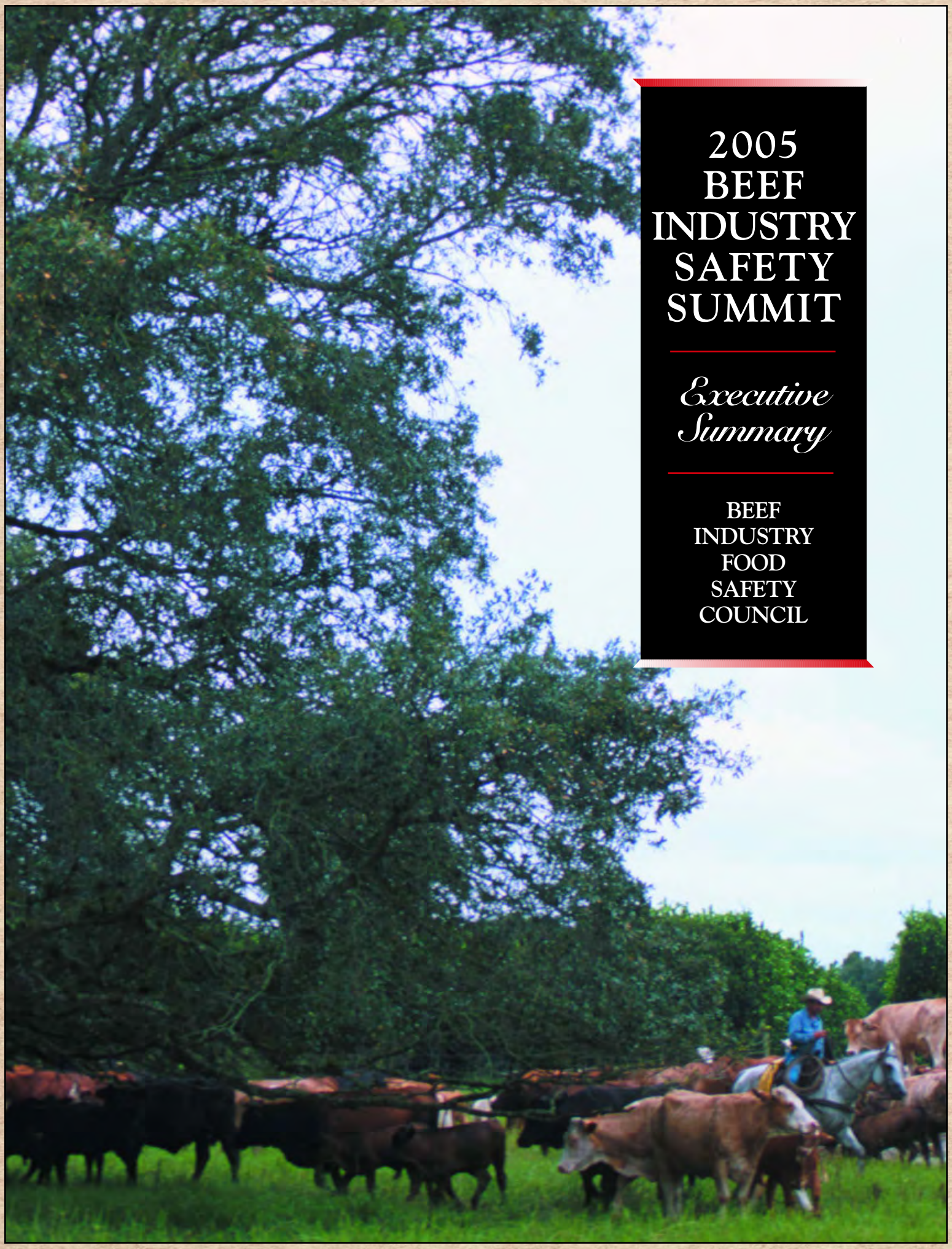
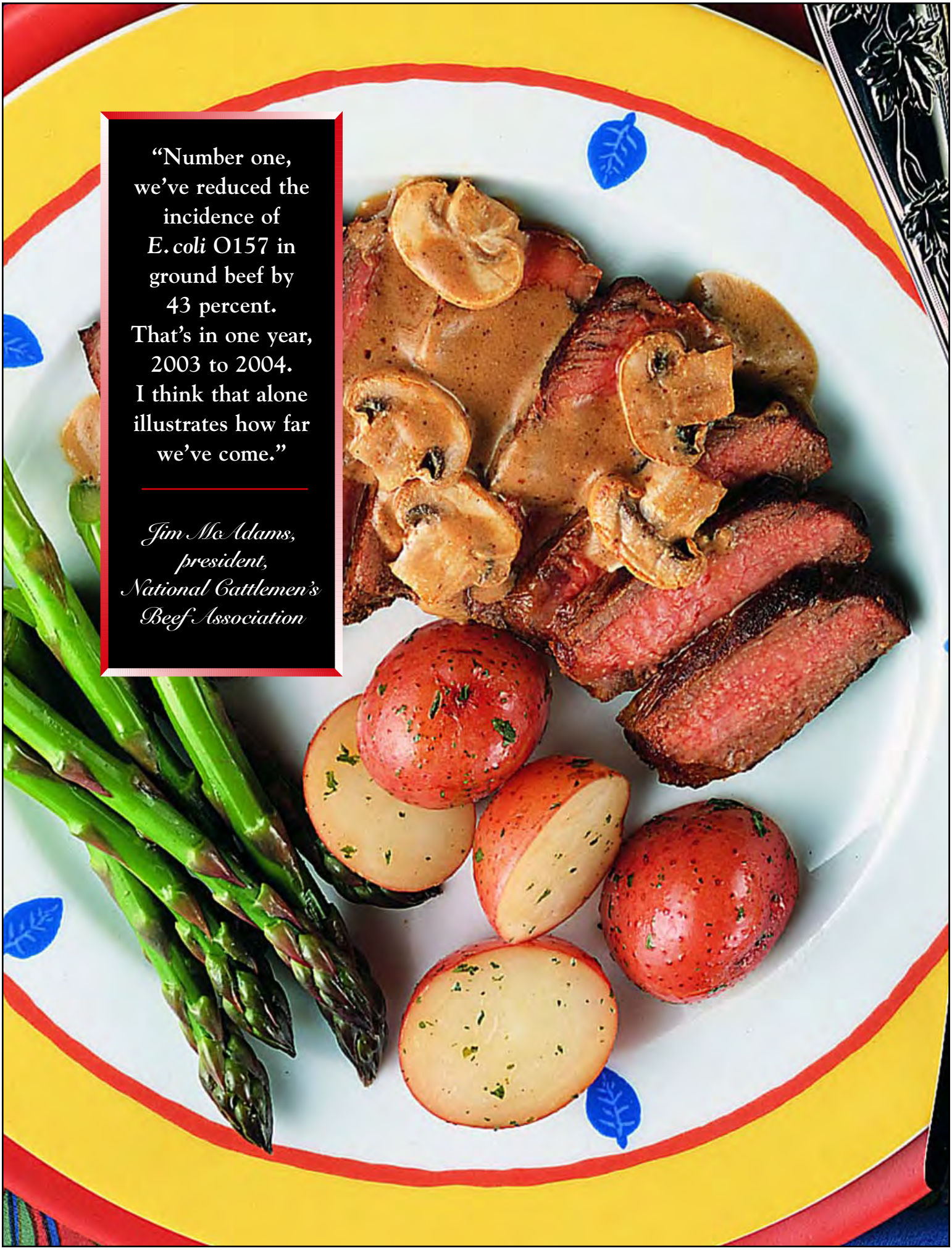


