

Bridging the gap between BSE risk assessment and consumer perception of the surveillance system in Japan

Mutsuyo KADOHIRA¹, Glen HILL^{*,2}, Manabu SAWADA³, and Seiko YOSHIDA⁴

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日本における BSE リスク評価とサーベイランスの間にあるギャップ：
スクリーニングテスト VS 消費者の牛肉安全に関する知識

門平 睦代¹, グレン・ヒル², 澤田 学³, 吉田 省子⁴

Abstract

Since the first case of bovine spongiform encephalopathy (BSE) was encountered in Japan in 2001, the country quickly responded with a change from passive to active surveillance. The response has not been a smooth one, though, and news media have contributed to opening the public's eyes to inadequate behavior from government sources responsible for monitoring and protecting the health of consumers. The resultant information "gap" has served to augment the typical Japanese perceptions of risk assessment, as assessed in surveys from 2003 to 2005. Such false beliefs have caused consumers to call for 100% testing of animals for BSE despite accepted scientific standards which do not support such comprehensive and costly surveillance. Instead, testing agencies acceded to the demands from citizens for comprehensive testing regardless of the cost. We show how all stakeholders may be directly involved in closing this "gap" through the use of public meetings and workshops. Such venues inform those with and without technical backgrounds, leading to a better understanding of the food safety issues at hand. An overwhelming response from all concerned parties was for more knowledge from experts, better news media reporting, and easier access to the information needed to promote awareness of the food safety issues. Creating a system of sharing information in this way may serve to generate a further proposal to local governments so that they may more adequately respond in the future and thereby alleviate unnecessary public fear and reduce government expenditures.

¹ Department of Life Science and Agriculture, Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Japan
帯広畜産大学畜産生命科学研究部門

² Department of Human Sciences, Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Japan
帯広畜産大学人間科学研究部門

³ Department of Agro-Environmental Science, Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Japan
帯広畜産大学地域環境学研究部門

⁴ Research Faculty of Agriculture, Hokkaido University, Sapporo, Japan
北海道大学農学研究院

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1. Introduction

The first case of bovine spongiform encephalopathy (BSE) in Japan was found in September, 2001 (Kimura et al., 2002). Since October 2001, control measures and active surveillance have been installed, and by the end of 2009, 36 cases (including 2 atypical ones) were detected after testing approximately 100 million cattle (Kadohira et al., 2008, submitted). Nearly a decade after the initial case, Japan still suffers the effects of BSE in the form of social, political, and economic issues. Although these effects linger in other countries as well, there is a cultural phenomenon unique to Japanese people, both citizens and administrative powers that this report wishes to address. This paper will report on the difference (“gap”) between the understanding of a major biohazardous risk to the public health and the implementation of a monitoring program (surveillance system) whose scientific basis is not wholly justified.

From a scientific and medical viewpoint, BSE is a fatal, neurodegenerative disease of cattle caused by a gradual accumulation of scrapie prion protein (PrP^{Sc}), an anomalous isoform of prion protein (PrP), in the central nervous system. When young people consume meat contaminated with PrP^{Sc}, they might contract variant Creutzfeldt-Jakob disease (v-CJD), a human neurodegenerative malady similar to BSE (Taylor, 2002). Since its discovery in the UK in 1986 (Smith and Bradley, 2003; BBC News, 2000) and its link to v-CJD in 1996 (Will et al., 1996), BSE has become a feared zoonotic disease in many parts of the world, despite well-established control methodologies. It is a frightening disease, and people do not always want to accept less than 100% testing of cattle to assure safety of the public’s health.

Despite the inability to detect prions in cattle younger than 20 months (Sugiura et al., 2003; The Asahi Shimbun, 2004), as of 2010 all local governments in Japan (which are in charge of 76 slaughterhouses across the nation) still continue to test all healthy slaughtered cattle due to lack of (so-called) consumer confidence. As early as August 2005, cattle younger than 21 months of age were exempted from BSE test, based on the result of risk assessment by the Food Safety Commission (Sugiura et al., 2009b). Sugiura and Murray (2007) and Sugiura et al. (2009a) predict zero cases of BSE in Japan as of 2013, yet comprehensive (100%) testing persists as a response to social risk amplification and the perceived need to allay public fears. This unique Japanese approach to managing risk directly contradicts general disease control goals where a country’s surveillance systems should be based on the outcome of the national risk assessment (Heim et al., 2006).

