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APOCALYPSE COW: POLICY-MAKING IN CONDITIONS OF UNCERTAINTY— LESSONS FROM THE BSE EPIDEMIC IN THE UNITED KINGDOM

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Emerging epidemics challenge governments to make effective policy decisions in conditions of extreme uncertainty. The customary assignment of disease management to the scientific realm proved ineffective in the recent emergence of “mad cow disease” in Britain. This contemporary plague provides a means of examining the efficacy of traditional responses to epidemic management in Western society and of identifying new paradigms for policy makers required to make decisions based on incomplete information.

INTRODUCTION

People dropped where they stood. Families who could arrange transportation packed their household goods and fled to the countryside. Near hysteria reigned as citizens watched their neighbors for evidence of infection. Yet government officials claimed nothing was amiss.

In fact, it was a full six months before the British government of 1665 acknowledged what the public already knew—the black plague was abroad in London (Defoe 1990).

Some three hundred years later, British citizens saw history repeat itself. This time the drama was played out on the world stage, as newspapers around the globe watched the British government juggle apparently

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conflicting responsibilities to the British cattle industry and public health when “mad cow disease” jumped the species barrier.

The history of epidemics is as old as the history of humankind. For just as long, diseases and their causes have fascinated humans. Over the centuries, understanding of the causes of disease has progressed from the magical through the religious to the scientific and the environmental. Yet humans are, in truth, no closer to conquering microbes today than they were a century ago when Louis Pasteur created the first vaccine.

In fact, the emergence of seventeen new viruses in the past quarter century might suggest that the versatile, microscopic enemy is gaining the upper hand. Additionally, the proliferation of antibiotic-resistant forms of venerable plagues, such as tuberculosis, poses a new type of threat, not only to human health, but also to confidence in the scientific paradigm that for the past century has governed Western understanding of the human relationship with disease.

As transportation and other technologies bring the nations ever closer, and as world population increases, the potential rises that diseases will proliferate (Chang 1997, 62). If that potential is realized, the historic record indicates that governments will be unprepared to respond.

The issues are significant. Most new diseases are emerging in less developed nations, where public health systems are often rudimentary—at best. The continuing spread and mutation of AIDS on the African continent provides clear, real-time evidence that policy management of epidemics requires attention. Yet, in developing nations, scarce resources are stretched to fulfill the fundamentals of public health, and policy makers in developed nations appear to be relatively unconcerned about emerging epidemics, because they are not perceived as national public health threats.

Emerging epidemics are all the more challenging to manage because they occur in conditions of uncertainty. Most frequently, scientific information follows disease, evolving as scientists and researchers gather new information. Policy-making in an environment of uncertainty is fraught with risk. The wrong choice of direction can have political consequences, certainly; but more profound are the potential health, social and economic consequences. History has shown that in conditions of uncertainty, governments most frequently choose not to act. However, at the outset of the twenty-first century, when an occurrence in one sector of the global community can be almost instantaneously felt on the other side of the world, inaction may engender results potentially more severe than was the case in the Middle Ages.

The human impact of “mad cow disease” (clinically known as bovine spongiform encephalopathy [BSE]) does not appear to be an epidemic, in the classic sense of the black death, smallpox, influenza or AIDS, where a scourge rapidly kills tens of thousands in a defined geography. But both public and policy responses to BSE followed the epidemic model. More salient, perhaps, for the consideration of the best global policy approach to emerging diseases, is that BSE, and its human form: new variant Creutzfeld-Jakob disease (nvCJD), originated in a developed country—the United Kingdom. Through export trade, this disease threatened much of the developed world, including the EU and the United States.

Unlike the influenza epidemic of 1917, the BSE crisis did not arise at a time of war or other social upheaval; so the policy responses can be clearly associated with the disease. Unlike the continuing AIDS pandemic, the other contemporary plague that affects developed nations, “mad cow disease” has had a relatively defined beginning and end. One can argue that the epidemic had its origins as early as 1974,¹ and it is clear that developments sparked by the disease still continue. Nonetheless, the period from 1985, when British veterinarians finally diagnosed the first “mad cow,” to 1998, when the EU lifted its ban on British beef, provides a concise time frame in which to examine the scientific, social, and political responses to a new scourge.

Given that this epidemic occurred in the developed world, with its sophisticated public health systems and stable governmental structures, lessons from the mad cow controversy can inform future policy decisions regarding emerging epidemics.