2005 BEEF INDUSTRY SAFETY SUMMIT

Executive Summary

BEEF INDUSTRY FOOD SAFETY COUNCIL



"Number one, we've reduced the incidence of *E. coli* O157 in ground beef by 43 percent. That's in one year, 2003 to 2004. I think that alone illustrates how far we've come."

Jim McAdams, president, National Cattlemen's Beef Association

Safety—a beef industry commitment

Since 1993, through the beef checkoff program, beef producers have invested more than $20 million in beef safety research. The processing industry has done its part too—devoting millions of dollars to plant improvements and intervention technologies all aimed at one goal—creating a safer product for consumers. Foodservice operators and retailers have also contributed to the effort by instituting supplier controls and microbial testing programs.

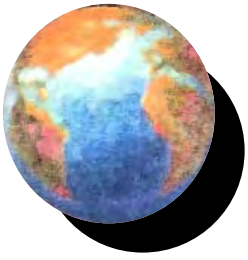
The hard work is paying off. The overall incidence of foodborne illness attributed to *E. coli* declined significantly in 2004, meeting the United States Healthy People 2010 goal of 1.0 cases per 100,000 people six years ahead of schedule, according to a report issued in April 2005 by the Centers for Disease Control and Prevention (CDC). The number of *E. coli* illnesses in humans declined 42 percent from the 1996-98 baseline.