What was the profile of events that led to such government standards from the public outcry? After the first case of BSE in September 2001, sales of beef fell drastically from 800 g/month per household to less than 400 g/month (Fig. 1). At that time, the government instituted 100% testing (cattle of all ages for human consumption), and sales rose significantly to about 600 g in a short time (Fig. 1; Sawada et al., 2009). Then, the public’s comfort level in testing was high, but such comprehensive testing was unnecessary and expensive. Inaccurate governmental reports (Gray and Ropeik, 2002; Lewis and Tyshenko, 2009) and extensive television media coverage (Clemens, 2003) contributed to public fear of potential BSE cases, and kept the consumers on edge to maintain such 100% testing.

Ogoshi et al. (2010) documented the effect of five major Japanese newspaper articles that were written during the outbreak from September to October 2001. They demonstrated that although anxiety levels fell

with the amount of news that consumers read, the more information that was provided caused “an increased distrust of the government and of the information being provided by the government”. Once issues pertinent to BSE surveillance are properly explained, we believe that consumers feel much more confident about the standards and controls on the safety of meat.

Smith and Riethmuller (1999) conducted a survey on Australian and Japanese households to determine consumer concerns over food safety. Informing consumers has obvious positive attributes when considering consumer attitudes and risk awareness. Informed consumers would make more educated choices in buying. However, they pointed out that there are negative aspects as well, including time and expense needed to educate citizens, a risk of “information overload” and the hazards of grasping enough technical details, and a potential barrier of trust between the public and source of such information. But, in the case of Japan and BSE, is (unnecessary) 100% testing of animals preferred over informing consumers?

A national BSE surveillance system can be profiled by its objectives, design, diagnostic methods, analysis, and communication and feedback of results (Stark et al., 2002; Lynn et al., 2007). Stakeholder analysis of disease risk assessment is a key component in implementing such systems which are designed to protect and inform

the public about health safety issues. However, the characteristics of determining the quality of surveillance can change between cultures and over time as the needs of the stakeholders vary (Stark et al., 2002).

Public trust in food safety and testing is not a new phenomenon in Japan. Since World War II, the public has faced problems such as arsenic poisoning of milk in 1955 (Ui, 1992), Kanemi rice oil contamination with PCBs in 1968 (Umeda, 1972), banning of tofu preservative AF-2 in 1973 (Consumers Union of Japan web site, 2010), a 1977 consumer-initiated boycott on imported (American) citrus fruits treated with fungicide OPP (Consumers Union of Japan web site, 2010), the June 2000 food poisoning scandal at Snow Brand Milk Products Company (Arnaud, 2000), and others (Consumers Union of Japan web site, 2010; Saito, 2010; Tabuchi, 2007). Trust is not easy to mend once it is broken, and Snow Brand not only suffered financially with recalls, lost sales, and lack of customer confidence, but also a government directive forced Snow Brand to close two plants permanently. Further proof of the effect of lost trust is evidenced by the BSE saga in the U.K. (Van Zwanenberg and Millstone, 2005). There, BSE caused great harm to British agriculture, the food industry, consumer confidence in food safety, and in particular, public trust in official policy-making institutions.

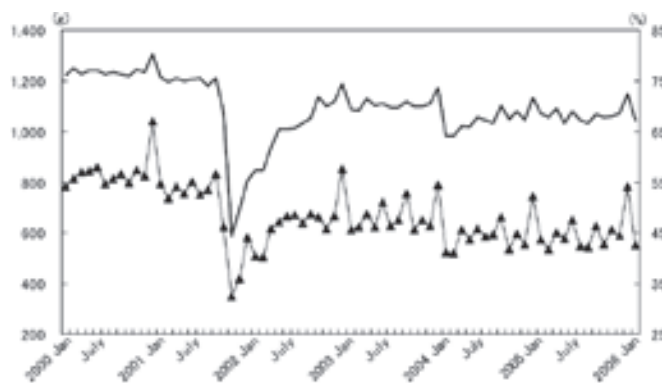


Figure 1. Comparison of amount of beef purchased and the percentage of beef consumed per household prior to and following the introduction of BSE into Japan in September 2001 (modified from Sawada et al. in their final report of Scientific Research from the Japan Society for the Promotion of Science [JSPS # 15580185, in Japanese]).

