs as well as effective compensation[65] and cattle identification programs[66] are in place to support Canada's surveillance program.[67]

The OIE recommends that one of the factors in the assessment of the BSE risk status of a country is a BSE surveillance and monitoring system which records the number and results of investigations for at least 7 years. Prior to the detection of BSE, the number of annual BSE tests recommended by the OIE to be performed on animals showing neurological dysfunction was about 300.[68] This target was aimed at determining whether BSE was present at an annual prevalence rate as low as one in a million amongst the adult cattle population. Canada

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[63] "Canada: a minimal BSE risk country". CFIA. December 2003. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/minrise.shtml
[64] Risk Assessment on BSE in cattle in Canada: Executive Summary. CFIA. December 2002. www.inspection.gc.ca/english/sci/ahra/bseris/bserise.shtml
[65] "National BSE Surveillance Reimbursement Program" CFIA. 12 October 2004. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/surv/produce.shtml
[66] "Canadian Cattle Identification Agency". www.canadaid.com/about/what_is.shtml
[67] Risk Assessment on BSE in cattle in Canada: Executive Summary. CFIA. December 2002. www.inspection.gc.ca/english/sci/ahra/bseris/bserise.shtml
[68] "Canada: a minimal BSE risk country". CFIA. December 2003. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/minrise.shtml

consistently exceeded this OIE testing target since 1996.[69] In 2002 for example, Canada tested 451 animals that showed signs of neurological dysfunction, 50% above the number recommended by the OIE, as well as 2,926 additional animals from other high risk categories e.g., dead animals and downers, making a total of 3,377 negative BSE tests. Table 2.2 shows the total number of BSE tests conducted annually in Canada.

The team of scientific experts that reviewed Canada's investigation acknowledged that Canada's surveillance measures achieved their designed outcome, as demonstrated by the identification of the positive animal in May of 2003, in a manner which precluded its entry into the human food chain. An increased surveillance program was recommended in order to determine the current prevalence and to judge the effectiveness of measures implemented both in the past and in the future over time.[70] The same international team also reviewed the incident of a cow that tested positive for BSE in Washington State and recommended increased surveillance for the U.S. as well.[71]

In January 2004, Canada announced that $92.1 million of Federal funding had been approved over five years, to invest in enhancements to Canada's surveillance system. A minimum of 8,000 target animals were to be tested in 2004 with the number rising to about 30,000 animals tested per year as soon as possible. However, Canada surpassed its original target for 2004, testing 23,550 animals.[72]

In 2004, the CFIA launched a targeted communications campaign to encourage producers to report cattle for BSE testing. The campaign, which includes a poster and brochure, identifies the specific categories of animals that should be tested and promotes a reimbursement program[73] intended to offset costs associated with veterinary examinations and carcass disposal. Campaign materials are distributed nationally through producer associations, CFIA offices, auction markets and veterinarians.[74] CFIA also launched a new section of its website to provide additional details about its surveillance program, to track the number of animals tested and to provide the public

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[69] Risk Assessment on BSE in cattle in Canada: Executive Summary. CFIA. December 2002. www.inspection.gc.ca/english/sci/ahra/bseris/bserise.shtml

[70] "Report on Actions Taken by Canada in Response to the Confirmation of an Indigenous Case of BSE". CFIA. 26 March 2003. www.inspection.gc.ca/english/heasan/dismala/bseesb/internate.shtml

[71] "Report on the Measures Relating to Bovine Spongiform Encephalopathy (BSE) in the United States". 2 February 2004. p6. www.aphis.usda.gov/lpa/issues/bse/US_BSE_Report.pdf

[72] "Government of Canada Announces Enhancements to Surveillance and Animal Tracking Systems". CFIA. 9 January 2004. www.inspection.gc.ca/english/corpaffr/newcom/2004/20040109e.shtml

[73] "National BSE Surveillance Reimbursement Program". CFIA. 12 October 2004. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/surv/produce.shtml

[74]. "New Measures to Accelerate BSE testing Progress " CFIA. September 17, 2004. www.inspection.gc.ca/english/corpaffr/newcom/2004/20040917e.shtml

with testing results.[75] USDA initiated a similar surveillance program in this same year.[76] The U.S. also maintains a website to track its BSE surveillance test results.[77]

BSE Prevalence in Canada

Three BSE cases have been detected in Canadian-born cattle since the first animal was diagnosed in May, 2003. These additional cases were not unexpected since the diagnosis of BSE in 2003 had indicated the presence of a low prevalence of BSE. Since then, a number of factors have combined to substantially increase the chances of detecting further cases in Canada. They include:

- The testing of significantly more animals through an enhanced surveillance program that specifically targets certain risk groups amongst which BSE cases are much more likely to be found;[78]
- The retention of older breeding animals in the national herd as a result of depressed market conditions following the closure of the U.S. border, which has increased the chances of an infected animal surviving long enough to develop into a BSE case;

    - Since it is more than likely that animals are infected with BSE within their first year of life, the ages of the North American BSE cases detected so far (70, 80, 81 and 98 months) suggest that their incubation periods have mostly been longer than the average incubation period observed in the 1980s and 1990s in the UK (48 to 60 months).[79] There is a growing trend in the UK and Europe indicating that the average incubation period is now longer following the introduction of BSE control measures including a feed ban.[80] Research findings have demonstrated that animals exposed to low levels of infectivity have much longer incubation

[75]"BSE: Enhanced Surveillance Results". CFIA. February 8, 2005 (updated weekly). www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/surv/surve.shtml#num

[76]USDA's BSE Testing program". USDA. www.aphis.usda.gov/lpa/issues/bse_testing/

[77]"USDA's BSE Testing". USDA. February 4, 2005 (updated weekly). www.aphis.usda.gov/lpa/issues/bse_testing/test_results.html

[78]. "New Measures to Accelerate BSE testing Progress". CFIA. September 17, 2004. www.inspection.gc.ca/english/corpaffr/newcom/2004/20040917e.shtml

[79]Ferguson NM, Donnelly CA. ""The epidemiology of BSE in cattle herds in Great Britain. II. Model construction and analysis of transmission dynamics. *Philosophical Transactions of the Royal Society of London – Series B: Biological Sciences*. 352 (1355): 803-28. 1997.