That news came less than two months after the U.S. Department of Agriculture's Food Safety and Inspection Service (USDA-FSIS) announced that the percentage of *E. coli* O157:H7 positive ground beef samples collected in 2004 fell by 43.3 percent when compared to 2003, and that figure has declined 80 percent since 2000.

It appears the beef industry is winning battles, but the war continues. While significant progress has been made to deal effectively with *E. coli*, other pathogens and issues are emerging as challenges. The industry is committed to working with all segments of the beef production cycle—from farmers and ranchers to foodservice and retail operators—to find ways to keep America's beef supply the safest in the world.

"Other nations are struggling with *E. coli* still, and certainly with *Salmonella* to a greater extent than any of us here in the United States. We are the model for the whole world, and I think it's the leadership that is displayed by the industry that has gotten us to this point."

Dr. Elsa Murano, vice chancellor and dean of agriculture and life sciences at Texas A&M University and director of the Texas Agricultural Experiment Station



Background

The first major outbreak of *E. coli* O157:H7 occurred in 1993, and that same year a Blue Ribbon Task Force was appointed by the National Livestock and Meat Board to address *E. coli* O157:H7 and what had become one of the biggest issues to affect the beef industry to date. In 1997 beginning with Hudson Foods, the era of "mega-recalls" began. From 1994 to 2004, beef recalls averaged 1.8 million pounds per year, a figure that excludes a 19 million pound recall in 2002.

The regulatory environment also affected how the industry deals with *E. coli* O157:H7 and other pathogens. Hazard Analysis Critical Control Points or HACCP is now part of everyone's vocabulary. In 2002, the Food Safety Inspection Service (FSIS) required all beef plants to reexamine their food safety plans.

Foodservice and retail operators have also done their part by implementing supplier controls and microbial testing. End-users understand their role in ensuring food safety, due in large part to educational campaigns for consumers.

An industry-driven, science-based approach has been extremely effective in addressing *E. coli* O157:H7, however the work continues. That was part of the reason that the Beef Industry Food Safety Council (BIFSCo) was formed in 1997. BIFSCo quickly became a driving force to bring together all facets of the beef industry to address food safety issues. Funded by beef producers with checkoff dollars, the Beef Industry Food Safety Council brings together representatives from all sectors of the beef industry—including cow/calf producers, feedlot operators, packers, processors, retailers and foodservice operators—to battle the industry's most complex food safety issues together.

The Beef Industry Safety Summit

In April of 2005, representatives from all industry segments met in Orlando, Fla. to continue work that had begun two years earlier at the *E. coli* Summit. At that first meeting in 2003, industry leaders developed best practices to deal with *E. coli* and other food safety issues. Based on current estimates, more than 90 percent of slaughter facilities and more than 80 percent of ground beef processed in the U.S. is done so using those best practices recommendations.

"They worked together to create a unified *E. coli* O157:H7 battle plan that ensures each sector in the production chain is employing proven production practices and technologies to best serve the next link in the chain, with the united goal of putting safe food on America's tables," noted Terry Stokes, chief executive officer of the National Cattlemen's Beef Association, about the 2003 *E. coli* Summit.

During her keynote address at the 2005 Beef Industry Safety Summit, Dr. Elsa Murano, former under secretary for food safety, U.S. Department of Agriculture and the current vice chancellor and dean of agriculture and life sciences at Texas A&M University and director of the Texas Agricultural Experiment Station, asked the participants, "How would you like the headlines to read 'Another year without an *E. coli* outbreak' or 'Another year without a major meat recall?'"

Murano applauded the industry's proactive efforts to address food safety issues, and said "You make food safe. It's not the government—it's you. The bottom line is that we need to continue to be proactive."

Breakout Group Reports

Since the early nineties, the beef industry's approach to food safety evolved to incorporate a better understanding of the risk factors, as well as a more unified approach to addressing those threats. Before it reaches a consumer's plate, beef follows a food chain that encompasses several industry segments. That food chain begins on a farm or ranch and continues to the retail or foodservice outlet that interfaces directly with consumers.

During the 2005 Beef Industry Safety Summit, industry stakeholders came together to review progress, revise the best practices developed in 2003 and identify future challenges and knowledge gaps. As in 2003, each sector broke into working groups to accomplish the following tasks:

- Review best practices documents
- Discuss new technologies and interventions that have become available since 2003
- Develop a list of research needs

Industry Best Practices

Best Practices for each sector of the beef industry were first developed at the 2003 *E. coli* Summit and represent recommendations based on the most current research available. These are designed to be dynamic documents, subject to continual updates based on input from leading experts in beef safety. To access copies of the Best Practices for each sector, visit the Beef Industry Food Safety Council's Website at www.bifsco.org, as well as other trade association sites. Input about these documents is appreciated and the panel of experts that drafted them is available to answer any questions users may have.