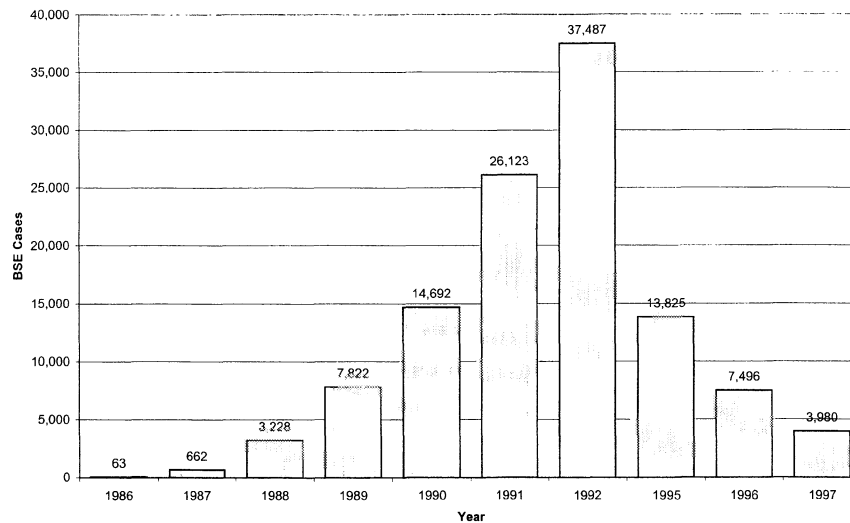
Biology Meets Technology

BSE is but one of many such diseases that form the family of transmissible spongiform encephalopathies (TSE). For the most part, TSE is a disease of unknown etiology.² It is found in numerous species,³ and it has been proven to be not only infectious but also transmissible between species (Rhodes 1997). TSE is a degenerative neurological disease characterized by ataxia (loss of muscular coordination) and often, in humans, dementia brought on by a deterioration of the nerve cells of the brain.

In humans, the most common spongiform encephalopathy is known as Creutzfeld-Jakob disease (CJD) (WHO 1994, 269–89). Ninety percent of CJD cases are sporadic, occurring at an average frequency of one case per million population consistently throughout the world. (*See Table 1*). CJD, like HIV, is known as a “slow virus,” meaning that it has a lengthy incubation period before symptoms are evident; however, once symptoms manifest, the progression of the disease tends to be rapid and is always fatal.

Table 1

Confirmed Cases of BSE in the UK, 1986 - 1997



Source: European Commission, *First Bi-Annual BSE Follow Up Report*

The mean age of onset for classic CJD is 66 (WHO 1996, 243). Before 1995, documented cases of CJD in young people had occurred only as a result of administration of human-derived pituitary growth hormone or of iatrogenic transmission,⁴ principally from the transplant or exchange of human tissue.

Therefore, when young British citizens under the age of 30 began demonstrating symptoms of TSE and succumbing to its effects, panic ensued. A disease which for half a century had been of interest primarily to research scientists suddenly catapulted into the world spotlight. The seemingly real possibility that a fatal, degenerative disease could be passed to humans in the course of one of their most routine activities—eating—led to alarm, speculation, increased research and, ultimately, a corresponding outbreak of policies in governments around the world.

Mad Cows and Englishmen

A city-based society since the industrial revolution, the United Kingdom has for two centuries grappled with the challenge of feeding large, city-dwelling populations from a small agricultural base. Only 2.1 per cent of the entire UK labor force is engaged in agriculture, compared to an average seven per cent in the EU (WHO 1994, 269–89). Faced with increasing population and a dwindling agricultural base, Britain, like many developed countries, sought to increase farm output.

Science helped spur agricultural productivity. By the 1920s, farmers in the UK, like those in many nations, had adopted the practice of supplementing cattle feed with protein. Often the protein supplement derived from ground-up brains, bone and waste products from the slaughtering process, in effect creating cannibals of herbivores. In fact, Britain made as much as five percent of its cattle ration from bone meal (BSE Inquiry 1999), a larger percentage of supplementation than any other nation employed.

Other unique circumstances existed in the UK as well. Scrapie, the TSE of sheep, was endemic in the British flock (Colee 1993, 790–94), having been widespread in the UK for more than 250 years (Rhodes 97, 58). In the UK, large numbers of TSE-endemic sheep grazed alongside large numbers of cattle, an uncommon coincidence (Economist 1998, 2, 27). The presence of scrapie among sheep alone, however, had not affected cattle.

Then, in the early 1970s, UK rendering processes came under scrutiny. The techniques that had been so successful in increasing yields of tallow from beef carcasses required extremely high temperatures and chemical solvents, but these were judged unsafe for workers (Lanchester 1996, 70–81). Instead of investing in expensive new equipment to meet stricter solvent-use standards, the rendering industry adopted the Carver-Greenfield process, which uses lower temperatures presumed to make the resulting protein product more nutritious. Reportedly, however, British renderers kept temperatures even lower than that necessary to kill common bacteria (*The Economist* 1998, 2, 27). In the period from 1981 to 1982, all but ten per cent of British renderers abandoned solvent processes.