[80]Wilesmith JW. "Preliminary epidemiological analyses of the first 16 cases of BSE born after July 31, 1996, in Great Britain". *The Veterinary Record*. 2002. pp151, 451-452. and Koeijer A, Schreuder B, Bouma A. "Factors that influence the age distribution of BSE cases: potentials for age targeting in surveillance". *Livestock Production Science*. 2002. pp76, 223-233.

periods.[81] These observations and findings strongly suggest that the Canadian BSE cases are likely to have been exposed to a very low level of infectivity in their feed early in life with anticipated incubation periods as long as 7.5 years or more.[82]

- The creation of a financial reimbursement program that encourages farmers, veterinarians and the dead stock/rendering industry to identify suitable surveillance candidates;[83]
- The combination of a targeted communications campaign to encourage producers to report cattle for BSE testing, a depressed market for mature cattle, a limited slaughter capacity for these animals and the financial reimbursements being offered has resulted in producers receiving higher financial returns for suitable surveillance candidates than market conditions have otherwise provided;
- The minimum sampling target for 2004 (8,000 animals) was easily exceeded with 23,550 samples submitted; and
- New laboratory techniques designed to provide for the highest level of sensitivity achievable.

These factors have resulted in increased testing, particularly of older animals born prior to or around the time of the feed ban when exposure to the BSE-agent would have been at its peak. This was expected to lead to the detection of a few more cases. However, it is important to note that only three cases have actually been detected in Canada among over 35,000 tests undertaken in Canada since 2003. Canada's BSE test results confirm that the level of BSE in Canada is below that of a minimal risk country as defined by the OIE. Estimates of the incidence rate of BSE in the adult cattle population for each of the last four consecutive twelve month periods based on the reporting requirements of the OIE are presented in Table 1.0 and Table 2.2. Even if the case, detected in early January 2005, were to be included in the 2004 test results, the resulting incidence rate (0.3) would be still well below the two-in-a million threshold for a minimal risk country as defined by the OIE.

The prevalence of BSE in Canada is extremely low. The large increase in BSE testing that began in 2003 has only resulted in a more sensitive Canadian BSE surveillance system, capable of detecting even more of the small number of remaining BSE cases in the adult cattle population. In February 2005, the International Food and Agriculture Organization of the United Nations

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[81] Update of the Opinion on TSE infectivity distribution in ruminant tissues (initially adopted on 10-11 January 2002 and amended on 7-8 November 2002) following the submission of (1) a risk assessment by the German Federal Ministry of Consumer Protection, food and Agriculture and (2) new scientific advice regarding BSE infectivity distribution in tonsils. www.europa.eu.int/comm/food/fs/sc/ssc/out296_en.pdf and Matthews D. unpublished data presented at TAFS (an International forum on TSE and Food Safety) Washington, 2004.

[82] "Response to R-CALF" APHIS. February 2, 2005. p3. www.meatami.com/Content/FoodSafety_Inspection/AnimalHealth_Biotech/r-calfstatement2-05.pdf

[83] "National BSE Surveillance Reimbursement Program". CFIA. 12 October 2004. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/surv/produce.shtml

(FAO) issued a statement confirming the assertion that the cases in North America are "isolated incidents".[84] North American BSE surveillance programs continue to demonstrate that BSE is a rare occurrence that cannot be compared to the experience of Europe.

Will more BSE cases be found in North America?

With the dramatic increase in BSE testing and surveillance (see Table 2.2) it was anticipated that a small number of additional BSE cases would be found on both sides of the border. USDA has also acknowledged the possibility of finding additional BSE cases in the U.S.[85]

Detecting some additional BSE-positive animals, whether born prior to or shortly after entry into force of the ban while stocks of pre-ban feed were being used up, has been fully taken into account in the development and implementation of the robust risk-mitigation measures in North America for continuing to protect public and animal health. The potential number of BSE cases remaining in the North American cattle population would be extremely small as only a few animals are likely to have become infected prior to the feed ban and the majority of these would have already been culled, slaughtered or died. It is important to note that the detection of some additional BSE-positive animals does not change the risk profile for either Canada or the U.S.

B. Has Canada's feed ban been effective?

Lessons from the UK

The key animal health control measure introduced in the UK was the feed ban implemented in July 1988, two years after BSE was first detected. It was brought in to prevent the incorporation of potentially infectious material into feed for ruminants, and so to prevent cattle which were not already infected from becoming infected.[86] The feed ban led to a dramatic reduction in exposure and it is widely considered by scientists that this measure alone would have led to the eventual eradication of BSE in the UK.

Although there have been a number of BSE cases in cattle born after the feed ban (BABs), the majority of these (2/3rds) were born in the first few years after it was introduced. Following the confirmation of the first BAB cases in 1991, detailed investigations indicated that some feed manufactured before the ban had remained on farms and in the feed chain. Despite the prohibition, it was used after the ban was introduced. This feed was the most likely source of

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[84] "Recent cases of "mad cow disease" are isolated incidents: Three cases detected in Canada and one in the U.S." FAO. 7 February 2005. www.fao.org/newsroom/en/news/2005/89641/index.html

[85] USDA's BSE Testing program". USDA. www.aphis.usda.gov/lpa/issues/bse_testing/faq.html

[86] "BSE: Disease Control and Eradication". Department for Environment, Food and Rural Affairs. United Kingdom. 4 August 2004. www.defra.gov.uk/animalh/bse/controls-eradication/feed-ban.html

infection for the majority of cases born within the first years after the UK feed ban (Figure 2). Due to the prolonged incubation period of BSE, BABs did not appear in significant numbers until 1993 and later.[87]

By 1994 it was apparent that the decline in the epidemic, which had begun in the 1993, (Figure 3) was occurring more slowly in those parts of the UK in which the proportion of pigs and poultry relative to cattle was the greatest. Pig and poultry feed could have, at that time, legitimately contained ruminant MBM. In such areas there was a higher possibility of cross contamination of ruminant feed with MBM, either in the feed mill, during transport or on farm. In addition, some farmers may have accidentally or deliberately fed cattle with pig or poultry rations. As a result of these experiences the measures in place for BSE were progressively tightened. They were designed to minimise any risk of cross-contamination of cattle rations in feed mills, during transport or on farms with MBM intended for other species. From 1996 the use of mammalian MBM was banned in all feed for farmed animals in the UK.[88]

Given the impact of the feed ban and the prolonged incubation period of BSE, the number of BSE cases in North America would be expected to peak approximately six years later, that is around 2003-4. The potential number of cases remaining in the cattle population today from animals infected prior to the feed ban would be extremely small as the majority of these animals would have already been culled, slaughtered or died. Although some animals may have become infected after the feed ban was introduced, the potential number of such animals would be much less than the number of BSE cases arising from animals infected prior to the ban. This has certainly been the trend in the UK and other BSE-affected countries where the feed ban has eliminated the vast majority of BSE infectivity from the ruminant feed chain.