Group Leaders

PRODUCTION
Duane Theuninck and Roger West

HARVEST/FABRICATION
Warren Mirtsching and Rod Bowling

PROCESSING
Tim Biela and Dane Bernard

RETAIL
Molly McAdams and Gale Prince

FOODSERVICE
Rob Cannell and Nick Nickelson

Production Working Group

Food safety interventions at the farm and ranch level are a relatively new concept, however recent research brought to light several promising interventions for the production sector such as a vaccine for the reduction of *E. coli* O157:H7 or feeding cattle antimicrobials to reduce *E. coli* shedding rates. A lack of baseline data and commercially available interventions complicates the present ability for producers to effectively address pathogen reduction. The production group focused primarily on the need for more research, which in turn should help develop more effective best practices recommendations for this sector.

Key Learnings

- Holistic, system-wide approach crucial to success
- While progress has been made in better understanding *E. coli* O157:H7 and other pathogens at the pre-harvest level, significant research gaps still exist that prevent developing widespread recommendations for best practices for producers.

Best Practices Review

- The current best-practices document should be rewritten to include the following points:
  - Develop best practices that are all-encompassing and address other pathogens in addition to *E. coli* O157:H7
  - Focus on the producer audience
  - Directly address best practices, or lack thereof

Research Needs

- Increase research efforts to address pathogens other than *E. coli* O157:H7
- Determine current status of market beef and dairy cows and bulls. Limited research indicates *E. coli* incidence may be higher on market beef and dairy cows and bulls
- Develop better understanding of pathogen loads and reduction of those loads versus prevalence for all segments of production
- Develop economically viable enumeration techniques
- Research shedding rates on live animals, and the relationship between pathogen loads, and seasonality, geographic locations and other environmental factors
- Determine current baseline and what level is an appropriate pathogen load on cattle entering slaughter facilities to provide achievable "targets" for other sectors. The production segment needs a quantitative "deliverable" before any progress can be made.
- Determine the economic value of reduction in *E. coli* loads, including a cost/benefit ratio to help evaluate interventions, especially at the processing level.

Harvest Working Group

The nature of the beef production cycle has dictated that the harvest and slaughter phase was the first segment of beef production targeted for reducing bacterial contamination. Over the years, industry-driven and checkoff funded research has developed an arsenal of intervention methods that have been applied in a multiple-hurdle approach leading to significant progress in reducing the risk of foodborne illness.

Key Learnings

- Work should continue to develop new and better intervention and decontamination methods, however it is important to also take these efforts further back into the production cycle so as not to overwhelm existing technologies at the harvest level and to reduce the probability of carcass contamination at slaughter.

Best Practices Review

The current Best Practices for Slaughter should be revised to include the following changes and additions:

- Insert existing Best Practices for Specified Risk Material Removal (SRM) document[1] as appendix
- Insert appropriate statutes as appendix[2]
- Insert Decontamination Interventions for Carcass as appendix
- Information in the current best practices for slaughter document needs to be updated to reflect current knowledge for the following areas:
  - Training
  - Carcass mapping
  - Statistical process control
  - Hide washing
  - Rotating equipment
  - Pre-evisceration wash
  - Carcass split saws
  - Cold chain management

Research Needs

- Conduct comparative analyses of interventions such as hot versus cold treatments, as well as all surface treatments.
- Examine effectiveness of head washing
- Research the effectiveness of multiple interventions at the preharvest level
- Examine split saw engineering and appropriate water temperatures and cleaning methods
- Conduct a *Salmonella* Newport baseline study to determine current levels
- Examine other methods of using irradiation including applying it to hide-on carcasses

1 *Best Practices for Removal of SRM*

2 *CFR Part 309 and CFR Part 310*

3 *This document was reviewed in conjunction with the Foodservice Working Group.*

Best Practices Review

Pathogen Control During Tenderizing/Enhancing of Whole Muscle Cuts[3] – The current Best Practices for Pathogen Control During Tenderizing/Enhancing of Whole Muscle Cuts (non-intact products) should be revised to include the following changes and additions:

- Remove Appendix A, Food and Drug Administration, Department of Health and Human Services, Current Good Manufacturing Practice in Manufacturing, Packing, or Holding Human Food (21 CFR Part 110)
- Update list of intervention methods to include most current developments

Processing Working Group

Supplier integrity is key for processors procuring product, however this segment of the beef production cycle has also implemented several intervention measures of its own and has employed testing procedures to ensure that any potentially contaminated product does not reach consumers. The processing group primarily addressed the need for more clarification in the existing Best Practices for Raw Ground Products, especially for lotting and sub-lotting of products.

