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Bi terrorism and Food Security

Issues and Challenges

Executive Summary

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We would be happy to provide a single copy of this report free of charge. You may address your inquiry to Beth Ambrosio, Center for Agricultural Policy and Trade Studies, North Dakota State University, P.O. Box 5636, Fargo, ND 58105-5636, Ph: (701) 231-7334, Fax: (701) 231-7400, email: beth.ambrosio@ndsu.nodak.edu. This publication is also available online in printable format online at <http://agecon.lib.umn.edu/>

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Introduction

Won W. Koo, Professor and Director, Center for Agricultural Policy and Trade Studies, North Dakota State University

A conference titled **Bioterrorism and Food Security: Issues and Challenges** was held on October 28 and 29, 2002 at the Ramada Plaza Suites and Conference Center in Fargo, North Dakota. The conference was organized by the Center for Agricultural Policy and Trade Studies and the Great Plains Institute of Food Safety, North Dakota State University. Sponsors of the conference were the North Dakota Agricultural Experiment Station, and the Department of Agribusiness and Applied Economics. Speakers included U.S. Senator Byron Dorgan, U.S. Representative Earl Pomeroy, Lieutenant Governor Jack Dalrymple, government officials, and members of academia and private industry. The purpose of this conference was to address emerging issues related to bioterrorism and food security affecting U.S. agricultural production, processing, and trade, and to discuss strategies to prevent intentional contamination and attacks on U.S. agriculture. This volume summarizes the major issues and findings discussed by each of the conference speakers.

Welcome Address

Joseph A. Chapman, President, North Dakota State University

North Dakota State University has undergone a recent, meaningful transformation in its history of service to the state through its three-fold mission of teaching, research, and public service. The efforts of the university faculty, staff, and students have not changed, but how their mission is conducted is constantly evolving. The Bioterrorism and Food Security conference is an example of this transformation. The traditional focus of a land-grant institution on food production has expanded to meet the grim realities of the day. North Dakota State University has broadened its curriculum to include new programs that address food safety and emergency management, and has harnessed its mission of education, research, and outreach to meet the emerging threat of terrorism. This conference is testimony that the university can address the historic needs of American agriculture, while addressing the concerns of the day. With the added issues of bioterrorism and food safety, the challenges of agriculture have never been greater.

Keynote Addresses

Byron Dorgan, U.S. Senator (ND)

Bioterrorism and food security is very real and important. **There are two sets of issues with respect to food security: health issues and economic issues.** The dramatic drop in beef sales in Japan following an outbreak of mad cow disease is an example of the type of economic disruption that can occur. The senate passed and the president signed the Public Health Security and Preparedness

Act of 2002, which includes provisions to protect the U.S. food supply. The purpose of this legislation is to significantly improve the country's ability to respond effectively and quickly to bioterrorist threats and other public health emergencies. Some progress has been made, but more emphasis within the government still needs to be placed on food security. U.S. inspection of food imports is an area of concern; while 5.7 million containers come into our ports each year, only 100 thousand are inspected.

Floyd Horn, Former Director of Food, Agriculture, and Water Security at the White House Office of Homeland Security

U.S. agriculture is vulnerable to attack because it is large and complex, highly concentrated, easily accessible, limited in genetic diversity, and susceptible to foreign disease (especially livestock). Terrorists want to attack our economy, of which agriculture forms a major part. The threat is real since many countries have agricultural biowarfare capability, and substate groups (including al Qaeda) have attempted to acquire biowarfare capability. Proliferation to rogue countries is a concern and is being addressed through the Cooperation Threat Reduction Program. **The terrorist attacks on September 11, 2001 have sharpened the focus of homeland security in the U.S. government, and food and agriculture are key components of this agenda. Challenges remain in areas of deterrence, prevention, and domestic preparedness. The Office of Homeland Security is enabling new relationships between key interests in all levels of government and also in private sectors.**

Risk of Bioterrorism: Issues and Challenges

Robert Trotter, Director of Field Operations, Eastern Texas Customs Management Center, U.S. Customs Service

Bioterrorism has a long history. In the 6th century BC, Assyrians poisoned the wells of their enemies with rye ergot. In 1767, during the French and Indian War, the English gave blankets laced with smallpox to Indians loyal to the French in order to decimate the tribe.

Two of the U.S. Customs Service's key programs are the Customs Trade Partnership Against Terrorism (C-TPAT) and the Container Security Initiative (CSI). **The purpose of C-TPAT is to initiate cooperation between Customs and industry leaders to ensure national security at the U.S. border and beyond, to strengthen the supply chain, to exchange ideas, and to facilitate legitimate trade.** While the United States needs to ensure security at the border, the just-in-time inventory that many U.S. businesses rely on could be in jeopardy if trade is slowed at the border. Under C-TPAT commitments, businesses agree to conduct a comprehensive security self-assessment, to submit a completed supply chain security questionnaire to Customs, to develop and implement a program to enhance security throughout their supply chains, and to communicate C-TPAT guidelines to

other companies in the supply chain and promote their use. Potential benefits of C-TPAT to businesses are that it brings companies into full compliance and it results in a more efficient and secure supply chain.