Absence of solvents led to an increase in the fat content of meat-and-bone meal. Fat protects microorganisms from heat. Accordingly, with renderers employing lower temperatures in meat-and-bone meal manufacture, the potential for an infectious agent to enter the food chain increased.⁵ At the same time, a drop in the value of the British pound drove up the price of imported proteins, such as fishmeal, causing UK farmers to increase their use of nationally produced meat-and-bone meal (Rhodes 1997, 180).

In 1985, Dr. Colin Whitaker, a veterinarian in Kent, observed the first case of BSE. But, he attributed the unsteady cow's behavior to ovarian cysts and treated her for that and other conditions. When the cow finally died, it was hauled to the local rendering plant to be processed into meat-and-bone meal.

It was not until 1986, after evidence of the same untreatable condition appeared in three other herds, that dairy farmers and veterinarians alerted

the Ministry of Agriculture, Fisheries and Farms (MAFF) to the possibility of an epidemic. In 1987, MAFF veterinary scientists found the TSE hallmark astrogliosis⁶ formations in brains of downed cows, and named the disease BSE.

The MAFF is a “super-agency” with responsibility for agricultural economics and production, veterinary safety and food safety. MAFF was created in 1955, by combining the former Ministry of Food with the powerful Ministry of Agriculture. Historically, the Ministry of Agriculture had operated in a highly centralized way to increase food production during war years, while the Ministry of Food managed rationing on a largely localized basis (Winter 1996). In addition to differing administrative methods, the combined agencies placed the British cattle industry, with its estimated worth of £4 billion per year and employment of 146,000 (Lanchester 1996, 71), in potential opposition to consumer interests.

Over the next two decades, MAFF was also charged with inspecting slaughterhouses through a system of local veterinarians, who were also engaged in caring for local farm animals, and regulating animal feed and fertilizers. The mounting evidence that BSE was epidemic in the British herd (*see Table 2*) posed a quandary for government officials charged with protecting both public health and economic welfare.

MAFF responded to mounting public concern in the spring of 1988 by appointing a four-man, independent committee, chaired by zoologist Sir Richard Southwood. In addition to Southwood, the committee was comprised of three retired scientists. None of the members was expert in spongiform encephalopathies.

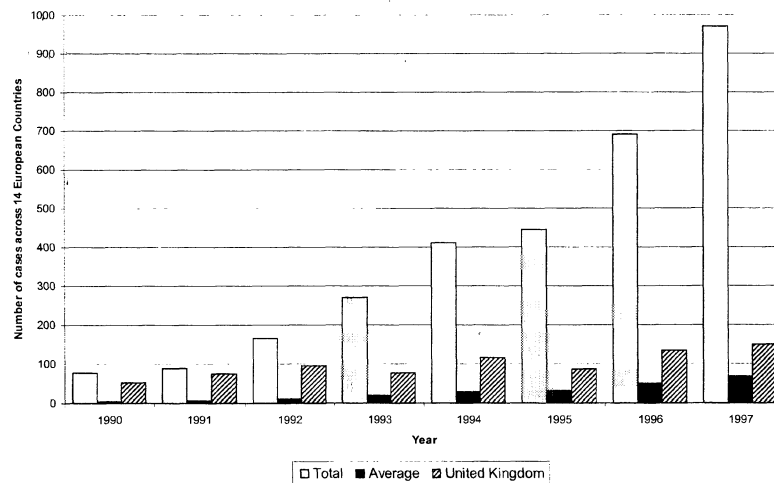
The Southwood Committee immediately issued a recommendation calling for a ban on feeding ruminant-derived protein supplements to ruminants. Three months later, in July, the government implemented the recommendation. However, the ban was effective only until the end of 1988, while a team of MAFF veterinarians reviewed rendering processes.

In the meantime, the government also initiated a slaughter policy calling for all cattle showing symptoms of BSE to be destroyed. Farmers were to be paid only 50 per cent of the market value for sick cattle, and were not compensated for their lost investment in meat-and-bone meal that could no longer be used for cattle feed. The financial loss may have given farmers incentives to send their sick cattle to the slaughter house at the earliest sign of BSE, thus leading to underreporting of the infection and to an increase in potentially infective meat entering the food supply.⁷

The Southwood Committee issued its final report just 10 months after its initial meeting. While calling for an extended ban on ruminant-to-ruminant feed, the destruction of milk from infected cows and a monitor-

Table 2

Cases Referred to the Centre for CJD Assessment, 1990 - 1997



Source: *Central Veterinary Laboratory and MAFF Statistics*

ing program for calves of affected cattle, the committee's most significant announcement was that cattle were "a dead-end host" (Lanchester 1996) for BSE. Despite having reviewed ample scientific evidence of the transmissibility of TSEs, including evidence that mice inoculated with BSE had within 10 months shown evidence of spongiform encephalopathy, the committee reinforced the government position that BSE posed no danger to humans.