A small number of further BSE cases arising from animals born prior to the feed ban are to be expected in Canada and there might even be a few more BABs in addition to the January 11, 2005, case. However, these should not be interpreted as an indication that the feed ban is failing. As demonstrated by experiences in the UK and Europe, they are epidemiologically unimportant. Although they may prolong the time required to eradicate BSE they will not initiate a new outbreak, as the feed ban ensures that the chance of them infecting other animals is remote. As a result, it can be concluded that Canada has an epidemiologically effective feed ban under which BSE is destined for eradication.

[87] Idem
[88] Idem

Figure 2: Impact of feed controls introduced into the UK on the exposure of cattle to the BSE-agent. Figure constructed from data from the UK Department for Environment, Food and Rural Affairs website.[89]

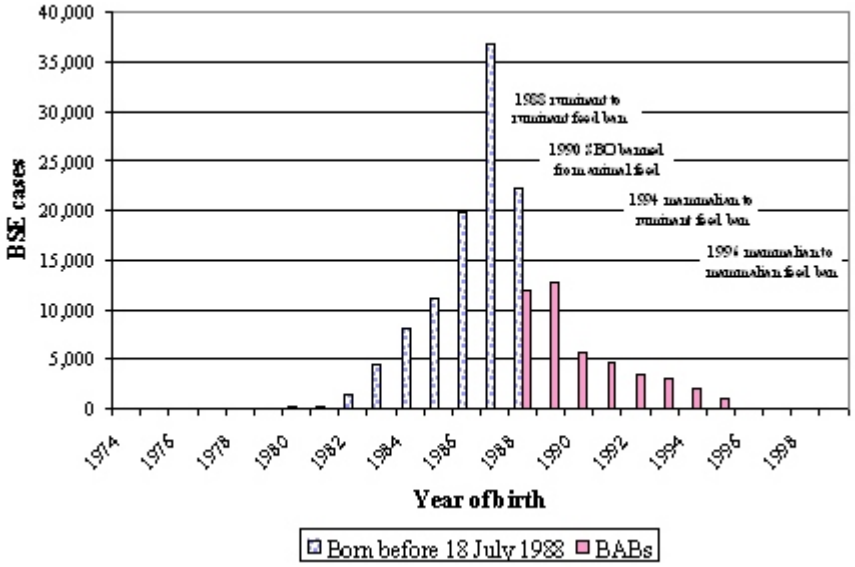
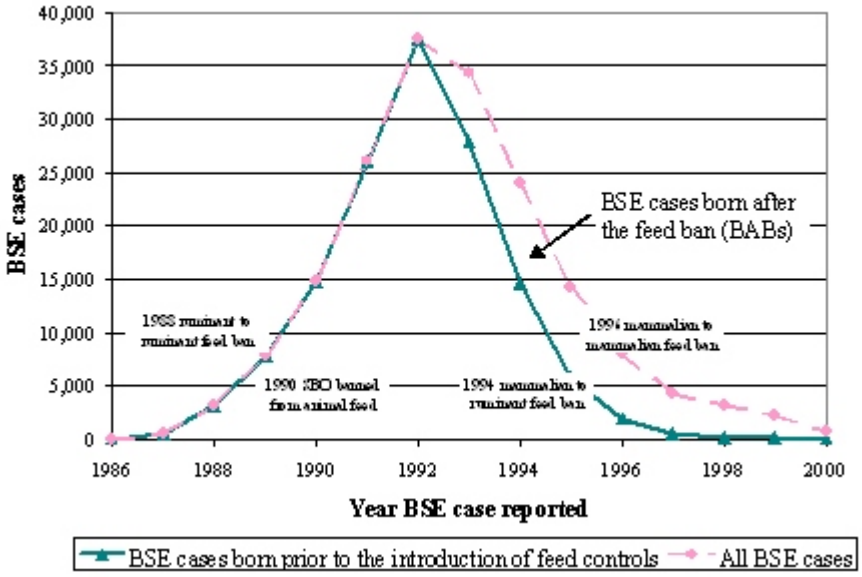


Figure 3: Impact of feed controls introduced into the UK on the BSE-epidemic. Figure constructed from data from the UK Department for Environment, Food and Rural Affairs website.[90]



[89]Idem and "BSE: Statistics. Department for Environment, Food and Rural Affairs". United Kingdom. June, 2004. www.defra.gov.uk/animalh/bse/statistics/incidence.html

[90]Idem

Canada introduced a pre-emptive feed ban in 1997

North America produces an abundant supply of economically priced feed ingredients and historically, there has been significant movement of feed ingredients between the U.S. and Canada, including rendered animal protein. Prior to the detection of BSE in North America, fifty percent of the rendered animal protein used in Canadian livestock feeds was imported from the U.S.[91] In response to the shared risk factors, common industry practices and an international recommendation issued by the WHO, Canada and the U.S. introduced virtually identical ruminant feed bans in 1997. Canada and the U.S. were among the first countries to respond to the WHO recommendation.

The feed ban introduced in Canada in 1997 was a pre-emptive measure to guard against the potential spread of BSE in case it had been previously introduced. We now know that there was some infectivity in the feed chain at the time the feed bans were introduced in 1997.

Such a pre-emptive ban stands in stark contrast to the feed bans that were introduced in the UK and several European countries only after BSE cases were actually detected. By this time, the amount of the BSE-agent cycling within the cattle populations of these countries had already built up to significant levels. Many animals, which had been exposed and were incubating the disease, were destined to develop into BSE cases in subsequent years. Nevertheless, these feed bans led to such a dramatic reduction in exposure that this measure alone was considered by scientists to be enough to arrest the growth of the epidemic and force it towards extinction.

Feed ban compliance

Feed restrictions are universally recognized as a critical measure to contain the spread of BSE. Canada, like the U.S. has progressively built a record of compliance within the context of a comprehensive inspection program. The feed ban involves the regulation of a complex and diverse network of independent industry players throughout the agri-food sector. In Canada it covers some 28 inedible rendering facilities, 550 commercial feed mills, 1300 retailers and over 100,000 farms with ruminants, a portion of which have multiple species on the same farm. The number of facilities varies with economic conditions. Given this level of complexity throughout the animal feed system, as was the case with many countries, it was not possible to instantly achieve full compliance in either Canada or the U.S.