CSI was launched in January 2002 to prevent global containerized cargo from being exploited by terrorists. **The key elements of CSI include establishing criteria for identifying high-risk containers, pre-screening containers at the earliest possible point, using technology to pre-screen high-risk containers, and developing secure and "smart" containers.** The CSI "24 hour regulation" was proposed in August 2002. Under this regulation, ocean carriers would be required to transmit manifest information 24 hours prior to lading. This would eliminate incomplete or vague descriptions of cargo.

Customs is also targeting the world mega-seaports and is making agreements with a number of countries. The top ten world mega-ports handle almost 50% of containers shipped to the United States, and the top 20 ports handle 66% of containers shipped to the United States.

Customs targets individuals and attempts to hinder terrorists from entering the country. U.S. Customs is now training officers who normally search for narcotics to look for terrorists. Customs is also spending money to update and increase the speed of laboratories to check for bio/chemical agents. Customs is focusing efforts on radiation detection so they can inspect all cargo shipments as they enter the country.

James Schaub, Director of the Office of Risk Assessment and Cost-Benefit Analysis at USDA

The Center for Disease Control and Prevention defines bioterrorism as “intentional or threatened use of viruses, bacteria, fungi, or toxins from living organisms to produce death or disease in humans, animals, or plants.” Agroterrorism can be defined by expanding this definition to include “Intentional or threatened use of chemicals against food or animals. Or intentional or threatened use of explosives to disrupt agricultural production or supplies of food. The purpose of the act or threat is to intimidate or coerce a government or civilian population.”

There is potential for risk at each stage of the food supply chain (inputs, production, processing, storage and distribution, and retail) and we must attempt to determine the risk and consequence of a bioterrorist attack at each stage. The three components of risk analysis are risk assessment, risk management, and risk communication. Under risk assessment, we ask three questions: 1) What can go wrong? 2) How likely is that event to happen? and 3) What are the consequences if it does occur? Under risk management, we must decide what to do about the risk. Risk communication involves informing the public about the risk, which sometimes entails warning the public and at other times involves reassuring the public.

Examples of biological risks include foreign animal diseases such as foot-and-mouth disease, classical swine fever, and exotic newcastle disease; foreign plant pests or diseases such as citrus canker, soybean rust, karnal bunt, and black stem rust; and foodborne disease such as *E. coli* O157:H7, *Listeria monocytogenes*, and *Salmonella*. There are also ecological risks from foreign plant invaders, foreign animal invaders, and possible environmental degradation.

Economic impacts of bioterrorism include direct losses of crops, livestock, and assets; secondary losses in upstream and downstream markets; lost export markets; significant price effects; and a reduction of economic growth caused from a reallocation of resources. Other effects of bioterrorism include environmental problems and social and political impacts such as reduced confidence in government, reduced confidence in food safety, and social disruption resulting from fear and xenophobia.

We face a number of challenges. We must think like a terrorist (risk assessment asks what can go wrong); apply experience with conventional risk analysis to bioterrorism; build communications, coordination, and education systems; improve monitoring, detection, and forensics; research means of protection and risk mitigation; prepare for economic shocks; determine appropriate roles for government and private sector; and preserve freedom and an open society.

Bioterrorism: Agricultural Industry Perspectives

The Food Industry's Response to Ensuring Food Security and Safety

Jenny Scott, Senior Director, Office of Food Safety Programs, National Food Processors Association; and Rhona Applebaum, Ph.D., Executive Vice President for Scientific and Regulatory Affairs, National Food Processors Association

Prior to September 11, 2001, the food industry has had a long history of dealing with threats. However, they are now dealing with the previously unthinkable: intentional, widespread contamination of the food supply. Potential outcomes include illnesses, death, disruption of domestic food production and delivery systems, disruption in international trade, and destruction of businesses. The potential for the food supply to be a target of terrorism is one we cannot ignore. The food industry takes issues of food security very seriously.

We have focused our efforts on personnel (increased screening and supervision), products (controls on access during production and transportation), and property (stronger barriers to possible intruders). **Food security and food safety are not the same; their disciplines and underpinnings are different, and each requires different expertise and experience. Food security deals with intentional threats and contamination, food safety with accidents and natural contamination.** The National Food Processors Association (NFPA) has worked to assist industry to organize and conduct food security assessments and implement preventative practices and countermeasures to

events of terrorism against the food industry. We have established the Alliance for Food Safety to share procedures, practices, and tools to prevent, to the extent possible, threats to the food supply. We developed the Threat Exposure Assessment and Management (TEAM) process to assess food security risks and a security checklist of questions to consider when assessing potential vulnerabilities. We developed multilingual posters of the three “L’s” of Food Plant Security - Light it, Lock it, Limit access - to promote food security in the plant. We have recently released, in conjunction with the Food Marketing Institute, our *Food Security Manual*, to provide our members additional information on food security practices. We are evaluating potential food industry ISACs (Information Sharing and Analysis Centers) designed to reduce the vulnerability of the vital infrastructure for food through sharing of critical, credible information about threats. We also are addressing the new FDA regulations established by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 - covering administrative detention, debarment, plant registration, record access, and prior notice for imported foods - to ensure that they are targeted to terrorism and implemented in a way that makes them workable for industry.