Johansson (1986) described Japanese consumers as “more demanding” in terms of product quality, and the report compares shopping behavior between Japanese and Americans. Since World War II, there has been a growing movement of consumer cooperatives and unions fighting for food safety concerns. These consumer organizations were instrumental in urging the government to establish the Food Safety Commission in 2003. Clearly, Japanese consumers are interested in food safety issues enough to actively participate for improvements. Sawada et al. (2009 and references within) add the complication that “Japanese consumers...have the tendency to adopt the attitude that domestic foods are safer than imported foods...” In light of all this, education and distribution of technical information from official government sources are not well developed.

The objectives of this paper are to provide an overview of what knowledge Japanese consumers had regarding BSE infection and control, to discuss the implications of gaps in such information (real vs. perceived), and to discuss how to bridge the gap between real and perceived risk assessment and the optimal surveillance system. We will use data collected mainly in Hokkaido, the region of Japan with the largest population of cattle and highest BSE risk.

2. BSE SCREENING TEST AND SURVEILLANCE IN JAPAN

BSE was identified in Japan as a notifiable disease, and passive surveillance commenced in April 1997 (Kadohira et al., 2008; Anonymous, 1997). In April 2001, the number of bovine brain samples was increased to meet the international standard set by the Office International des Epizooties (MAFF, 2001c; OIE, 2001). After detecting the first case of BSE in September 2001 (Kimura et al., 2002), the Ministry of Agriculture, Forestry and Fisheries (MAFF) implemented a ban on the feeding of meat-and-

bone meal (MBM) to all farmed livestock (MAFF, 2001a, 2001b) and further initiated a program of active surveillance (MAFF, 2001c; Anonymous, 2002; MAFF, 2002; Sugiura et al., 2008). The change to active surveillance meant that all slaughtered cattle were to be screened for BSE using one of the following tests (Kadohira et al., 2008): (1) Platelia BSE (Bio-Rad Laboratories, California), (2) Enfer TSE v.2.0 (Enfer Scientific, Ireland), or (3) FRELISA BSE (Fujirebio, Japan). In April 2004, active surveillance was extended from slaughtered animals for beef to include testing of all fallen stock greater than 24 months of age (Kadohira et al., 2008; Sugiura et al., 2009b).

The probability of detecting BSE using the previously mentioned tests in cattle younger than 20 months is likely to be very low (Sugiura et al., 2009b; Normile, 2004), because it takes approximately 5-6 years for BSE prions to accumulate in the brain sufficiently to cause BSE. Those tests can only detect prions in cases six months before an animal shows clinical symptoms of the disease. Based on survey data and other information discussed later in this report, we suspect that this evidence concerning the test was not properly disseminated to the public in Japan at that time.

Due to the introduction of Platelia BSE, Enfer TSE, and FRELISA BSE tests, a higher proportion of BSE cases—where the animal had been born in 1996 (the first cohort)—were found not in fallen and downer cattle, but in apparently healthy slaughtered cattle at the beginning of the active surveillance in Japan (Kadohira et al., 2008; Sugiura et al., 2009b). In Europe, too, such screening tests identified new cases in countries where no clinical cases had been detected previously (Karaki, 2010). On one hand, therefore, those testing procedures helped to identify more cases of BSE, but on the other hand poor risk communication (Ogoshi et al., 2010) produced excess trust by Japanese consumers and a perceived need to rely on them. If healthy cattle could be tested positive, the

public felt that such testing should be implemented.