Compliance with the feed ban in Canada has been high, as verified by routine inspections of both renderers and feed mills. In the first year or so following its introduction, since existing supplies

[91] "Risk Assessment on Bovine Spongiform Encephalopathy in Cattle in Canada". Animal Health Risk Analysis Animal, Plant and Food Risk Analysis Network (APFRAN). December 2002. p3. http://www.inspection.gc.ca/english/sci/ahra/bseris/bserise.pdf

were not recalled in either Canada or the U.S., it was possible that feed containing MBM was fed to cattle before such supplies were exhausted. Nevertheless, just as occurred in the UK the feed ban would have resulted in a dramatic reduction in exposure. In all likelihood it would have limited further spread and amplification of the BSE-agent to such an extent that BSE would be destined for eventual eradication.

Canada has a strong record of compliance based on active enforcement of its feed ban. A survey of 600 farms and inspection of 200 individual producer operations was conducted to trace rendered material and feed of interest in the May 2003 BSE investigation. 99% of the sites experienced either no exposure of cattle to the feed of interest (96%) or only incidental exposure (3%). The remaining one percent represented limited exposures, such as cattle breaking into stored feed.[92] Over the past three years the average compliance rate at the end of a complete inspection cycle was 95% at commercial feed mills. Scientific risk assessments conducted in Canada have indicated that our current feed ban will successfully eradicate BSE from Canada over time. The U.S. National Cattlemen's Beef Association (NCBA) evaluated Canada's feed ban in January 2005, and expressed confidence that the Canadian feed industry was in compliance with its feed ban, based on visual inspection and multiple annual audit reports.[93] Surveillance results stretching over 12 years in Canada and the United States continue to demonstrate that BSE is a rare occurrence in North America and that the 1997 feed bans have been, and continue to be, effective in limiting the potential spread of BSE.

Canada's feed ban is limiting the spread of bovine spongiform encephalopathy (BSE), according to the findings of the Canadian Food Inspection Agency's (CFIA) feed ban review.[94] The review was undertaken at the request of Agriculture and Agri-Food Minister Andy Mitchell following the confirmation of two cases of BSE in January 2005. The United States Department of Agriculture (USDA), which conducted its own review, also determined that Canada's feed ban is working as intended.[95]

The Agency's review determined that the ban was appropriately designed—incorporating the best science of the day—and implemented. The review also found that compliance with the feed ban's requirements at rendering facilities and feed mills was high. On average, 95% of feed mills and 93% of renderers inspected over the past three years were either fully compliant or reported only minor non-compliance issues, such as documentation requirements, which do not

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[92] "BSE Disease Investigation in Alberta". CFIA. 16 July, 2004. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/ab2003/ab2003e.shtml

[93] "NCBA Canadian Trade Delegation Final Report. 2 February, 2005. p12. www.beefusa.org/documents/ACF985.pdf

[94] "Review finds Canada's feed ban effective". CFIA. 2 March 2005. www.inspection.gc.ca/english/corpaffr/newcom/2005/20050302e.shtml

[95] "USDA Assessment of Canada's Feed Ban". USDA. February 2005. www.aphis.usda.gov/lpa/issues/bse/CAN-FeedBanReview.pdf

necessarily signify increased risks of cross-contamination of ruminant feeds with prohibited material. The Agency requires industry to address all cases of non-compliance.

The USDA's review of Canadian feed controls, which was partly conducted in concert with Canadian audit activities, concluded that Canada's feed ban has significantly reduced the potential spread of BSE through the animal feed system. It also determined that the government, the feed industry and producers have taken significant steps together to introduce and integrate the ban into standard feed production and usage practices.

Both reviews indicated that the Canadian feed ban is effectively reducing BSE risks to animal health.

Canada's feed ban & the OIE

The guidelines in the OIE Code for a minimal risk country stipulate that a feed ban should have been effectively enforced for at least eight years. Since Canada introduced its feed ban seven and a half years ago (August, 1997), the eight year time period has almost elapsed. However, rather than focusing on a specific duration of time, it is important to consider the intent of the OIE's recommendation. In this situation, even though Canada's feed ban has not been in place for the full eight years, an equivalent level of assurance can be provided to the eight year period stipulated in the OIE Code.

Following the introduction of an effectively enforced feed ban and taking into account the incubation period for BSE, it can be expected that the number of BSE cases remaining in the cattle population after eight years would be extremely low. It is important to appreciate that the OIE's guidelines were originally developed when BSE was restricted to the UK and Europe and, in particular, in response to the detection of BSE cases in various cattle populations. These cases had arisen prior to the introduction of specific control measures such as a feed ban.

As discussed previously, by the time a feed ban was introduced into many European countries, BSE cases had already been detected. As a result, widespread exposure within the cattle population had already occurred. In this situation it could be reasonably expected that it would take approximately eight years before the majority of BSE cases had been removed from the cattle population. In contrast, for countries such as Canada that introduced a pre-emptive feed ban, the number of animals actually infected with BSE at the time the ban was introduced would have been substantially less. As a result, the length of time required to reach the same low prevalence levels of BSE as those countries that introduced a feed ban in response to detecting actual BSE cases would be less than eight years.

Comparison of Canadian and U.S. feed bans

As can be seen in Table 2.3, under the heading "feed policy", both Canada and the U.S. implemented equivalent feed bans in 1997. Both Canada's feed ban and the U.S. feed ban provide an exemption that allows certain rendered products to be included in ruminant feed e.g., rendered fat. Unlike the U.S. ban, Canada's ban does not allow poultry litter or plate waste from restaurants to be fed to ruminants. While the U.S. has proposed this same restriction as well as removing its current exemption on blood and blood products, it has not implemented this proposal.[96]

Blood and BSE

Evidence of BSE infectivity in the blood of experimentally infected sheep[97] and the spread of vCJD following blood transfusions from patients who subsequently developed clinical vCJD[98] do not indicate that cattle blood is a vehicle for spreading BSE. Exhaustive studies to date have failed to demonstrate the presence of the BSE-agent in either the muscle tissue or blood of cattle.[99] However, contamination of blood might be possible either as a result of neurological tissue entering the bloodstream following slaughter with a penetrating device or from neurological tissue leaking from the shot hole in the skull of the animal. The potential for such contamination is associated with the stunning method employed. Stunning techniques that involve air injection and/or pithing result in significant brain damage and increase the potential for contamination.[100] However, these techniques are prohibited in Canada and the U.S.

Considering that BSE infectivity has not been detected in tissues apart from the distal ileum and tonsils until at least 32 months post-exposure, the likelihood that blood collected from a foetus would contain BSE infectivity is also negligible.[101]

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[96] "USDA and HHS Strengthen Safeguards Against BSE". USDA. 9 July, 2004. www.usda.gov/Newsroom/0280.04.html

[97] Houston F., Foster, J.D., Chong A., Hunter N., Bostock C.J.. "Transmission of BSE by blood transfusion in sheep". The Lancet Vol 356. 16 September, 2000.