Our goal with respect to communication is to raise awareness of food security initiatives without raising alarm. **All sectors (government, academia, public health, industry, media, and consumers) need to work together to ensure the security of our food supply. But we need to be sure we do not lose track of food safety as we move forward.**

The Perspective of Livestock Producers

Wade Moser, Executive Vice President, North Dakota Stockman’s Association

The following six policies are supported by the North Dakota Stockman’s Association (NDSA): any malicious act against agriculture should be a felony; disease surveillance needs to be improved; federal labs need remodeling, as research facilities are deteriorating and not capable of doing what is needed; further risk assessment is necessary, including a review of risk assessments of export countries; country of origin labeling should be supported; and the Ag Innovation Center in North Dakota should move forward. **Because the agricultural industry in North Dakota is so spread out, it could be at risk; we do not see everything that is going on, and diseases could be easily spread. The livestock industry must overcome its distrust of government, and the government must understand the livestock industry better;** for example, the government must understand that it is impossible for the livestock industry to pass on costs. The livestock industry is more likely to work with local government.

The Extension Disaster Education Network (EDEN): the Land-Grant System's Outreach Effort for Disasters, Including Homeland Security

Becky Koch, Information Specialist (Ag. Communication, NDSU), Staff Development Specialist (NDSU Extension Service), Extension Disaster Education Network

The Extension Disaster Education Network (EDEN) is a collaborative multi-state effort by Extension Services across the country. The mission of EDEN is to reduce the impacts of disasters through coordinated inter-disciplinary and multi-state research. **EDEN's goals are to train producers, families, volunteers, emergency responders, and others; to inventory resources and research in the land-grant system; to share and develop educational materials; and to provide local coordination with disaster agencies.**

EDEN was formed in the North Central Region when states affected by the 1993 Mississippi and Missouri River flooding wanted to record and share what was learned through the experience. Since 1993, EDEN has grown national in scope and expanded to include man-made as well as natural disasters.

The Extension and outreach arm of the land-grant university system has always been involved in disasters, since county agents who live in affected areas are members of the community and professionals who meet the needs of their local clientele. Extension is in communities before, during, and after disasters.

On September 11, 2001, EDEN immediately made educational resources available on the internet. Research-based information from a Purdue professor on talking with children about terrorism was on the Web within hours of the terrorist attacks. EDEN shared information, resources, and ideas to reach the public with university knowledge.

In July 2002, the USDA Cooperative State Research, Education, and Extension Service (CSREES) provided funds to EDEN with the focus to be on plant biosecurity. However, the initial effort was to be needs assessments of county Extension educators, ag producers, and general consumers.

The Web-based Extension survey found:

- 86% believed an agricultural, food, or water bioterrorist attack in the United States was likely to very likely
- But 78% said this attack was very unlikely in their county
- Though part of county government, in addition to the land-grant university, 54% did not know if their county government was prepared for an ag or food safety bioterrorism incident

- 73% believed that Extension should develop and deliver homeland security education
- Rather than animals or plants, most Extension educators ranked drinking water, food, the individual's role, and government's role in disasters as the most urgent topics for their communities.

The Web-based survey of ag and horticultural producers will continue through December 31, 2002, but initial results show:

- 46% say they are not prepared for an agroterrorism or other biosecurity threat on their operations, and 41% do not know
- If an unrecognized animal disease was discovered on their operation, 70% would contact their veterinarian or veterinary association, 54% their Extension agent, 39% their state Department of Agriculture, and 27% another farmer or rancher
- If an unrecognized crop disease was discovered, 79% would turn to Extension, 44% to their state Department of Agriculture, 33% to another farmer, 30% to a pesticide dealer, 28% to a consultant provided by a supplier, 17% to the USDA, and 10% to a hired crop consultant.

To view the latest of the EDEN surveys and resources available from different states, see <http://www.agctr.lsu.edu/eden>

Bioterrorism: Government Perspectives

Bioterrorism Response and Planning: The North Dakota Department of Health

Larry Shireley, State Epidemiologist, North Dakota Department of Health, and Director of the Division for Disease Control in North Dakota

The North Dakota Department of Health was recently awarded approximately \$6.9 million by the Centers for Disease Control and Prevention and the Health Resources Services Administration for planning countermeasures and responses to acts of bioterrorism. **Objectives are to designate an executive director (Tim Wiedrich was chosen for this position), to develop a strategic plan, to monitor bioterrorism preparedness and response, to coordinate the North Dakota National Pharmaceutical Stockpile Program, and to facilitate orientation for regional bioterrorism coordinators and committees. Eight bioterrorism regional planning areas have been established in North Dakota, and regional plans are being developed.**

A state-level advisory committee has also been developed to advise the North Dakota Department of Health on developing the statewide program. There are 11 subcommittees that deal

with administrative issues, Emergency Medical Services (EMS) and transportation, environmental health, facilities, information/communication, law enforcement, medical issues, public works, rural health, surveillance, and tribal and minority health.