3. SOCIAL AMPLIFICATION AND RISK PERCEPTION

The Japanese experience with BSE was a prime example of social amplification of risk (Lewis and Tyshenko, 2009; Kasperson et al., 1988; Renn, 1991). Even four to eight years after the September 2001 initial case, a majority of survey respondents (60%) admitted that they had eaten less beef because of their concerns over food safety (Goddard, 2009). Immediately after the first case was discovered in September 2001, demand for beef fell drastically (Fig. 1), with domestic sales falling by 40%-50% in that month (Fox and Peterson, 2002, 2004). By the next month one-fourth of consumers reportedly stopped eating beef altogether (Clemens, 2003; Fox and Peterson, 2002, 2004). During October 2001, sales (proportion of beef purchased per household) fell to approximately two-thirds of the value of a year before (from ~78% of households to ~45% of households, Sawada et al. (2009); Fig. 1), then rose to nearly the original levels by fall 2002. The amount purchased per household took a similar dip at the onset of the outbreak (from 850 g to 330 g per month per household)—a decrease to one-third of 2000 purchases—and then a far lesser rise by fall 2002 (to only about 70% of 2000 amounts, 600 g per month). Even though sales had resumed in a year, consumers were still wary, as evidenced by smaller purchases per family.

In 2005, three years after 100% testing was implemented, the average beef consumption per household was still reduced (29% lower compared to 2000), and only 68% of homes purchased beef (9% lower than in 2000). That consumer confidence was being restored is further supported by Sawada and Sato (Sawada et al., 2008). They reported that twice as many people were willing to pay for blanket testing on regular domestic beef, as compared to the far more expensive Wagyu beef. The

fact that the public was willing at all to pay for higher priced Wagyu beef suggests that they accepted the cost of comprehensive active surveillance (100% testing) for the sake of safety.

4. Methods

In order to understand a causal relationship on BSE risk perception among customers, we will attempt to describe how consumers changed their attitude towards beef consumption and how their knowledge about BSE screening tests changed. Three types of communication were initiated to collect this information.

4.1 Questionnaires to consumers

Data was collected by one of the authors (MS) using mail-in questionnaires in January 2003, March 2004, January 2005, and December 2005 (Sawada et al., 2009). The study site was Kiyota-ku, a suburb of Hokkaido's largest city Sapporo. A two-stage sampling method with probability proportional to size was employed on 1,000 people initially selected. This was narrowed down to about 300, from which valid responses were received from about 35%-40% of those surveyed.

4.2 Risk communication meetings for Hokkaido stakeholders

Four public meetings were held in Hokkaido in 2007 when the food safety commission of Japan and Hokkaido government disseminated risk assessment results concerning the exemption of healthy cattle younger than 20-months-old from BSE testing at slaughterhouses. The Hokkaido government official web sites were used to gather opinions from all stakeholders who participated in the four meetings. These stakeholders included farmers (76), consumers (51), government staff (66), people involved in the food processing and retail business (42), and others (15) (Kadohira and Kobayashi, 2009).

4.3 Workshop for veterinarians

A workshop was conducted in Tokyo in December 2008 to identify problems in comprehensive animal testing and to discuss how to change attitudes of consumers to be more in line with the officially recognized surveillance system that did not include 100% testing. Fourteen veterinarians participated from Fukuoka, Kanagawa, Hiroshima, Tokushima, Chiba, and Osaka, and all were involved in active BSE surveillance.

The participants were divided into three groups. After a brainstorming session, ten main problems were identified related to comprehensive animal testing for BSE. For example, they were about on-farm issues (e.g., traceability), stakeholders such as consumers seeking zero risk, and extra costs imposed at slaughterhouses (Kadohira and Horikita, 2009).