[98] Llewelyn CA Hewitt PE Knight RSG Amar K Cousens S Mackenzie J Will RG. Possible transmission of variant Creutzfeld-Jakob disease by blood transfusion. The Lancet. 2004. Vol 363: 417-21.

[99] "Opinion on TSE infectivity distribution in ruminant tissues: State of Knowledge, December 2001". Adopted by the Scientific Steering Committee 11 January, 2002. www.europa.eu.int/comm/food/fs/sc/ssc/out241_en.pdf

[100] "Scientific report on stunning methods and BSE risks: The risk of dissemination of brain particles into the blood and carcass when applying certain stunning methods". December 2001. http://www.europa.eu.int/comm/food/fs/sc/ssc/out247_en.pdf

[101] "Update of the Opinion on TSE infectivity distribution in ruminant tissues (initially adopted on 10-11 January 2002 and amended on 7-8 November 2002) following the submission of (1) a risk assessment by the German Federal Ministry of Consumer Protection, food and Agriculture and (2) new scientific advice regarding BSE infectivity distribution in tonsils". www.europa.eu.int/comm/food/fs/sc/ssc/out296_en.pdf

Enhancement of North America's feed bans

Following the detection of BSE in North America, the international team of animal health experts that reviewed the BSE situation strongly endorsed removal and redirection of SRM from the animal feed chain.

"...given the epidemiological evidence indicating that BSE agent was already circulating in ruminant feed prior to the feed ban in 1997, and the integration of the North American cattle and feed industries, strong consideration should be given to excluding all SRM from both the human food and animal feed supplies."[102]

On July 9, 2004, the CFIA and USDA/FSIS/FDA,[103] each made announcements regarding their respective intentions to introduce additional animal feed restrictions to further strengthen existing safeguards against BSE. Both Canada, and in a more qualified manner, the U.S., signalled that the removal of bovine SRM from the animal feed chain would be the most appropriate approach to making these enhancements. Preventing these potentially infectious materials from entering the entire feed production chain at the start diminishes the effects of potential cross-contamination of ruminant animal feeds that could occur as feed is produced and distributed, as well as any inappropriate on-farm use. Based on risk analyses, removing SRM from animal feed will enable us to achieve eradication of BSE in North America earlier.

On December 11, 2004, CFIA published for comment in *Canada Gazette Part 1*,[104] a proposed package of regulatory amendments to require the removal and redirection of bovine specified risk material (SRM) and dead and condemned ruminant animals from the entire animal feed chain, including from pet food and fertilizer.[105] This proposal parallels the requirement to remove SRM from the human food supply that has been in effect since July 2003 in both Canada and the U.S. The proposal to remove SRM from feed responds fully to the recommendations of the

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[102] "Report on the Measures Relating to Bovine Spongiform Encephalopathy (BSE) in the United States". 2 February, 2004. p5. www.aphis.usda.gov/lpa/issues/bse/US_BSE_Report.pdf

[103] "USDA and HHS Strengthen Safeguards Against BSE". USDA. 9 July, 2004. www.usda.gov/Newsroom/0280.04.html and "Canada to Enhance BSE Feed Controls". CFIA. 9 July, 2004. www.inspection.gc.ca/english/corpaffr/newcom/2004/20040709e.shtml

[104] The *Canada Gazette* plays an important role in Canada's regulatory process (see: http://canadagazette.gc.ca/aboutus-e.html). Like the U.S. *Federal Register*, it serves as official notice to Canadians, and allows them to participate and to provide comments on proposed regulations. Publication of a regulation in *Canada Gazette part I* is the equivalent of a Proposed Rule in the *U.S. Federal Register*. Publication of a regulation in *Canada Gazette part II* is the equivalent of a Final Rule in the *U.S. Federal Register*.

[105] New Regulations Proposed for BSE Related Feed Controls". CFIA. 10 December, 2004. www.inspection.gc.ca/english/corpaffr/newcom/2004/20041210e.shtml and "Regulations Amending Certain Regulations Administered and Enforced by the CFIA". Canada Gazette Vol 138. No. 50. December 11, 2004. http://canadagazette.gc.ca/partI/2004/20041211/html/regle2-e.html

international team of BSE experts that reviewed the May 2003 BSE investigation[106] as well as the December 2003 U.S. BSE case in Washington State.[107]

Given the impact of this measure to the North American market, extensive consultations have been conducted with Canadian stakeholders and international counterparts, including relevant U.S. government agencies, on the scope, implementation timetable, and other operational details for this measure as it is further developed. The deadline for comments on Canada's proposal in *Canada Gazette Part I* was February 24, 2005. The Agency is now reviewing comments submitted on the proposed removal of specified risk material (SRM) from the animal feed system.

BSE investigation results on sources of feed infection

Similar to the U.S. task in regard to the December 2003 Washington State case animal,[108] CFIA's investigation into the May 2003 BSE case in Canada included tracing the animal remains that were rendered. The tracing of the rendered product revealed that some of the remains of the infected cow were turned into poultry feed, which is an allowed use under both Canada's and the U.S. feed ban. Canada's regulations require rendering plants and feed manufacturers to keep records on the source and distribution of their products. They also specify labelling requirements. CFIA and provincial authorities visited the slaughter establishment, rendering plant and feed mills. As a result of these inspections, the CFIA is confident that BSE controls, including the feed ban, were followed. The carcass of the index case was traced through the abattoir-renderer-feed mill-producer continuum to its direct allocation into pet food and poultry meal and its additional retail distribution across 1,800 farm sites. This cluster of enterprises is typical of the pyramidal feed production and distribution relationship in Canada. Visits to the renderer and feed mills confirmed adherence to the feed ban legislation on product receipt, segregation, labelling and distribution.[109]

In the December 2004 case in Canada (confirmed 2 January, 2005), the CFIA confirmed, based on records of feed purchases and use, that the affected animal was exposed to feed rations containing meat and bone meal. This feed was produced before the 1997 feed ban. Regulations then in-effect permitted the inclusion of meat and bone meal in ruminant feeds. At that time, BSE had not been detected in North America and the reciprocal feed bans implemented by both Canada and the U.S. were precautionary measures.

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[106]"Report on Actions Taken by Canada in Response to the Confirmation of an Indigenous Case of BSE". Bern, Switzerland. 26 June, 2003. www.inspection.gc.ca/english/heasan/dismala/bseesb/internate.shtml

[107]"Report on Measures relating to BSE in the United States". February 2004. www.aphis.usda.gov/lpa/issues/bse/US_BSE_Report.pdf

[108]Rendering is a heat-treatment process used to cook inedible portions of animal carcasses for industrial uses.