Both public and political pressure began to escalate relentlessly. More than 7,000 confirmed cases of BSE in the UK in 1989 spurred the European Union (EU) in March 1990 to expand its 1989 export ban (prohibiting export of British cattle born after July 18, 1988) and to include all cattle except those under six months of age. On April 1, 1990, the EU required that the European Commission⁸ be notified of cases of BSE.

British public hysteria resulting from the May 1990 death of Max, a Siamese cat, from spongiform encephalopathy⁹ was countered boldly by Britain's Conservative Minister of Agriculture John Gummer, who was photographed feeding a hamburger to his young daughter to underscore the safety of British beef. Throughout the first half of the decade, although MAFF steadily increased controls on animal slaughtering and feed, its officials, along with members of Parliament and other government leaders, issued regular public declarations about the safety of beef.

Despite the economic threat posed by export strictures, between 1988 and 1991, MAFF spent only £3 million of its research budget¹⁰ on research

into BSE (*The Economist* 1998, 1, 21–23). From 1992 to 1995, MAFF invested £5 million per year. By the end of 1997, British research expenditures for the decade totaled £38 million. By comparison, some £1.5 billion were expended in 1997 alone for the destruction of infected cattle. The government was directing its preventive efforts to eradication rather than to the discovery of the source and methods of infection.

The scientific research effort was further compromised by its total control by MAFF. The agricultural ministry owned all the corpses of the deceased cows as well as the associated epidemiological data, and the agency refused to share its data or its resources with independent scientists. An inquiry into the government's actions has also shown that the veterinarian who first documented the disease was asked to remove any reference to scrapie from his report (*The Economist* 1998, 1, 15). MAFF also suppressed a study in 1992 that showed that dogs fed on beef had developed TSE symptoms (Rhodes 1998, 245).

Therefore, when British Secretary of State for Health Stephen Dorrell announced in Parliament on March 20, 1996, that 10 cases of Creutzfeldt-Jakob Disease appeared to be attributable to consumption of infected beef, the shock reverberated around the world.

Out, Mad Cow, Out, Out

The EU has not been noted for its nimble legislative responses, and its reaction at the outset of the BSE epidemic was no exception. The EU responded protectively in 1989, when the magnitude of the disease's effect on the British herd began to be evident, by banning export of cattle born before July 18, 1988. Exports of British cattle to the EU alone constituted £200 million per year, (*The Economist* 1990, 89–91) making the ban a significant blow to the British economy. The British government held that the ban "constituted unjustifiable interference with trade within the EU's single market" (MAFF 1998). The UK lost its appeal to the European Court of Justice in October 1997.

Just six months later, the Commission strengthened its stand by restricting British exports of cattle to those younger than six months of age. In succession, that same year the Commission voted for outbreaks of BSE in member states to be reportable; it imposed slaughter restrictions on suspected BSE cases and prohibited the UK from exporting specified bovine offal products; and it imposed certification requirements on consignments of fresh beef from the UK. But it was not until 1994, that the Commission imposed a ruminant-to-ruminant feed ban, despite clear scientific evidence on the other side of the Channel that supplementation with meat-and-bone meal had precipitated the BSE epidemic.

Within days of the British government's March 1996, official announcement acknowledging the probable connection between BSE and human cases of CJD, the EU banned exports of any products derived from British cattle. This ban included such by-products as tallow and gelatin, which are widely used in pharmaceuticals, cosmetics, soaps and food products. At the same time the EU pledged to pay up to 70 per cent of slaughter costs incurred by Britain (*The Economist* 1996, 14).

Yet, despite nearly a decade of increasingly stringent legislation regarding BSE that addressed both the British situation and established reporting measures for other member states, the EU still made no movement toward a single policy for public health or consumer protection. This fact was implicitly acknowledged by Dagmar Roth-Behrendt, spokeswoman for the Environment, Public Health and Consumer Protection Committee of the European Parliament, who stated in April 1996, "the principle of subsidiarity, as expressed in Article 129 (of the Maastricht Treaty) should not be touched" (Rogers 1996, 1007).¹¹

A June 21, 1996, European summit in Florence produced "The Florence Framework," a five-point program that would allow the UK to move toward re-entry in the beef and cattle-products markets. The plan called for Britain to meet five preconditions. First, a selective slaughter program that would eliminate cattle most likely to have been exposed to contaminated feed. Second, an effective system for identifying animals and recording their movements, including official registration. Third, removal of meat-and-bone meal from feed mills and farms and thorough cleansing of all equipment and premises. Fourth, removal of cattle over the age of 30 months from the human food chain. Fifth, improved methods for removing specified bovine offal from carcasses.