To provide an epidemiological response, there will be eight field epidemiologists, one for each of the eight North Dakota regions. The objective is to rapidly investigate and respond to outbreaks of disease. The epidemiological response teams include public health officials and private health professionals such as physicians, nurses, veterinarians, laboratory technicians, and individuals from infection control. Electronic and web-based surveillance is being developed to increase animal health monitoring and to provide information about communicable diseases, laboratory reporting, pharmaceuticals, emergency room syndromic surveillance, and EMS (ambulance runs).

Improving laboratories involves increasing training and coordination with Level A labs, elevating five basic capacity labs to Level A, renovating the North Dakota Department of Health lab, increasing the capacity for rapid identification, and enhancing the NDSU diagnostic lab capabilities.

Another goal is to ensure effective communications, which includes communication among public officials, healthcare organizations, and law enforcement. Methods of ensuring effective communication include distributing messages using a variety of technologies, adding a Health Alert network coordinator, and providing access to broadband internet service. Activities that will provide public health risk information include hiring a public information coordinator; providing training to eight regional public health information officers; providing training on risk communication, media relations, and outreach; providing additional public information resources, such as a media website; and assessing the special needs population and translating information.

Training and education are included in the North Dakota bioterrorism program. This includes using multimedia training techniques such as distance learning, contracting training coordination services through UND, establishing an education advisory committee, providing tuition assistance for public health education, and offering bioterrorism training through the North Dakota Department of Health distance learning program, an interactive video network, or traditional classroom settings.

Other activities that are part of this North Dakota bioterrorism program include reviewing statutes and regulations and participating in exercises and drills.

Food Security Preparedness and Response: Food Safety and Inspection Service

Nader Ismail, District Veterinary Medical Specialist, Minneapolis, Food Safety and Inspection Service, USDA

Today, biological and chemical threats to our country's food supply are a growing source of public concern. Since the September 2001 terrorist attack, security - including food security - has been the highest national priority.

One way we have responded to increased security concerns has been to place our inspectors on heightened alert at ports-of-entry and in meat and poultry plants. A strong food safety infrastructure is imperative to the Food Safety and Inspection Service (FSIS) if we are to maintain consumer confidence in our regulatory programs and food supply.

In order to maintain this protection and the confidence consumers have in our ability to safeguard the country's meat, poultry, and egg products supply, FSIS will continue to look for ways to improve food safety. This includes improving surveillance systems for foodborne illnesses and identifying outbreaks more quickly, ensuring our risk reduction strategies are more science-based, and making changes in our workforce to support our increasingly science-based and public-health-oriented system.

On October 8, 2001, President George W. Bush established the Office of Homeland Security. An internal USDA Homeland Security Council was organized to work in partnership with the Office of Homeland Security, the National Security Council, and other departments to set a course for long-term success.

The council is responsible for establishing overall USDA Homeland Security policy, coordinating department-wide homeland security issues, tracking USDA progress on homeland security objectives, and appointing a representative to interagency or other external groups. The council also ensures that information, research, and resources are shared and activities are coordinated with other federal agencies.

The USDA Homeland Security Council has three subcouncils that provide coordination between mission areas and agencies, as well as information to the secretary and other key decision-makers. The three subcouncils are 1) Protection of the Food Supply and Agriculture Production (PFSAP), the only subcouncil with responsibilities for food safety; 2) Protecting USDA Facilities and other Infrastructure; and 3) Protecting USDA Staff/Emergency Preparedness.

Other measures in place to further strengthen our food safety systems include the Food Threat Preparedness Network (PrepNet) and the FSIS Food Biosecurity Action Team (F-BAT). PrepNet functions across federal departments to ensure effective coordination of food security efforts throughout

the government. F-BAT coordinates and facilitates all activities pertaining to biosecurity, countering terrorism, and emergency preparedness within FSIS.

Additionally, FSIS coordinates all its efforts with several other parties committed to preventing biosecurity threats. FSIS works closely with the CDC, FDA, and EPA, as well as with states and local health agencies, to share information about illnesses.

FSIS also participates in PulseNet, a national network of public health laboratories supported by the CDC. FSIS has also armed consumers with the tools they need to protect themselves against foodborne illness. Through continuing food safety education efforts, information on safe-handling and cooking practices has reached a large audience, providing an additional layer of protection.

Joan Sebenaler, Assistant Port Director of Trade for the U.S. Customs Service at Pembina, North Dakota

Customs is the first line of defense and its goal is to keep adulterated food out, while trying to facilitate legitimate trade. Coordination with specialists is important. A new dedicated commuter lane program called NEXUS is being implemented. NEXUS allows pre-screened low-risk travelers to be processed by Customs or INS via a dedicated lane at U.S. land borders, protecting U.S. border integrity and allowing for a more effective allocation of resources for enforcement activity. The NEXUS technology was developed in 1999. Each participant carries a proximity card which contains a radio frequency identification (RF chip) that transmits data to the inspection booth.