[109]"Response to R-CALF". APHIS. February 2, 2005. www.meatami.com/Content/FoodSafety_Inspection/AnimalHealth_Biotech/r-calfstatement2-05.pdf

In CFIA's on-farm investigation of the birth herd of the Washington State animal, two feeds of interest were identified, a dairy ration and a protein supplement. Review of the CFIA's feed mill inspection records indicated that the feed mill which produced the dairy ration had a good *Health of Animals Act* compliance history. The feed mill's formulae showed that ruminant meat and bone meal was used in the dairy ration until July 1997 and discontinued when the Canadian feed ban was implemented in August 1997. It was highly unlikely that the protein supplement was the source of exposure, since it would probably have been consumed before the case animal had access. The feed investigation concluded, therefore, that meat and bone meal exposure, through feed, occurred prior to implementation of the Canadian feed ban.[110]

The CFIA has also compared these last two cases to the earlier BSE case in May 2003 to determine if they were linked by cattle movement or a common feed source. The CFIA's investigation has not yielded any conclusive evidence that would link the cases.[111]

In the BSE case confirmed on January 11, 2005, the feed component of the investigation determined that BSE may have been transmitted to the affected animal through feed produced shortly after the feed ban was introduced.

As discussed earlier, Canada's feed ban was introduced in 1997 as a proactive precaution. At that time, it is likely that the feed ban was not immediately adopted uniformly across the feed industry. Prohibited materials would have been purged from the ruminant feed system as Canadian renderers, feed manufacturers, retailers, distributors and producers developed, implemented and refined new operating processes. Similar experiences have been observed in all countries with BSE that have implemented feed controls. Based on this understanding, the detection of an affected animal born after the feed ban was not unexpected.[112]

The CFIA has also compared these cases to the earlier BSE case in May 2003 to determine if they were linked by cattle movement or a common feed source. The CFIA's investigation has not yielded any conclusive evidence that would link the cases. The information gathered over the course of the investigations would suggest that the appearance of BSE in North America was likely due to the importation of cattle from the UK from 1982 to 1989 when the disease was first emerging and the understanding of the disease was extremely limited. From this group of animals, it is possible that a low level of infectivity entered into the animal feed chain prior to the decision in Canada to remove all remaining imported UK animals in 1993.[113]

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[110]"CFIA's Investigation into the December 2003 BSE Case found in Washington state, U.S.". CFIA. 16 July, 2004. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/americ/wa_invest2003e.shtml

[111]Idem

[112]"Animal Feed". CFIA. 11 February, 2005. www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/ab2005/3queste.shtml#fee

[113]Idem

Feed testing capabilities to verify systems-based compliance

As part of an ongoing effort to ensure that the CFIA is taking advantage of all relevant tools to enforce Canada's animal health safeguards, the CFIA continuously monitors and periodically evaluates new testing technologies. A small feed sampling and testing trial was conducted in 2004 to evaluate the limitations of direct microscopy. The conclusion reached was that microscopy is not capable of differentiating between animal tissues that can enter the feed chain through the grain harvesting and feed distribution system (e.g., incorporation of field mice or small mammals) from those that would be of concern in managing animal health risks for BSE within the scope of Canada's feed control measures. At this time, microscopy as a tool for evaluating compliance would only be seen as useful if undertaken in conjunction with existing inspection programs and with full recognition of its potential limitations.

An article in the *Vancouver Sun*[114]published on December 16, 2005, prior to the completion of this trial, generated discussion about the efficacy of Canada's feed ban. On February 2, 2005, CFIA published a report providing the final results of the microscopy trial.[115]

Members of the US NCBA Canadian Trade Delegation who visited Canada in January 2005, questioned Canada's Chief Veterinarian Officer, Dr. Brian Evans, at length about the content of this article. In their February 2, 2005, final report they concluded that the *Vancouver Sun* article was "sensationalized". Of the 110 samples, 65 samples were Canadian, 44 samples were from the U.S. and one was imported from France. Physical inspection of facilities and reports identified that the vast majority of samples did not contain prohibited material.[116]

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[114]"Cattle feed contaminated by animal parts Secret Canadian tests reveal proteins in both domestic and imported feed". Chad Skelton. December 16, 2004. Vancouver Sun. "DNA tests not used on contaminated cattle feed: Would have detected whether tissue and bone fragments were bovine". Chad Skelton. December 18, 2004. *Vancouver Sun.*

[115]"National Feed Inspection Program 2003-04 Report - Assessment of Microscopic Analysis as a Tool for Analysing Composition of Feed". CFIA. 2 February, 2005. www.inspection.gc.ca/english/anima/feebet/rumin/microe.shtml

[116]"NCBA Canadian Trade Delegation Final Report. 2 February, 2005. pp10-11. www.beefusa.org/documents/ACF985.pdf

C. Comparison of Canadian and U.S. risk mitigation measures

Because both countries have the same risk profile for BSE, the U.S. and Canada moved in a coordinated fashion (see Table 2.3) to implement increasingly stringent risk-mitigation measures as scientific knowledge was learned about the mode of transmission of BSE and once BSE was detected in North America. The more aggressive approach taken by Europe with regard to these issues was dictated by a much higher prevalence of the disease and by less understanding of how the disease was spread. Measures in North America reflect current WHO and OIE advice. National and subnational governments in North America have taken action within their respective jurisdictions in a coordinated manner and have exploited the infrastructures we have to promote the collective compliance of industry.[117]

TABLE 2.3 BSE RISK MITIGATION ACTIVITIES CANADA-UNITED STATES SIDE-BY-SIDE

CANADA[1]	UNITED STATES [1]
Import Polices: Live Cattle	
1987 BSE-free certification of farm required for cattle imported from the UK 1990 import ban placed on cattle from UK and Ireland 1994 import ban on cattle from countries where BSE diagnosed in native cattle 1996 live bovines imported only from countries Canada has recognized as BSE-free 1998 ban expanded to also include live ovine and caprine animals 2005 Proposed regulations published in Canada Gazette 1 for comments to allow live cattle born in 1998 or after to be imported from the U.S. [1a]	1989 banned import of all ruminants from UK and other BSE affected countries 1997 prohibited import of live ruminants from all of Europe until a risk assessment completed 2005 Published final rule allowing the import, as of March 7, 2005 of live cattle under 30 months for slaughter [1b]
Import Policies: Ruminant Products	
Meat and other edible products	
1991 import of beef products from countries with BSE banned	1991 restricted import of ruminant meat and edible products from countries known to have BSE in a native animal