Rigorous enforcement of the Florence Framework called for biweekly reports by the UK and Commission-led inspections followed by monthly reports to the European Parliament. The Standing Veterinary Committee would review British proposals for lifting the ban.¹²

In November 1996, the Commission set aside \$63.5 million for a pan-European research program into spongiform encephalopathies. The research design called for centralized funding to support a range of scientific inquiry that would allow scientists from many European nations to collaborate. The centralized funding would provide structural support for the costly, long-term experiments required for the analysis of a slow virus.

The measured European response disintegrated in early 1997, however. Upon receipt of the report from its Temporary Committee of Inquiry into the handling of the BSE crisis, the European Parliament threatened

the Commission with censure. A leftist Parliamentary coalition called for full reform by the Commission within the year to avoid a vote of no confidence. Although the eruption most likely precipitated as a political ploy to gain increased powers for the Parliament,¹³ it had the effect of springboarding the EU response to BSE into a different dimension.

The report by the Temporary Committee of Inquiry, entitled "Recommendations for the Future," appears to acknowledge the fact that epidemics, indeed, touch all aspects of a contemporary society and cannot be contained to a medical or scientific arena alone. The Committee indicated its sense of responsibility for improving availability of research findings, for establishing procedures to monitor measures both to combat BSE and to protect public and animal health and for restoring confidence in the marketplace (Temporary Committee 1998).

Commission President Jacques Santer, perhaps profiting from the experience of British officials, preempted the enactment of censure¹⁴ with a speech before the European Parliament which outlined a series of bold proposals that would establish a system of checks and balances unique in the developed world. Santer's speech may mark the first occasion on which a political leader has articulated the diverse elements necessary for effectively managing emerging epidemics. He called for measures to correct inadequacies in "administrative structure, the system for scientific consultation, the decision-making machinery, inspection methods and the Community legal bases" (Santer 1998).

Santer announced a separation of policy-making and policy-enforcing responsibility supplemented by an aggressive program aimed simultaneously at improving public health, the economic marketplace and scientific research. At the time of his speech before Parliament on February 27, the Commission was already one week into a radical restructuring which would separate the responsibility for legislation from both scientific investigation and inspection.

The Commission had reorganized its Directorate-General (DG) XXIV to be fully responsible for consumer health.¹⁵ Seven scientific committees, which had reported to various directorates, were also placed under the authority of the newly constituted 'Consumer Policy and Consumer Health Protection' Directorate. The scientific committees would operate under the supervision of a multi-disciplinary scientific steering committee. A new unit responsible for public health and food-related inspections was also established in DG XXIV. Perhaps among the most significant changes for an alliance which has traditionally protected its Common Agricultural Policy, the Office for Veterinary and Plant Health Inspection

and Control moved from the Directorate-General for Agriculture to the newly reconstituted Consumer Policy and Consumer Health Protection Directorate-General.

Although the political debate between Parliament and the Commission remained rancorous into the fall of 1997,¹⁶ the redirection of DG XXIV seemed to elevate the EU's activity in addressing the root causes of the BSE crisis.

Commissioner Emma Bonino called specifically for Member States to achieve equivalency in their veterinary norms and in their inspection processes. Demonstrating its seriousness, the Commission supplemented its regular monitoring visits to the UK with inspections of slaughterhouses and rendering facilities in other Member States. Inspections showed that some Member States had not fully implemented the required heat and pressure treatments in the manufacture of meat-and-bone meal. Inspectors also found that inadequate systems for controlling meat trade were impeding the ability to trace meat to its source, thereby perpetuating fraud.

As a result of the inspection program, the Commission initiated infringement proceedings against a majority of Member States (Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Portugal, Spain and Sweden). The infringement proceedings marked a departure from the principle of subsidiarity, which had allowed Member States to regulate compliance with the new manufacturing requirements. Responding to the need to restore consumer confidence, the Commission began reviewing BSE infringement cases twice a month and shortened the response time accorded to Member States. The more stringent enforcement of policies promptly spurred compliance with EU regulations and advanced the process of harmonizing differing national regulations.

The EU set the capstone on the preliminary stage of its response to BSE by approving 22 research projects into transmissible spongiform encephalopathies for a total of ECU 21.9 million. This move more than doubled the number of TSE research projects in the EU (16 projects had begun between 1990 and 1996). "One of the special features of these projects is their transnational dimension, as they will be carried on by teams of researchers originating from different countries, with a view to combining complimentary skills. In the face of such a complex problem, this European approach maximizes the chance of achieving results," stated official publications (Genevay 1997).¹⁷

By the time the E.U. launched its research initiative, however, the cost to fight BSE was estimated at some 5 billion ECU. Better than 20 percent

of that amount (ECU 1.6 billion) could be attributed to measures responding to the collapse of consumer confidence in the beef market (Agra Europe 1997, 92).

Far from the Madding Cow

On the other side of the Atlantic, the United States response was characterized by inconsistency. Policies differed markedly depending upon which agency was involved and whether human health was perceived as being directly threatened.