Impacts on the U.S. Agricultural Sector and Exports

The High Economic Costs of an Attack

Daryll Ray, Professor and Director, Agricultural Policy Analysis Center, University of Tennessee

Since September 11, 2001, it is common to see front page stories about terrorism in our daily newspapers. In most cases, the terrorism being discussed is a bombing or the potential attack on a U.S. facility or installation somewhere in the world. **When it comes to bioterrorism, the deliberate use of biological agents to frighten and attack large populations, most of the focus has been on diseases such as anthrax and smallpox that affect human beings. Stories about bio-weapons that are primarily directed toward animals and plants are not included in reports by most media outlets.**

I have been looking at the potential impact of an attack on a portion of the U.S. food system. First, I'll review the devastating livestock diseases that have plagued the United Kingdom recently, such as mad cow disease (Bovine Spongiform Encephalopathy, or BSE) and foot-and-mouth disease (FMD). BSE was identified in the United Kingdom in 1986. For the next 10 years, BSE had little

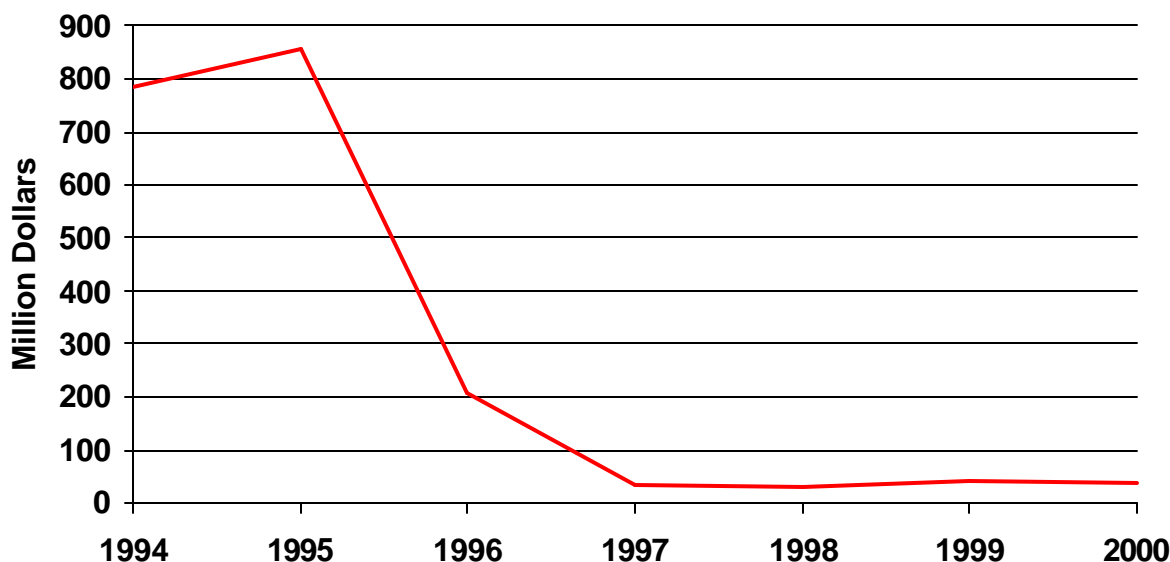


Figure 1. Value of bovine meat exports from the United Kingdom, 1994-2000.
Source: FAO

impact on the beef market and beef exports as experts reassured the public that BSE was not a threat to human health. Then, in March of 1996, British authorities revealed a potential connection between BSE and a newly identified variant of Creutzfeldt-Jakob Disease (vCJD). Closely following that statement, the European Union announced what was effectively a ban on the export of beef and veal from the United Kingdom.

Such a ban has a far-reaching effect on agriculture and agribusiness. The value of bovine meat exports dropped from \$856 million in 1995 to \$32 million in 1997 (Figure 1). In the decade prior to the export ban, exports accounted for nearly 20% of beef production in the United Kingdom. The ban remained in place for three and one half years.

What if a bioterrorist engineered an outbreak of such a disease in the United States? BSE may not be bioterrorists' disease of choice since some would argue that BSE is not a very effective bio-weapon because it is spread by contaminated feed and has a fairly long incubation period. Foot-and-mouth disease (FMD) might be a more likely agent of bioterrorism. It is relatively easy to obtain, does not infect humans, and spreads easily once in the animal population.

Suppose an outbreak of FMD turns up among a significant portion of the cattle in Kansas, Oklahoma, and Texas, the heart of U.S. beef production. These three states account for a quarter of all beef production in the United States. Here again, following the United Kingdom's lead, which had a natural outbreak of FMD in 2001, we assume that officials choose to use animal

slaughter rather than vaccine as a means of controlling the disease. It is not out of the realm of possibility that one quarter of all cattle in the three-state area would have to be destroyed. **With 25.4 million animals in the three-state area, that would mean the slaughter of 6.35 million animals. If producers were to be reimbursed by the federal government, with an average payment of \$600, the cost would be \$3.8 billion.**

In addition, the slaughter of 6.35 million animals would result in about a 250 million bushel reduction in corn demand. In addition to the loss of these feed sales, the resulting increase in carryover stocks would reduce the season average price of corn by seven cents, or nearly \$670 million overall.

If red meat exports were to be banned because of FMD, another \$5 billion dollars could be added to the cost of a bioterrorism attack. Together, these three direct costs would add up to a loss to the economy of nearly \$9.5 billion. Indirect costs, such as the personnel and equipment needed for the slaughter and disposal and the loss of employment in processing plants and feed lots, are not included in this total.