Key Learnings

- Adequate documentation can help alleviate potential losses due to recalls
- Labeling and packaging should reflect other challenges beyond foodborne pathogens such as allergens and food tampering

Best Practices Review

- Explain lotting and sub-lotting of finished products, and its potential to decrease production loss in the event of a contamination issue. The existing USDA definition for a lot, when there is a positive result for *E. coli* O157:H7, is from "full sanitation to full sanitation." The processing group added language that explained how proper documentation and controls may allow products to be sub-lotted, thus avoiding the potential loss of an entire day's production in the event of an *E. coli* O157:H7 positive sample or other potential contaminant
- Clarify the definitions of *product* versus *raw material*
- Add information on implementing test and hold programs
- Address facility and food security, including the addition of tamper-evident packaging
- Label finished products that contain allergens appropriately

Research Needs

- Develop better sampling and testing programs for raw materials and finished products

Retail Working Group

Communicating the availability of the best practices document and other food safety information and interventions was an overriding theme for the retail group. As an interface with end-users, the retail group also emphasized the need to adequately communicate with consumers their role in ensuring the safety of beef products through proper handling and cooking.

Key Learnings

- Communication, both with consumers and retailers, especially smaller, independent outlets, is extremely important in widespread adoption of best practices philosophies.
- Consideration of the end-user of the best practices document should assure that it is pertinent to a wide variety of operations and users.

> **"Consumers expect beef to be safe. Not a little safe, but completely safe and so we as beef producers need to contribute to the safety of that product."**
>
> *Roger West, cattle producer, Florida*

- Retail segment needs to be open to applying new technologies and interventions.
- Collaborate with other groups, such as retail and consumer organizations, as well as government, to leverage education programs and also establish how these efforts can or should be included in best practices documents

Best Practices Review

- Several refinements and clarifications were made to the existing document to make it more user-friendly
- Suggested that an advisory panel be formed to offer expertise and help smaller, independent retailers implement best practices in-store
- Determine the best methods to communicate best practices documents to the various audiences and develop tools, such as the following, to do so:
  - Reference guide
  - Flow charts/examples
  - Pocket cards
  - Back room poster
  - Work with professional and trade associations

- Translate materials
- Web-based tutorial system
- Use suppliers as thought leaders
- Extension service for dissemination

- Future best practices revisions should consider whether consumer education should have its own separate working group

Research Needs

- Scientific Research Needs
  - Review efficacy of alternative technologies to enhance ground beef, e.g. application of high-pressure technology, irradiation, etc.
  - Investigate use of processing aids to minimize or control pathogens in ground beef
  - Review equipment innovation and technology to enhance cleaning and sanitation
  - Investigate new technologies that will assist in product trace-back from retail package to source or origin
- Consumer Research Needs
  - Investigate the efficacy and delivery of consumer education on proper handling and preparation of ground beef
- Retailer Research Needs
  - Conduct retailer survey to understand how best practices can be most effectively communicated to and implemented by employees to ensure unified food safety messages

Foodservice Working Group

During its discussion, the foodservice group sought to make the best practices document reflect minimum recommendations for current regulations as outlined in the Food and Drug Administration's Food Code *(http://vm.cfsan.fda.gov/~dms/foodcode.html)*. The overriding objective of this breakout session was to maintain and enhance consumer confidence in beef products for consumers purchasing meals away from home.

Key Learnings

- Important to align the best practices document to make it consistent with the Food Code, as well as any additional or local regulations that are more stringent than the federal Food Code

Best Practices Review

- Personnel section should include components for manager food safety training and a demonstrated knowledge of regulatory requirements and HACCP principles
- Employee food safety training should be documented, conducted at regular intervals, monitored for performance and consistently applied
- Restaurants should employ Standard Operating Procedures (SOPs) for the following areas:
  - Facility sanitation (pre-operational and operational)
  - Sanitation equipment (dishwashers or 3-compartment sinks)
  - Employee cleanliness and hygiene, including hand washing, the use of gloves, etc.
  - Employee health
  - Implementation of a HACCP plan
- Best practices for food receiving, such as pre-approved suppliers, cold-chain integrity and packaging integrity should be adhered to
- Best practices included recommendations for food storage including product rotation, storage temperatures and thawing recommendations
- Cooking equipment should be maintained and calibrated and performance validated at least daily
- When cooking product, internal temperatures should be monitored and verified as specified. Preparation times and temperatures used should comply with the Food Code, however provisions for "guest choice" food preparation should not be interpreted as lack of adherence to best practices recommendations.
- Recommendations for hot holding, cooling for later use and reheating should all comply with the Food Code
- Cross-contamination control recommendations should include:
  - Storage
  - Handling
  - Preparation
  - Equipment
- Supplier approval recommendations should be in accordance with company's quality and food safety standards, and meet or exceed best practices for harvest and processing
- Supplier audits should also include periodic specification updates with supplier acknowledgement, provisions for noncompliance, and microbial performance standards
- Depending on risk assessment of product, data should be collected and tracked on items such as microbial profile data, foreign objects, defects, audit results, product age, receiving temperature, etc.
- Suppliers must have an adequate traceability and recall program that is tested for performance
- Documented food safety training programs must be established for employees at supplier level