In the area of human blood transfusions, policy makers were applying knowledge secured in the hard, public battles over HIV. “We learned the hard way with hepatitis and AIDS that emerging infectious agents can slip past our public health defenses unless we vigilantly maintain an early warning system sensitive to probability as well as proof. Better to protect against unproven risks than to wait for proof that may only emerge in mortality statistics,” said Representative Christopher Shays, chair of the House Committee on Government Reform and Oversight, in opening US Congressional hearings in April 1997, on the potential transmission of spongiform encephalopathies to humans.

Although the scientific record shows no evidence that CJD can be transmitted by blood transfusion,¹⁸ the U.S. Food and Drug Administration (FDA) had shown its intent to protect against unproven risks as early as 1987. The policy chain began when the FDA called for persons who had received human pituitary growth hormones to be deferred from voluntary blood donation. In 1993, the FDA recommended that blood banks secure more extensive post-donation information when a blood donor had died as a result of CJD. And in 1994, the agency began quarantining plasma and plasma derivatives when CJD was implicated as a donor’s cause of death or if any member of a donor’s family had died of CJD. The quarantine resulted in millions of dollars of plasma products being kept from the market and contributed to a potentially life-threatening shortage of immune globulin intravenous (IVIg) at the beginning of 1998. In June 1995, the FDA ruled that blood products donated by individuals later diagnosed with CJD must be destroyed. Most recently, in December 1996, the criteria for permanent deferral from blood donation were expanded to include anyone who had a family member who had died of CJD.

Despite the increasing caution applied to human blood products by the FDA, the US Department of Agriculture (USDA) response mirrored that of the UK in the early years of the BSE epidemic. While acting decisively in halting imports of implicated British beef and other cattle products,

such as gelatin, the United States was not rapid in installing agricultural safeguards that might draw from the British experience. Just weeks after the March 20, 1996, British announcement, the World Health Organization formulated recommendations for nations to follow, including the recommendation of a ban on ruminant-to-ruminant protein supplementation. Yet the influence of the \$150 billion US beef industry stalled enactment of such a ban in the United States until seventeen months after the British announcement of the probable link between BSE and CJD. Ironically, given the FDA's cautious attitude toward blood transfusion, the US ban exempts bovine blood, along with ruminant-derived milk and gelatin, as showing no signs of infectivity.

U.S. government agencies continue to open public comment regarding BSE with statements to the effect that "no case of BSE has ever been reported among cattle in the United States (. . .) BSE remains a disease among cattle in some foreign countries . . ." ¹⁹

The U.S. has initiated diagnostic and preventive measures to guard against a repeat of the British experience. The USDA began a surveillance program in 1990 that has examined more than 5,500 brain specimens from cattle diagnosed with neurological impairment or "downer" cattle and has found no evidence of BSE in the US herd. The USDA Veterinary Service has also trained veterinarians to recognize "foreign animal diseases" (Hollingsworth 1997), and to use epidemiological surveillance techniques which can trace an infection to its point of origin.

However, U.S. renderers continue to process downer cattle into protein supplements for poultry, pigs and pets.

How Now, Mad Cow?

"Epidemics resemble great warnings from which a statesman in the grand style can read that a disturbance has taken place in the development of his people." The prophetic words came in 1848, from Rudolf Virchow, known as the father of epidemiology. Virchow had returned from investigating a typhus epidemic in Upper Silesia, where he concluded that poor housing, poverty and improper farming techniques had created a ripe environment for infection (Nikiforuk 1991).

Nearly a century and a half later, European Commission President Santer perhaps unwittingly echoed the same conclusion. "After all, can we really go on claiming that BSE is an act of nature? Is it not actually the consequence of a model of agricultural production which pushes productivity at whatever cost? Surely the logical outcome of going for the lowest

possible cost without regard to the basic laws of nature has to be much higher costs for society in the long term (Santer 1998)?”

If officials across a span of 150 years can conclude that human behavior is at issue in the spread of epidemic disease, then is it logical to restrict the management of epidemics to the medical and scientific arena? The evidence of BSE would indicate not. The rapid increase in technological, social and environmental change of the past half-century and the shrinking of the globe through more efficient means of trade and travel indicate considerable potential for new, unforeseen pathogens²⁰ to emerge. These conditions cry out for a new approach to policy making.

The British experience clearly demonstrates that epidemics touch every aspect of society. BSE affected not only cattle, cats and a handful of human beings with a still-mysterious infectious agent. It cost billions of dollars, affected consumer confidence in industry and the marketplace, and decreased public confidence in government. Not only was science alone insufficient for dealing with BSE, science under the direction of economic interests was paralyzed.