We also have not tried to estimate the costs associated with a reduction in demand for beef because of people's fear of the disease, nor the subsequent income loss to cattlemen and feedlot operators during additional time when their facilities are quarantined, nor a host of other subsequent and less direct draw-downs on economic activity.

The total economic cost could be in the tens of billions of dollars. But even the conservative estimate of \$9.5 billion dollars in direct losses, which is equivalent in size to one-fifth of total net farm income, illustrates the huge economic consequences of an attack on a single portion of our food supply chain.

Bioterrorism and Food Security - Trade Dimensions

David Blandford, Professor and Chair, Department of Agricultural Economics and Rural Sociology, Pennsylvania State University

Terrorism poses a number of threats to the U.S. food system. These threats include, in decreasing order of severity, the loss of human life, economic disruption, and negative impacts upon morale and consumer confidence. **Both U.S. export and import markets for food and agricultural products are at risk - roughly 18 percent of U.S. agricultural production is exported, and imports account for roughly 9 percent of the volume of food consumed domestically.**

Export threats include potential terrorist attacks on export shipments and the transportation infrastructure, such as storage facilities at ports or airports. There are also risks of general disruption in foreign demand for U.S. products due to the direct or indirect impact of terrorism. U.S. companies are important players in the global food and agricultural system through foreign subsidiaries and joint

ventures. Profitability could be affected by attacks on their overseas operations. Import threats include the potential disruption of supply due to terrorism and product contamination, but also extend to the use of agricultural and primary trade as a vector for terrorist attacks. Important risk factors for imports are the product type and origin. Consumer-oriented goods are more risky than bulk or intermediate goods because the processing of imported bulk or intermediate goods increases the likelihood of detecting contamination.

Bioterrorism in the United States creates risks of economic loss for the U.S. food and agricultural industry. **Biological threats are more significant than chemical or other forms of contamination because of the possibility of growth and spread of biological agents. Such threats can be directed towards human health, e.g., the introduction of toxins into foodstuffs (consumption threat), or to plant and animal health (production threat), or to human health indirectly by using animals as a disease vector.** While economic losses from bioterrorism might be considerable, they are relatively less important, in the eyes of the general public, than threats posed to human health through chemical or biological contamination.

A number of conclusions can be reached about the threats posed to the U.S. food system from bioterrorism:

- The risks of damage posed by terrorist activity are greatest in animal agriculture, through the potential effects of the introduction of disease.
- While there are disease risks associated with imports, the greater risk would seem to be through direct infection of the domestic food production system by terrorist agents operating domestically.
- Large expenditures on additional import inspections are unlikely to be effective from the perspective of risk reduction per dollar of expenditure, although there is a need to ensure that existing systems function adequately.
- Private companies have a lot to lose from terrorist events affecting the safety of food products, e.g., through the impact of public confidence and loss of sales (Tylenol tampering, Perrier). It would be advisable for companies to take steps to try to minimize their exposure to such risks. The trend toward the adoption of measures that achieve this, such as contracting, traceability, and identity preservation, which we are already observing in Europe, is likely to intensify globally, and this will affect future trading relationships.

Roger Johnson, North Dakota Agricultural Commissioner

A bioterrorist attack could have a huge impact on North Dakota agriculture and the economy. Agriculture is the largest sector of the North Dakota economy, and the state is very dependent on it. Agriculture adds \$3.8 billion to the North Dakota economy. Although the risk of terrorist attack in the state may seem low, a few attributes of North Dakota agriculture do make the state vulnerable, and terrorists may attack where it is not expected. North Dakota leads the nation in the production of many commodities which may be susceptible to attack.

The biggest likely effect of a bioterrorist attack is the economic impact, and not the impact on human life, since destroying the economy is a major goal of terrorists. Economic impacts include the cost of disease eradication and the loss of exports. While disease eradication would be very costly, trade is very important to the U.S. economy, and the loss in exports could be the most significant economic effect of a bioterrorist attack. Trade agreements give countries the right to cease trade if certain diseases exist. When Taiwan experienced an outbreak of foot-and-mouth disease, the greatest economic effect was a \$15 billion loss in exports. If an outbreak does occur, communication and coordination are very important. We must not focus too much on organization and neglect communication and coordination.

Policy Alternatives for Bioterrorism and Food Security

Robert Young, Co-Director of the Food and Agricultural Policy Research Institute (FAPRI), University of Missouri

For a bioterrorist attack to disrupt the United States, it needs to be doable, it needs to have broad dispersion, it needs to cause great economic hardship, and it needs to have long-lasting effects. An outbreak of an animal pathogen like foot-and-mouth disease meets these criteria. An outbreak of a crop disease is also possible due to a lack of genetic diversity in the country. An important policy concern is how we indemnify producers, especially for some illnesses where it takes time to confirm the disease. History has suggested that one of the best responses to a disease outbreak is rapidly building a firewall around an outbreak area through elimination of herds with actual or suspected infestations. Given that several of the tests for diseases may take a number of days to complete, producers are understandably reluctant to slaughter their herds until tests results are returned. But during this time, the area required to build the firewall may well need to extend to a much larger geographic area. Establishing a substantial indemnification fund that could be drawn upon for biosecurity purposes may ultimately reduce the overall cost, both in terms of time and money, needed to bring such outbreaks under control.