Research Needs

- Perform cooking tests on inoculated, tenderized product to determine if recommended cooking temperatures are adequate for eliminating any risks of foodborne illness. Research should be done, so as to separate needle/blade tenderized product from product enhanced with a brine solution
- Research food safety risks of recirculated brine from enhanced products
- Develop better cooking recommendations for time and temperature for all pathogens
- Research heat resistance of MDR *Salmonella* Newport and other Shiga-toxin *E. coli*

Progress is a continual process

Science is always advancing current knowledge and creating better ways to address existing challenges. A large part of the Beef Industry Safety Summit was spent updating participants on recently conducted research and its implications for a review of the Best Management Practices documents. The research updates were focused on the production and harvest sectors. Following are brief summaries for several of the presentations made:

Production

- *Impact of Transportation of Feedlot Cattle to the Harvest Facility on the Prevalence of E. coli O157:H7 and Salmonella spp.—A.L. Reicks, M.M. Brashears, K.D. Adams and M.F. Miller.*
  - A study analyzing the effect of clean versus uncleaned cattle trailers found that trailer condition did not affect the prevalence of *Salmonella* spp. and *E. coli* O157:H7
  - Increases in pathogen loads have been demonstrated in past research after cattle were transported, however this study demonstrates that there may be other sources for the increased levels
- *Neomycin as a Potential Pre-Harvest Intervention for E. coli O157:H7. G.H. Loneragan and M.M. Brashears*
  - Neomycin sulfate is an aminoglycoside broad-spectrum antimicrobial drug.
  - Neomycin was demonstrated to be highly effective at reducing prevalence of *E. coli* O157:H7, however it is not approved as an intervention by the Food and Drug Administration (FDA)
  - Administration of neomycin increased the presence of antibiotic resistant bacteria
  - Merit of using Neomycin needs to be examined further in order to quantify the public benefit versus the public health risk
- *Can Vaccination Reduce the Probability that Feedlot Cattle Shed Escherichia coli O157:H7?—D.R. Smith*
  - Commercial vaccine administered to feedlot cattle during the summer months, which is the peak shedding period for *E. coli* O157:H7, reduced shedding rates to levels similar to those found during the winter months
  - Vaccinating a majority of cattle within a pen offered a significant protective effect to non-vaccinated cattle within the same pen (evidence of herd immunity)
  - Increased doses (up to three) also improved vaccine efficacy
- *Vaccine as an Intervention Strategy for Reduction of Escherichia coli O157:H7 in Cattle Feces.—W.T. Choat, J.A. Paterson, B.M. Rainey, K.E. Belk and G.C. Smith.*
  - At harvest, all vaccinated groups of feedlot cattle had elevated titer levels compared to non-vaccinated controls, however vaccination did not appear to affect shedding rates
- *Reduction of E. coli O157:H7 in Beef Cattle using Direct-Fed Microbials—Eight Year Research Summary.—M.M. Brashears and G.H. Loneragan.*
  - Repeated research, including independently conducted studies, has shown significant reduction of *E. coli* O157:H7 in the feces and on the hides of beef feedlot cattle as a result of feeding direct-fed microbials
- *Determination of a Sodium Chlorate Dose that Results in Safe Concentrations of Tissue Residues in Beef Cattle D.J. Smith, C. Oliver, J.S. Caton and R. Anderson.*
  - Sodium chlorate when used as a pre-harvest intervention technique eliminates *E. coli* O157:H7, *Salmonella Typhimurium*, and *Clostridium* sp. from the gastrointestinal tracts of food animals
  - Concern exists about harmful residues, however this study demonstrated, when administered interruminally, chlorate residues were well below FDA provisional safe tissue concentration for edible tissues and chlorite residues were not detectible in any sampled tissue