While BSE might have occurred as an outcome of what Karlen calls a desire to “live in greater plenty” (Karlen 1995), a review of the popular and archival record indicates that the result might have been far less costly had checks and balances existed among the key facets of society involved. But in the UK, MAFF, the super-agency, contained all elements, creating an implicit conflict among the economic, scientific, social and political paradigms which could not be publicly resolved without political peril to the incumbents.

As recently as the beginning of 1999, the MAFF web pages continue to illustrate the conundrum posed by its conflicting responsibilities. “Essentially, MAFF’s job is to help improve the economic performance of these industries (agriculture, fishing and food), especially in the expanding markets of Europe and the wider world. At the same time it has to protect our health and conserve our natural environment,” states the introductory page, “About MAFF.”²¹ A visitor who continues through the BSE pages to the new section on cattle tracing, however, will find this opening statement: “Cattle Tracing is an integral part of the Government’s efforts to improve consumer confidence in beef.”²²

Most curious of all, the British government’s published program to eradicate BSE seems oblivious to the scientific evidence when it reports, “The primary objectives of UK Government policy in respect to BSE are: (a) to protect consumers in the UK and elsewhere against any risk, however

remote, that there would be *if BSE were transmissible to man*" (Programme to Eradicate BSE in the United Kingdom 1999).

In his February 1997 address to the European Parliament, Santer encapsulated the challenge and the solution. "What we are seeing more and more often at the moment is that our decision-making mechanisms are not necessarily capable of keeping pace with the astonishing advances being made in science. These are difficult questions which raise ethical, scientific, social and economic issues all at once, and the answers to them must come from every section of society."²³

Indeed, the solution proposed and implemented by the EU, however tardy, does draw from every section of society. The EU solution weaves science, consumer interests, market protections and political considerations, into a new system, which while integrated in responsibly, allows checks and balances to work in a way that is inherently accessible to the public. The Commission appears to have made a wise choice in separating legislative from regulatory responsibility. It appears equally functional to couple the regulatory and scientific functions in a single directorate.

In contrast to the actions taken by the British, the EU in the past three years has effectively implemented the precautionary principle. This principle holds that precautionary measures should be taken in the face of an event that raises threat of harm to the environment or human health, even when certain cause-and-effect relationships cannot be scientifically established (ABC Newsletter 1998). The precautionary principle, in fact, gives a guideline, however imprecise, for policy makers faced with uncertainty, as in the case of emerging epidemics.

Scientific knowledge can be regarded as a public good, and the provision of public goods is a fundamental function of government. Effective management of public goods encompasses issues of both fairness and efficiency. However, the nature of an increasingly global society where information is immediately and widely available blurs the definitions of fairness and efficiency when a fundamentally changeable good, such as scientific knowledge, is involved. The reality of public confidence when faced with a lethal disease in developed countries is to confront government institutions with demands for a zero-risk standard. The public finds avoidable harm to be unacceptable.

Of all the governmental players involved in the BSE crisis, the EU demonstrated the greatest understanding of the complexity of the modern dilemma. The UK consistently denied that a problem existed. In dealing with blood policy, the United States sought to protect its citizens from any conceivable harm, and in the process put another group of vulnerable individuals at risk. In agricultural policy, the US put surveillance measures

in place, but continues to hold that BSE is not a risk in the United States. By contrast, the EU implemented the precautionary principle and articulated the dilemma publicly and forthrightly. The Final Consolidated Report of the Temporary Committee of the European Parliament on the Follow-up Recommendations on BSE defines four issues that all contemporary governments might consider when formulating policy. First, decisions must be made with awareness of their global implications. National actions are no longer self-contained. Second, the analysis of risk has to take into account any beneficial effects. If a life-saving treatment comes from a potentially risky material, the benefit of the treatment must be weighed along with the risk. Third, while more local entities (member states) may control the implementation of legislation, they should respect common standards and strive for equivalency. Fourth, consumers are not convinced by scientific evidence, and a new risk analysis may be the appropriate result of consumer concerns.

The EU's response to BSE acknowledges that public expectations of government institutions are rising, especially in matters of science and technology. While developed in response to a specific medical dilemma, the structure to reconcile the conflicting demands of consumer protection, scientific research and marketplace advocacy appears to be one that will be resilient to future challenges. Coupled with the disease surveillance unit also established as part of the BSE policy initiatives, the EU solution poses a potential model for developed and other nations to consider in managing emerging epidemics.

Notes

¹In this year an explosion at a British chemical plant precipitated stringent rules for use of solvents. Rather than invest in new equipment, renderers began to abandon solvent processing (Rhodes 1998, 177).

²Although two Nobel Prizes have been awarded in connection with the disease, the most recent in 1997 to Dr. Stanley B. Prusiner for his research into the 'prion,' debate about the true cause of Creutzfeld-Jakob disease, one of the human TSEs, continues in scientific circles.