The USDA does have access to some funds from the Commodity Credit Corporation for indemnification, but access to these funds is not easy. **The costs to government of indemnification could be huge, as illustrated by the recent outbreaks in the United Kingdom. Also, there is a question of who does and who does not receive compensation.** For example, the tourism industry in the United Kingdom lost \$4 billion due to the outbreaks. Other policy concerns include the effects of a free fall in meat prices and how the United States regains export markets after an outbreak. Further, more livestock producers need to talk with Canadians about animal identification. There should be a secretarial fund under the Secretary of Agriculture for an occasion when an outbreak occurs, and we need to think about how we will communicate to the public if an outbreak occurs.

Food: How Safe? The United States boasts the safest food in the world. Maybe so, maybe not?

David White, Research microbiologist, Center for Veterinary Medicine, Food and Drug Administration

Foodborne illnesses have a major public health impact in the United States and around the world. **According to recently published Center for Disease Control (CDC) data, foodborne diseases account for approximately 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths each year in the United States alone.** Five pathogens account for over 90% of estimated food related deaths: *Salmonella* (31%), *Listeria* (28%), *Toxoplasma* (21%), norwalk-like viruses (7%), *Campylobacter* (5%), and *E. coli* O157:H7 (3%). Although many of these diseases result in a self-limiting diarrheal illness in humans, severe invasive disease or prolonged illness in immuno-compromised individuals can occur and may require antimicrobial therapy.

Development of antimicrobial-resistant foodborne bacterial pathogens can potentially compromise human drug treatments. During the past five decades, the use and sometimes misuse of antimicrobials in both human and veterinary medicine has given rise to a selection unprecedented in the history of microbial evolution. As a result, society is facing one of the most serious public health dilemmas ever - the emergence of infectious bacteria displaying resistance to many, and in some cases all, effective antimicrobials. There is currently a great deal of conjecture regarding the role that therapeutic and sub-therapeutic use of antimicrobials in animals has played in accelerating the development and dissemination of antimicrobial resistant bacterial pathogens. Much like the situation in human medicine, the use of antibiotics in livestock and poultry species has accelerated the development of antibiotic-resistant strains of microbial pathogens, potentially complicating treatment for both animals and humans. **The increasing incidence of antimicrobial resistant bacterial pathogens will have serious repercussions for the future treatment and prevention of infectious diseases in both animals and humans.** Although a great deal of scientific information is available on this subject, many aspects of the development and dissemination of antimicrobial resistance in the animal production environment still remain murky. Research in this area has demonstrated that the manifestation and dissemination of bacterial antimicrobial resistance is the result of countless complex interactions between microorganisms, antimicrobials, and the surrounding environments. We must strive to better

comprehend these complex interactions if science-based risk assessments concerning the use of antimicrobials in the animal production environment are to be made. Only through a committed approach can we begin to reverse resistance trends and maintain the effectiveness of antimicrobials in human and veterinary medicine.

FDA/CVM conducted a survey of 820 retail meat samples (ground turkey, pork, ground beef, and chicken) obtained from stores throughout Iowa from March 2001 to March 2002. Of the 820 samples, 13% were positive for *Salmonella*. Turkey and chicken accounted for most of the *Salmonella*, and one strain of *Salmonella* from turkey was resistant to 12 antimicrobials. Twenty percent of samples were contaminated with *Campylobacter*; chicken accounted for most of the *Campylobacter* positives.

More than 200 known diseases are transmitted through food. Surveillance is complicated by several factors. Under-reporting complicates surveillance. Many pathogens transmitted through food can also be spread through water or from person to person, obscuring the role of foodborne transmission. A proportion of foodborne illness is caused by pathogens or agents that have yet to be reported. Also, intentional contamination with a biological agent is rarely suspected or reported. Despite these difficulties, surveillance programs are in existence. The Foodborne Diseases Active Surveillance Network (FoodNet) is a collaborative project between the CDC, USDA, FDA, and nine sentinel states (California, Colorado, Connecticut, Georgia, New York, Maryland, Minnesota, Oregon, and Tennessee). Bacterial pathogens under surveillance in FoodNet are *Salmonella*, *Shigella*, *Campylobacter*, *E. coli* O157:H7, *Listeria monocytogenes*, *Yersinia enterocolitica*, and *Vibrio*. FoodNet provides a network for responding to new and emerging foodborne diseases of national importance, monitoring the burden of foodborne diseases, and identifying the sources of specific foodborne diseases. The National Antimicrobial Resistance Monitoring System (NARMS) is a collaborative effort among the FDA, USDA, and CDC which monitors antimicrobial susceptibility patterns of zoonotic enteric pathogens. PulseNet is a network of public health and regulatory labs that perform molecular sub-typing of certain foodborne pathogens.

There have been examples of intentional contamination in the past. One notable example was the large community outbreak of *Salmonella typhimurium* infections in the Dalles, Oregon area between September and October 1984. A total of 751 cases of *Salmonella* gastroenteritis were associated with eating or working in area restaurants. A subsequent criminal investigation revealed that members of a religious commune had deliberately contaminated 10 salad bars in the area.