5. Results

5.1 Consumer questionnaires

In January 2003, 40% of respondents answered that they had stopped buying beef after the first BSE case was detected; 35% had reduced the amount of beef purchased; and 23% said their intake was not influenced by the BSE outbreak. Between January 2003 and March 2004, proportions of consumers' fear on eating domestic beef reduced from 35% to 27% (8%); safety confidence compared to other foods increased from 24% to 36% (12%) because of comprehensive animal testing. They said they trust university researchers more than consumer organizations, international organizations such as OIE, and government sources such as the Ministry of Agriculture. The major national newspaper was considered more reliable than television news and other TV programs as an information resource. Most participants accept the statement that there is no such thing as 100% food safety, and they recognized that BSE prions transmit through the

meat and bone meal. However, only 28% were aware of limitations of screening tests that are unable to detect BSE-infected cattle younger than 20 months. Half of consumers in this survey had incorrect knowledge related to fear of food safety. For example, some said that prions accumulate in any body parts of cattle including muscle (beef). There were different views in the public's understanding of BSE based on respondent ages (over 40 years versus younger). However, the majority of respondents supported 100% animal testing despite knowing there is no 100% assurance of safety.

5.2 Risk communication meetings for Hokkaido stakeholders

Table 1 shows the breakdown of responses from various attendees to the concept of blanket testing for BSE. A significant minority (20%) seemed to understand testing standards and controls and to accept the scientific risks of less than 100% testing. In contrast, approximately 77% of participants in these four meetings supported continuing blanket testing. Farmers naturally felt it was necessary to prove the safety of beef, which of course would lead to more income for them. Consumers thought that such testing is the best means to guarantee beef safety. Local government and producers/farmers understood and accepted official risk assessment results, but they put more value on consumer confidence. They wanted to request that risk managers (government officers) provide more information to consumers and promote better risk communication to the public, but admitted that it was cheaper to do testing than to educate and inform citizens. When participants of these meetings were asked what they felt was needed most, the overwhelming answer by all parties (including consumers) was more education, media coverage, and ease of access to such information.

Attitude toward 100% testing	Reasons given by breakdown of participants for their attitude toward 100% testing					Perceptions about the need for 100% testing
	Farmers (n = 76)	Retailers & processors (n = 42)	Consumers (n = 51)	Government staff (n = 66)	Others (univ. students) (n = 15)	
Continue 77.1%	Prove beef safety for more sales	4-5 more years till consumers understand	Believe such testing is reliable	Test costs are less than PR & educating the public	To detect more BSE cases	Can't accept or understand the real scientific risk
Discontinue 20.4%	Risk control in place; accept international standards	Educating consumers is important	They understand the risk for younger cattle	Useless spending of public resources	To avoid wasteful spending of public resources	Control is properly done; they understand the risk assessment results

Data translated from <http://www.pref.hokkaido.lg.jp/ns/tss/rakuchiku/bse/bse-ikennkoukann.htm>, cited October 2008; in Japanese. Only the overall percentage for continue and discontinue are shown; proportions within each group of meeting participants are not available.

5.3 Workshop for veterinarians

Table 2 shows the breakdown of discussion points for the workshop. These professionals clearly recognized that on a scientific basis, there was no point in testing 100% of animals (Maclachlan, 1997), but the general public seemed unaware of this. As a result, their demands to ensure food safety blocked efforts to stop such testing, and the veterinarians agreed that to resolve this problem, a dialogue was needed between local and central governments to exchange information and describe situations at both levels. There were discussions at the workshop about proposed procedures for meat examiners and issuance of certificates of safety, but no consensus was achieved. By far the most agreed upon conclusion that was reached was that a better explanation of BSE surveillance

and infection was needed for the sake of the general public. Moreover, the consumers' risk perception was perceived as a necessity to be shared among all stakeholders.

As a result, participants felt more support was needed from news media (and, specifically, newspapers more than television), to disseminate proper information about the use of money and time for testing, and how international standardized control measures were truly effective. Although consumers felt more comfortable with academic sources (such as university researchers) providing such information, the workshop participants agreed that whomever was selected to make such explanations, clear simple messages would be the most effective to appeal to consumers about beef safety.