Harvest

- *Decontamination of Beef Cuts Intended for Blade/Needle or Moisture-Enhancement Tenderization by Surface Trimming vs. Rinsing with Sanitizing Solutions—J.A. Scanga, B.A. Carlson, K.E. Belk, J.N. Sofos and G.C. Smith*
  - Investigated efficacy of six antimicrobial interventions to reduce risk of transferring *E. coli* O157:H7 from the exterior to interior of cuts during blade-tenderization or moisture-enhancement
  - Interventions reduced prevalence of *E. coli* O157:H7 on exterior of inoculated subprimals to the degree that transference to the interior during needle tenderization or moisture enhancement was minimal
- *Further Study of Hide-On Carcass Washing to Identify Alternative Chemicals/Conditions for Lowering Microbial Loads on Incoming Slaughter Cattle—J.A. Scanga, B.A. Carlson, K.E. Belk, J.N. Sofos and G.C. Smith*
  - Various chemicals and conditions were applied in 1) a lab setting, 2) simulated slaughter facility and 3) under commercial conditions

In addition to these presentations, participants in the Harvest Working Group also heard updates on the use of double hot water carcass rinses, microbiological mapping and carcass irradiation, as well as the use of a decontaminant on subprimals.

Emerging Issues

Staying abreast of new challenges will help the beef industry more adequately deal with future food safety issues. To help accomplish that goal, the Beef Industry Safety Summit hosted a forum on emerging issues of importance to all stakeholders in the beef production chain.

Regulatory Update

Dr. Sean Altekruse,
Food Safety Inspection Service,
U.S. Department of Agriculture

Background

Government oversight of food production greatly influences how the beef industry addresses food safety issues. Current areas of focus were outlined for summit participants.

Summary

Recently announced reductions in illnesses from *E. coli* O157:H7, *Listeria monocytogenes* and other foodborne bacteria have highlighted the need to more aggressively address *Salmonella* incidence rates.

- Of all the *Salmonella* serotypes, *Salmonella* Newport is the only one that shows an increase in incidence, a fact that could have ramifications for human health due to concerns about antibiotic resistance.
- *Salmonella* spp. incidence in all slaughter classes has declined from a level of 11 percent in 1998 to four percent in 2003. Within slaughter classes, there has been an increase of *Salmonella* incidence in poultry, which has resulted in a shift in the Food Safety Inspection Service's (FSIS) oversight emphasis. That direction will continue as long as FSIS is seeing progress in other slaughter classes.

Other regulatory issues of importance to the beef industry include:

- Security related directives
- Number of recalls due to allergens
- *L. monocytogenes* and the role of risk-based verification
- Recent data released by the Centers for Disease Control and Surveillance (CDC) show decreases in illness due to *E. coli* O157:H7
- Antimicrobial resistance
- Increased FSIS focus on poultry products
- Contamination in blade tenderized beef

Multi-drug Resistant Salmonella

Dr. Paula Fedorka-Cray,
Agricultural Research Service,
U.S. Department of Agriculture

Background

Antibiotics represent a powerful tool to maintain both human and animal health. The emergence of multi-drug resistant bacteria will continue to grow as an issue of importance for the food industry because of bacteria's ability to quickly evolve. The proliferation of multi-drug resistant bacteria also has potential ramifications for the future use of existing antibiotic technologies.

Summary

The definition of multi-drug resistance differs among agencies and health officials. The Centers for Disease Control and Surveillance (CDC) define it as resistance to two or more antimicrobials, while public health officials commonly define it as resistance to five or more antimicrobials.

There are four mechanisms of antimicrobial resistance:

- Drug inactivation
- Target inactivation
- Permeability alteration (cell surface changes)
- Active efflux

There are 254 known *Salmonella* serotypes[4], but the top 25 account for 83.5 percent of the total incidence. Unfortunately, existing data collection systems have inherent limitations for identifying and tracking serotypes. For example, the National Antibiotic Resistance System, which has information going back to 1996, does not always clarify if data were collected from beef or dairy sources. However, what is apparent is that the percentage of multi-drug resistant *Salmonella* Newport has increased from 12.5 percent in 1998 to 84.0 percent in 2003.