[117] Risk Management of transmissible spongiform encephalopathies in North America". J.A. Kellar & V.W. Lees. Rev.sci.tech.OIE. 2003. p208. http://www.oie.int/eng/publicat/rt/2201/12.%20Kellar.pdf

CANADA[1]	UNITED STATES [1]
1996 beef imports only allowed for countries Canada recognizes as free of BSE 1998 import policy expanded to include ovine and caprine products 2005 Proposed regulations published in Canada Gazette 1 for comments (deadline February 24, 2005) to allow for beef from animals of any age from which specified risk material has been removed and various other commodities [1a]	2001 restricted imports of foods containing ruminant by-products from countries with or at risk for BSE 2001 restricted imports of edible ruminant products processed or stored in a country with or at risk of BSE 2005 Published final rule allowing the import as of March 7, 2005 of beef from animals of any age from which specified risk material has been removed and of certain other ruminant products [1b] However, USDA later stated their intention to retract meat derived from animals over 30 months of age until cattle of this class were also eligible for import. A separate rule-making process for these commodities has been referenced in public statements by USDA.
Rendered products	
1988 all MBM and bloodmeal imports banned except from U.S. 1990 restricted import of rendered animal products other than U.S. origin 1998 restrictions expanded to include ovine and caprine products 2000 suspend import of all animal protein products including blood meal and feather meal from any species unless country of origin is BSE-free	1989 restricted the importation of certain cattle products from the U.K. and other countries where BSE was diagnosed 1991 banned most byproducts of ruminant origin (including MBM) from countries known to have BSE in a native animal 1992 restricted imports of ruminant byproducts for use in foods, human drugs, dietary supplements or cosmetics from countries with BSE 1997 prohibited import of most ruminant products from all of Europe until a risk assessment completed 2000 ban on imports of all processed animal proteins regardless of species 2000 Restricted imports of inedible animal by-products processed or stored in a country with or at risk for BSE
Import Policies: Feed	
1996 imports of animal and pet food only allowed from countries Canada recognizes as free of BSE 1998 import of mammalian protein for use in feed prohibited except for milk, blood, equine or swine) 2000 Feeds containing any rendered animal products of any species not eligible for import from BSE countries	2001 restricted imports of animal feed, including pet food and other animal products containing inedible animal by products from countries with or at risk of BSE

CANADA[1]	UNITED STATES [1]
Feed policy	
1997 (August 4) a ban on the feeding of ruminant derived MBM to ruminants in place (with the exception of pure porcine and equine meal; and milk, blood, gelatin and rendered animal fat from all species) was introduced. Plate waste and chicken litter is banned from feeding to ruminants in Canada.	1997 (final rule published in June, effective August) a ban on the feeding of ruminant derived MBM to ruminants in place (with the exception of blood and blood products; gelatin; inspected meat products which have been cooked and offered for human food and further heat processed for feed (such as plate waste and used cellulosic food casings); milk products (milk and milk proteins); tallow, fats, oils and grease;[6] and any product whose only mammalian protein consists entirely of porcine or equine protein.
2004 announced intention to introduce regulatory proposal for additional animal feed restrictions that require the removal of bovine specified risk materials (SRM) from the animal feed chain.[7] December 2004, published for comments (deadline February 24, 2005) in Canada Gazette 1, proposed package of regulatory amendments to require the removal and redirection of bovine specified risk material (SRM) and dead and condemned ruminant animals from the animal food chain and from fertilizers.[7a]	2004 published advanced notice of rule-making requesting comments on a series of options to strengthen the feed ban. FDA indicated its preliminary conclusion was to propose removal of bovine specified risk materials (SRM) from the animal feed chain.[8]
Formal Risk Assessment of National Situation	
2002 completed	2001 completed
Surveillance[118]	
1990 - BSE made a reportable disease 1991 - Rabies negative samples tested for BSE. 1992 - A national surveillance program was implemented involving collection of samples from mature bovines with neurological signs from abattoirs under federal inspection and from provincial and university laboratories. 1994 - Immunohistochemistry (IHC) introduced. 1996 - provincial ministries of agriculture asked to develop surveillance programs within abattoirs not subjected to federal inspection 1997 - surveillance enhanced to increase the number of samples collected at federally inspected abattoirs	1986 BSE made a reportable disease 1990 - USDA initiates a surveillance program to examine brains of U.S. cattle. 1994 – Surveillance expanded to incorporate new technology (immunohistochemistry) of testing brains for the partially resistant form of the prion protein which is indicative of the TSEs. 1999 - October – USDA expands surveillance of fallen stock (downer cows) as evidence in Switzerland supports this population as an effective target.

[118]U.S. information for this section from "USDA Actions to Prevent Bovine Spongiform Encephalopathy". USDA. 2 June 2004. www.aphis.usda.gov/lpa/issues/bse/bsechron.html.

CANADA[1]	UNITED STATES [1]
2001 - minimum targets were set in selected federally inspected abattoirs for submission of samples from condemned animals. Sampling based on the geographic distribution of dairy cattle. Provinces expand their surveillance program to include emergency slaughter, non-ambulatory (downer) animals and dead stock. A National TSE Veterinary Diagnostic Laboratory Network was established to ensure consistency of diagnostic testing nationally.	2000 – Surveillance of fallen stock increases even further and USDA regionalizes states to increase coverage.
2002 - additional abattoirs were included in the federal program and the target population was refined (dead on arrival, emergency slaughter and non-ambulatory (downer) animals. IHC testing introduced into provincial laboratories.	2002 - USDA tested 19,990 cattle for BSE using a targeted surveillance approach designed to test the highest risk animals, including downer animals (animals that are non-ambulatory at slaughter), animals that die on the farm, older animals and animals exhibiting signs of neurological distress.
2004 – CFIA aimed to test a minimum of 8,000 animals by the end of 2004, and then to continue to progressively increase the level to 30,000 animals or more. Testing is focused on those animals most at risk of BSE (animals demonstrating clinical signs consistent with BSE, non-ambulatory (downer), emergency slaughter and condemned animals and dead stock. A rapid test is used as a routine screening tool.[4a] CFIA surpassed its original target for 2004. CFIA tested 23,550 animals in 2004.[4a]	2004 - USDA is working closely with industry to reposition its efforts to collect samples of high-risk animals for BSE surveillance testing on farms, at rendering facilities, and other locations. Seven geographically dispersed state laboratories are approved to assist in BSE surveillance. Plans are announced to increase surveillance numbers to between 201,000 and 268,000 (U.S. herd is 96.1 million head). In addition to the highest BSE risk populations the USDA will include a random sampling of apparently normal, aged animals from 40 U.S. slaughter plants. Rapid tests are to be used as a screening tool in the testing program. USDA tested 176,468 animals in 2004, all tested negative for BSE. (96.1 million animals in national herd).[4d]
2005 11,383 samples completed (8 Mar., 2005, updated weekly) [4a]	2005 106,406 samples completed (13 Mar. updated weekly) [4d]
Awareness	
1989 - An ongoing education and awareness program targeting veterinarians, producers and workers in the cattle industry begins.	1990 - USDA begins an educational outreach of veterinarians, cattle producers, laboratory diagnosticians, etc.
2004:The CFIA launched a targeted communications campaign to encourage producers to report cattle for BSE testing. The campaign, which includes a poster and brochure, identifies the specific categories of animals that should be tested and promotes a reimbursement	2004: APHIS is building upon established partnerships with state animal health officials and many different segments of industry to obtain as many samples as possible from the targeted high-risk cattle population. Samples will be collected from any of the following