Table 2. Summary of discussion points from veterinarian workshop

Background	A. Scientifically, 100% animal testing is unnecessary. B. Despite scientific evidence, such testing has not been changed. C. Local & central governments must collaborate more.
Monitoring SRM*	A. Proper removal of SRM must be guaranteed. B. Removal of SRM must be monitored & recorded. C. Certificates for SRM removal should be issued.
Conclusion: Must gain more media support with easy-to-understand messages	

*SRM = specified risk material

6. Discussion

Much consumer research has been conducted at the local government level in Japan (Maclachlan, 1997). However, the results of many information meetings with the public are not readily available. Our questionnaire survey done in Sapporo shows figures similar to the national proportions (Fig.1). In other words, the surveys done in Kiyota-ku, Sapporo might provide a reliable indicator for nationwide opinions on beef safety. Our research results indicate that consumers in Japan do not have enough information on BSE testing. The majority of the national population seeks comprehensive BSE testing against all slaughtered cattle, even though they understand there is no 100% guarantee of zero risk.

Despite the government's decision to exempt younger than 21-month-old cattle from BSE testing at slaughterhouses, beef producers were willing to continue testing all cattle because of the public's feelings toward safety about beef. However, veterinarians that we consulted in our workshop unanimously would like to convince consumers that testing only animals over 21 months of age is safe enough and that continuing comprehensive animal testing is a waste of money. At the workshop, every participant felt it was a worthwhile meeting, mainly due to interactive opinion exchanges (intellectual dialogue) among themselves. An ultimate goal of veterinary epidemiological research is to identify problems and propose solutions in fields of public and animal health; therefore, using workshops such as this one would be a useful tool to enhance awareness among all stakeholders (including consumers)—who would be invited to participate—in order to achieve such goals (Kadohira and Horikita, 2009).

Findings from social science research on risk perception should allow direct application in the domains of risk regulation and management (Pidgeon, 1998).

Pidgeon (1998) argued whether consumer evaluation of the qualities of a hazard should actually enter into policy decisions about investing public resources in safety measures. Public participation in the processes of risk decision making is not only desirable on ethical grounds, but can also tell us useful things which might then be used to greatly enrich formal risk analyses and provide one form of guidance on risk tolerability criteria to be adopted for policy. Participatory decision making can 1) increase an individual's commitment to the course of action selected and 2) increase trust in the organizations who manage the risk and through this lead to greater acceptance of hazards.

There are several means by which consumers and other stakeholders can collaborate to learn more about disease risk issues. As we have shown in this study, these can include public questionnaires (followed by clear interpretation of such data, of course) taken quickly during the outbreak period. Assembling knowledgeable scientists such as veterinarians in workshops can serve as an initial step in reaching a consensus on what issues are important, and then following up on such meetings by involving citizens' groups and government personnel would be a logical next step that could lead to clearer explanations of technical language and bases upon which policies are made to create or follow accepted standard for testing.

Yoshida and Matsui (2007) led the 2005-2008 Genetic Modified Organisms (GMO) Dialogue Forum Project (Yoshida, 2008) to fill the communication gap between various stakeholders related to GMO in Hokkaido, Japan. This trial has materialized as a new research project to redesign risk communication. They identified communication gaps and key interactions among the stakeholders, including a government-academia network with "the aim of rebuilding trust between scientists and concerned peoples" (Fig. 2). Yoshida and Matsui (2007)

brought scientific knowledge to local citizens through forums and roundtable conferences, much like our own workshop and public meetings. Their end result was a stakeholder statement, which was handed over to the Hokkaido Government to recommend conducting pre-testing with presence of consumers in a smaller scale prior to introduction of GMO and was used in part as official reference to improve Hokkaido GM legislation system. A “hybridization of multifold dialogues, the combination of small dialogue forum and roundtable conference and large dialogue forum” served to “improve both researchers’ social literacy and lay-peoples’ scientific literacy”. These goals, methods, and results are ideally suited to the situation at hand with regard to BSE in Japan, and we hope that a similar result can be produced.

Similar to the GMO project, but instead related to BSE blanket testing, we have started to conduct several small scale forums in Hokkaido, together with a roundtable discussion among stakeholders. Later, we hope to be able to write a proposal and submit it to the local and/or central government to help fill the gap in a similar way to the GMO Dialogue Forum Project.

7. Conclusion

BSE risk communication is still in the infancy stage in Japan. Participatory technology assessment is urgently needed by including all stakeholders in order to build trust among them. Stakeholders such as researchers, consumers, farmers, food processors, food distributors, consumers, government, and mass media must come to the dialogue table, respect each other, and have long and repeated discussions. We have shown with surveys and public meetings just how consumer perceptions about BSE are shaped and how they can progress into more fruitful outcomes with the right levels of communication among appropriate parties.