Clearly, foodborne illness is not a simple problem. **A complex combination of factors must be managed on a continual basis. A well-conceived, science-based, strategic approach is needed to identify and prioritize hazards and to define effective strategies to reduce hazards. Increased food safety education of all involved groups (government, industry, consumers) is necessary. International coordination of food safety efforts should be initiated due to the globalization of the food supply. To detect and rapidly respond to potential outbreaks,**

improved tracking and surveillance for foodborne illness is needed. Finally, a multi-disciplinary effort combining microbiology, epidemiology, genetics, evolutionary biology, immunology, chemistry, and other areas of expertise is needed to enhance our understanding of the inter-related factors that drive emerging food safety issues.

Panel Discussion: Charting a Course

The final session of the conference was a discussion among panel members who included Douglas Friez, Homeland Security Coordinator/Emergency Management Director for the state of North Dakota; Lisa Nolan, Director of the Great Plains Institute of Food Safety at NDSU; Tim Sellnow, Professor of Communication at NDSU; Douglas Freeman, Professor and Chair of the Department of Veterinary and Microbiological Sciences at NDSU; Roger Johnson, Agricultural Commissioner for North Dakota; and David White, microbiologist in the Food and Drug Administration. White stated his belief that food contamination may not be the target of a bioterrorist attack because of the relatively small impact. Sellnow discussed the important role that the media plays. Johnson noted that responding to bioterrorism will require early detection, effective control, a free flow of accurate information, and complete cooperation, and that agencies may need to update statutory authorities. Friez stated there are some plans in existence, but he stressed the importance of communication and building relationships and the need to plan, train, and exercise.

Appendix

Conference Program

Introduction - **Won W. Koo**, Director, Center for Agricultural Policy and Trade Studies, North Dakota State University; and **Patricia Jensen**, Vice President and Dean for Agriculture, North Dakota State University

Welcoming Remarks - **Joseph Chapman**, President, North Dakota State University

Keynote Addresses

Moderator - **Patricia Jensen**

Speakers - **Senator Byron Dorgan**, North Dakota

Floyd Horn - Former Director of Food, Agriculture, and Water Security at the White House Office of Homeland Security

Session I - The Risk of Bioterrorism: Issues and Challenges

Moderator - **Won W. Koo**

Speakers - **Robert Trotter**, Director, Field Operations, Eastern Texas Customs Management Center, U.S. Customs Service

James D. Schaub, Director, Office of Risk Assessment and Cost-Benefit Analysis, U.S. Department of Agriculture

Luncheon Address

Moderator - **Lisa Nolan**, Director, Great Plains Institute of Food Safety, North Dakota State University

Speaker - **Bruce Levy**, Director, U.S. Transboundary Division, Department of Foreign Affairs and International Trade, Canadian government

Session II - Issues and Challenges in Food Security and Bioterrorism: Agricultural Industry Perspectives

Moderator - **David Lambert**, Professor and Chair, Department of Agribusiness & Applied Economics, North Dakota State University

Speakers - **Jenny Scott**, Senior Director, Office of Food Safety Programs, National Food Processors Association

Wade Moser, Executive Vice President, North Dakota Stockmen's Association

Becky Koch, Extension Disaster Education Network

Session III - Issues and Challenges in Food Security and Bioterrorism: Government Perspectives

Moderator - **David Lambert**

Speakers - **Larry Shireley**, State Epidemiologist, North Dakota Department of Health

Nader Ismail, Food Safety Inspection Service, U.S. Department of Agriculture

Joan Sebenaler, Assistant Port Director, Trade, U.S. Customs Service, Pembina, ND

Dinner Address

Moderator - **Patricia Jensen**

Speaker - **Jack Dalrymple**, North Dakota Lieutenant Governor

Session IV - Impacts of Bioterrorism on the U.S. Agricultural Sector and Exports

Moderator - **Won W. Koo**

Speakers - **Daryll Ray**, Professor and Director, Agricultural Policy Analysis Center, University of Tennessee

David Blandford, Professor and Chair, Department of Agricultural Economics and Rural Sociology, Pennsylvania State University

Roger Johnson, Agricultural Commissioner for North Dakota

Session V - Policy Alternatives for Food Security and Bioterrorism

Moderator - Lisa Nolan

Speakers - Robert Trotter, Director, Field Operations, Eastern Texas Customs Management Center, U.S. Customs Service

Robert Young, Co-Director, Food and Agricultural Policy Research Institute (FAPRI), University of Missouri

David White, Center for Veterinary Medicine, U.S. Food and Drug Administration

Session VI - Panel Discussion: Charting a Course

Moderator - Patricia Jensen

Panel Members:

Douglas Friez, Homeland Security Coordinator/Emergency Management Director for the state of North Dakota

Lisa Nolan, Director, Great Plains Institute of Food Safety, North Dakota State University

Tim Sellnow, Professor of Communications, North Dakota State University

Douglas Freeman, Professor and Chair, Department of Veterinary and Microbiological Sciences, North Dakota State University

Roger Johnson, Agricultural Commissioner for North Dakota

David White, Center for Veterinary Medicine, U.S. Food and Drug Administration