CANADA[1]	UNITED STATES [1]
program intended to offset costs associated with veterinary examinations and carcass disposal. Campaign materials are distributed nationally through producer associations, CFIA offices, auction markets and veterinarians.[4c] The CFIA also launched a new section of its website to provide additional details about the surveillance program and to track the number of animals tested and provide testing results. [4a]	locations: State or federally-inspected slaughter establishments, custom-exempt slaughter establishments, farms, rendering facilities, veterinary diagnostic laboratories, public health laboratories and veterinary clinics. Cattle owners are being offered compensation for any cattle taken as a result of the traceback/traceforward investigations in a BSE case. [4e]
Specified Risk Material removal policy as human health measure	
2000 - CFIA prohibits air injection stunning 2003 – Implemented an SRM ban, effective from 24 July:[4] SRMs are defined in regulations under both the Food and Drug Act and Health of Animals Act as skull, brain, trigeminal ganglia, eyes, tonsils, spinal cord and dorsal root ganglia of cattle aged 30 months or older, and the distal ileum of cattle of all ages. • Until such time as suitable techniques are developed to ensure that the dorsal root ganglia can be entirely removed from the vertebral column, the Government of Canada's Meat Hygiene Directive[4] issued under the Meat Inspection Regulations, mandates that the vertebral column from all cattle aged 30 months or older must be removed and disposed of as inedible product. The directive also stipulates that the vertebral column of these cattle cannot be used in the preparation of mechanically separated meat or finely textured meat. In addition, to ensure the complete removal of the distal ileum, the entire small intestine of all cattle regardless of their age must be removed and disposed of as inedible product.	2004 - USDA's Food Safety and Inspection Service (FSIS)[5] submitted three rules and one notice for publication in the Federal Register on January 12: • An interim final rule, effective immediately, declaring that SRM (the skull, brain, trigeminal ganglia, eyes, vertebral column, spinal cord and dorsal root ganglia of cattle 30 months of age or older, the small intestine and tonsils of all cattle are specified risk materials) are prohibited in the food supply. • The interim rule also prohibits the use of non-ambulatory and disabled animals in human food. • An interim final rule expanding on the prohibition of central nervous system tissues in advanced meat recovery products and prohibition on the production of Mechanically Separated beef. • A final rule to prohibit air injection stunning • A notice announcing that FSIS inspectors will not mark ambulatory cattle that have been targeted for BSE surveillance testing as "inspected and passed" until negative test results are obtained.

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[1a] "Canada Proposes New Science-based Import Regulations to Allow Expanded Access for U.S. Cattle and Beef Products" CFIA. January 31, 2005. www.inspection.gc.ca/english/corpaffr/newcom/2005/20050131e.shtml

[1b] "Bovine Spongiform Encephalopathy; Minimal-risk Regions and Importation of Commodities", 459–553 [04–28593]. *Federal Register*. January 4, 2005. a257.g.akamaitech.net/7/257/2422/01jan20051800/edocket.access.gpo.gov/2005/pdf/04-28593.pdf

[2] Regulations amending the Food and Drug Regulations (1389 - Specified Risk Material), July 24, 2003. www.hc-sc.gc.ca/food-aliment/friia-raaii/food_drugs-aliments_drogues/part-partie_11/e_1389.html

[3] Regulations amending the Health of Animal Regulations (SOR/2003-264), August 13, 2003. www.inspection.gc.ca/english/reg/approe.shtml

[4] Meat Hygiene Directive (2003-18), effective from July 24, 2003. www.inspection.gc.ca/english/anima/meavia/mmopmmhv/direct/2003/direct18e.shtml

[4a]"BSE: Enhanced Surveillance Results". CFIA. February 8, 2005 (updated weekly). www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/surv/surve.shtml#num

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[4e] "USDA's BSE Testing program". USDA. www.aphis.usda.gov/lpa/issues/bse_testing/

[5] "U.S. information for this section from "USDA Actions to Prevent Bovine Spongiform Encephalopathy". USDA. 2 June 2004. www.aphis.usda.gov/lpa/issues/bse/bsechron.html.

[6] For reference to tallow fats, oil and grease see: "Substances Prohibited From Use in Animal Food or Feed; Animal Proteins Prohibited in Ruminant Feed; Final Rule". *Federal Register* Vol 62, No. 108. Thursday, June 5, 1997. p30938.

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[7a]"New Regulations Proposed for BSE Related Feed Controls". CFIA. 10 December, 2004. www.inspection.gc.ca/english/corpaffr/newcom/2004/20041210e.shtml

[8]"USDA and HHS Strengthen Safeguards Against BSE". USDA. 9 July 2004. www.usda.gov/Newsroom/0280.04.html

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ANNEX A Consumers of Canadian beef products by product class (March 8 2005)								
	Cattle under thirty months of age				Cattle over thirty months of age			
Market	Boneless Beef	Bone-in Beef	Offal	Live	Boneless Beef	Bone-in Beef	Offal	Live
North America								
U.S.	✔		✔				✔	
Mexico	✔		✔				✔	
Asia								
Hong Kong	✔							
Macau	✔	✔	✔	✔	✔	✔	✔	✔
Middle East								
Iran	✔		✔					
Lebanon	✔	✔	✔	✔	✔	✔	✔	✔
Africa								
Tunisia				✔				✔
South and Central America and the Carribean								
Antigua and Barbuda	✔	✔	✔				✔	
Barbados	✔	✔	✔		✔	✔	✔	
Cayman Islands	✔	✔	✔				✔	
Cuba	✔	✔			✔	✔		
Honduras	✔				✔			
Trinidad and Tobago	✔		✔				✔	
Source: Agriculture Canada								