³Observations of the disease have been made in cats, cows, sheep, mule deer, elk, mink, kudu, eland, gemsbok, puma, cheetah, ocelot, marmosets, squirrel monkeys, ostriches and a host of other animals. Additionally, experimental transmission of spongiform encephalopathies to mice, hamsters, guinea pigs and chimpanzees has been extensively documented.

⁴Iatrogenic is literally "physician born." Iatrogenic transmission of disease occurs as the unintentional result of a medical procedure. In the case of iatrogenic CJD, tissue transplants from cadavers later deter-

mined to have died of CJD are one source. Other cases occurred as a result of reuse of electrodes which had been sterilized according to standard procedures. The latter demonstrated the TSE organism's impermeability to traditional methods of viral inactivation.

⁵As early as 1967, Alper *et al* noted that scrapie was "extraordinarily resistant to heating." In an article in *Nature* the researchers noted that ". . . it is clear that standard methods of sterilization . . . would be inadequate to deal with contamination by such agents." Alper, Tikvak; Cramp, W.A.; and Clarke, M.C. "Does the agent of scrapie replicate without nucleic acid?" *Nature*. May 20, 1967: v 214, p 764–766.

⁶*Glia* comes from the Medieval Greek for 'glue.' A repair mechanism of the brain, glial formations can be destructive. Examinations of brains of various species infected with spongiform encephalopathies show a characteristic astroglial (star-shaped glia) pattern of destruction.

⁷A similar sort of response has been observed among developing nations with regard to the reporting of disease outbreaks to the World Health Organization or other health monitoring agencies. The potential loss of tourist revenue becomes a disincentive for truthfulness. Chang. *Op cit.*

⁸The European Union is comprised of several agencies and commissions including the European Parliament, the Council of Ministers, the European Commission, the International Court of Justice, the Court of Auditors, the Committee of Regions, the European Investment Bank, the European Central Bank and various other bodies. The 20-member EC is the executive body of the EU. It proposes all new legislation, but decisions on legislation are made by the Council of Ministers or by the democratically elected Parliament. The Commission initiates legislation only in areas where the EU can take more effective action than Member States. In order to implement proposals, the Commission must achieve agreement with both Parliament and the Council of Ministers.

⁹Following the deaths of another six cats, officials eventually conceded that their deaths probably resulted from pet food made from the corpses of infected cattle.

¹⁰The total MAFF research budget rose from £110 million in 1992 to £130 million in 1997. These figures compare to a total agency budget of £2.2 billion in 1992, rising to £4.2 billion in 1997.

¹¹Article 129 of Title X of the Maastricht Treaty deals with public health. It states that "The Community shall contribute towards ensuring a high level of human health protection by encouraging cooperation between the Member States and, if necessary, lending support to their action."

¹²The ban on British beef exports was lifted on November 23, 1998, with favorable votes from ten EU Member States. Only Germany dissented, although Austria, France, Luxembourg and Spain abstained.

¹³This marked the fourth time in seven years that the European Parliament had considered a motion to censure the Commission. This vote secured 118 supporters, with 326 opposed. *The Reuter European Business Report*. "European Parliament makes measured use of powers." February 20, 1997.

¹⁴Censure would have forced the resignation of the Commission president.

¹⁵Directorate-General V retains responsibility for public health. The newly conferred responsibilities of DG XXIV focus on consumer health protection with an emphasis on scientific advice, risk assessment and inspection.

¹⁶Some members of Parliament continued to call for censure of the Commission for failure to take punitive action against Commission agriculture officials, UK Minister of Agriculture Douglas Hogg (for contempt in his failure to appear at a Parliamentary hearing), and the UK.

¹⁷"European Commission approves 22 research projects on mad cow disease and transmissible spongiform encephalopathies." Press release <http://europa.eu.int/search97cgi/s...te=EC.html>. October 1, 1998.

¹⁸Among the most compelling evidence that blood is not a vector for CJD is the case of hemophiliacs. Hemophilia sufferers have been exposed to literally thousands of blood donors, yet not once case of CJD has been documented in anyone with hemophilia.

¹⁹"Bovine Spongiform Encephalopathy and Creutzfeldt Jakob Disease: Public Health Service Actions to Ensure Against Health Risks." <http://www.hhs.gov/cgi-bin/waisgate?WAISdocID=481125363+1+0+0&WAISaction=retrieve>. April 20, 1998.

²⁰Pathogens are disease-producing organisms. As new diseases emerge, scientists face challenges not only in determining the infectious agent itself, but in identifying the means of transmission. The BSE epidemic is but one example of atypical transmission of infection.

²¹"About MAFF." <http://www.maff.gov.uk/aboutmaf/workmaff.htm>. October 14, 1998.

²²"Cattle Tracing." <http://www.maff.gov.uk/animalh/tracing/index.htm>. November 27, 1998.

²³Santer. *Op cit*.

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