Consumers are the end users in the food supply chain, and it is critical to protect their health and well-being. We believe this can be accomplished in situations such as GMOs and BSE not only by properly informing the public and educating them about food safety issues—thus, bridging the communication “gap”—but also by joining forces with all stakeholders to establish the atmosphere of trust across all social borders. To that end, we hope to improve on existing methods and develop more effective risk communication approaches in order to obtain common understandings which reflect on the food safety policy.

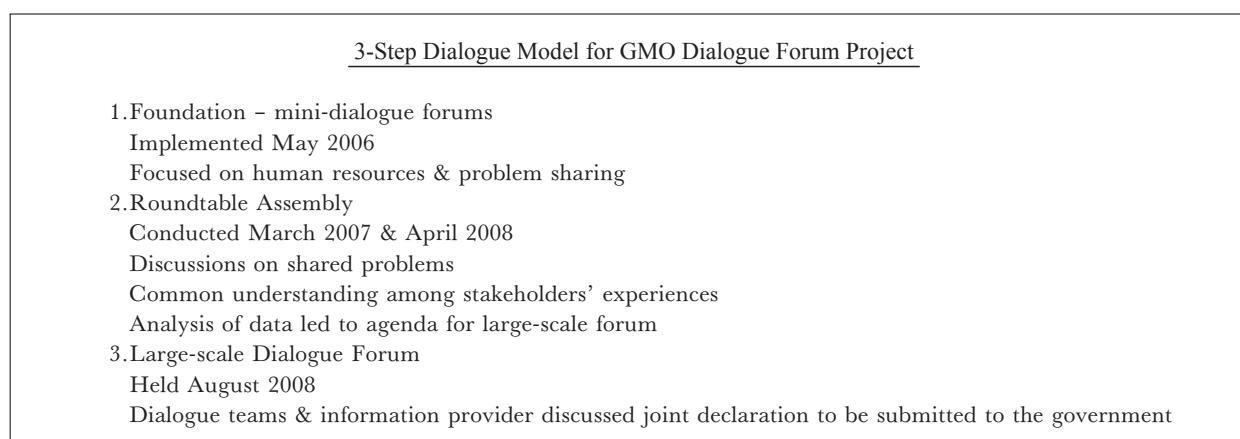


Figure 2. Outline of GMO Dialogue Forum Project chain of events (adapted from Yoshida and Matsui, 2007)

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摘要

一頭目のBSE (Bovine Spongiform Encephalopathy: 牛海綿状脳症)陽性牛が2001年に国内で見つかった後、政府は早急にSRM (Specific Risk Material: 特定危険部位)除去や飼料規制の徹底を図ると共に、サーベイランスの方法を変えた。いわゆる全頭検査である。政府は必ずしも適切に振舞ったわけではないが、メディアは政府の不合理的な動きを批判し公衆の関心を高めた。その結果、平均的な日本人の認識(2003年から2005年の調査から推定)と科学的リスク評価に基づく認識との間に大きなギャップが形成された。食品安全委員会によるリスク評価の結果では20カ月以下の牛の検査は不必要としたが、市民は全頭検査を支持することになった。また、多大な費用は無視して、都道府県は市民からの要求を受け入れた。われわれは、関係するすべてのステークホルダーがワークショップや公開の会議を通して直接に議論することで、ギャップを狭めることができると確信している。つまり、公開の場を作ることで食の安全をよりよく理解することが可能になるのである。専門性の有無にかかわらず、食の安心に関する問題を理解する人々からの切実な要求とは、専門家からのより多くの情報提供、専門家への不安の適切な表明方法、メディアからの適切な報道、情報への簡易なアクセス方法であった。このように情報を分か

ち合う仕組みができれば、条例などを決定するうえで有効な市民との共同提案書の作成につながり、 unnecessary 公衆の恐怖を緩和でき、費用の節約も可能となる。

キーワード：BSE, リスク評価, サーベイランス, リスク認知