Future analysis of antimicrobial resistant bacteria should address the following:

- Resolve the definition of multi-drug resistance
- Acknowledge serotype instability
- Account for time to isolate and serotype

Listeria moncytogenes

Dr. Nick Nickelson,
Standard Meat Company

Background

Listeria monocytogenes is a gram-positive, non-spore forming rod bacteria that manifests itself in ready to eat (RTE) products. It does not cause typical clinical foodborne illness symptoms, but rather sufferers exhibit flulike symptoms eight to 10 days after consuming contaminated product. This delay in the onset of clinical symptoms makes it harder to track an outbreak. There are not as many cases of foodborne illness due to *L. monocytogenes* compared to other pathogens, but once clinical

4 *Data sources include farm, slaughter and diagnostic records.*

symptoms do develop, fatalities occur at an estimated rate of 20 percent.

In 2003, FSIS significantly enhanced its oversight of establishments producing ready-to-eat products through an interim final rule for the control of *Listeria monocytogenes*. Recalls due to *L. monocytogenes* were down in 2003. Additionally, there were no human illness outbreaks in 2003. The U.S. government set a goal of 2.5 cases of *L. monocytogenes* per 100,000 individuals by 2010, and the food industry has already come close to achieving that benchmark, as the current rate is 2.7 cases per 100,000.

Nickelson summarized a recently completed study funded through checkoff dollars that had a twofold goal:

- Identify critical points of entry for *L. monocytogenes* in RTE processing facilities and evaluate and compare the ribotypes of the confirmed samples and identify methods of controlling the environment to prevent contamination
- Based on the baseline date collected in the first phase, develop and implement corrective actions and evaluate their effectiveness

Summary

Based on previous research and the current study, industry and RTE processing facilities should adopt the following practices:

- Prevent contamination through an aggressive "search and destroy" operation
- Prevent growth through proper temperature control and/or listeriostatic strategies
- Prevent foodborne listeriosis through science-based education

Dioxins

Dr. Janice Huwe,
Agricultural Research Service,
U.S. Department of Agriculture,
Biosciences Research Laboratory

"The past two years, the effort that we've seen from the entire industry has been very telling. It's shown that if we have a specific goal and there's a challenge laid out and everyone is working together to accomplish that goal, together we can do it. Separately, it would have been impossible."

Molly McAdams, director of business development, HEB Grocery Co.

Background

First recognized in 1970, dioxins are typically a product of combustion and are a result of both natural events such as forest fires or industrial practices. Chemically, these compounds are referred to as polyhalogenated aromatic hydrocarbons, but are commonly referred to as dioxins. Toxic equivalency factors (TEF) are used to measure the relative concern of polyhalogenated aromatic hydrocarbons that are structurally related. The TEF of a compound is based on a comparison to the most toxic of the polyhalogenated aromatic hydrocarbons.

For humans, exposure typically occurs from the diet, with 90 percent coming from animal food sources. When levels exist that are acutely toxic, patients will suffer from weight loss, thymic atrophy and chloracne, a condition that gained international attention with the intentional poisoning of Russian politician Victor Yuschenko. At chronically toxic levels, dioxins can lead to diabetes, have reproductive, immune and developmental effects, and can contribute to certain types of cancers.

When consumed by animals, dioxins are stored in fat. In a Survey of Dioxins in the U.S. Meat and Poultry Supply (2002-2003), beef cattle had the highest toxic equivalency. Even though the levels were miniscule for all sources, the fact that the figures were highest for beef should be noted. One potential source of dioxin in cattle is through wood treated with pentachlorophenol, which acts as a wood preservative.

Summary

Research is ongoing to further identify sources and to account for the amount of these compounds which are found in the environment versus those that are produced by industry. The Environmental Protection Agency (EPA) compiled a dioxin risk assessment in the 1990s, which is currently under review by the National Academy of Sciences.

Future research for beef animals should address:

- Inputs to beef and their potential contribution to higher dioxin levels
- Pharmacokinetic data including rate of absorption, distribution, metabolism and excretion
- Effect of leanness enhancing agents
- Effects of gender
- Survey of dioxin levels in meat and poultry

> **"The investment of checkoff dollars has been a big, big part in getting beef safety and this whole industry on the right track to success."**
>
> *Al Svajgr, chairman, Cattlemen's Beef Board*

Johne's Disease

Mark Klassen,
Beef Information Centre

Background

Johne's Disease, a malady of cattle, has potential implications for human health as some researchers believe that *Mycobacterium Avium Subspecies Paratuberculosis* (MAP), the causative organism of Johne's disease in cattle, causes Crohn's disease in humans.

According to 1996 U.S. Department of Agriculture data, approximately 22 percent of the national dairy herd is infected with Johne's, while approximately eight percent of the U.S. beef herd is affected.

In the U.S. and Canada, approximately 500,000 people suffer from Crohn's Disease, which manifests itself through chronic intestinal inflammation leading to chronic diarrhea and weight loss. The disease's initial onset typically occurs when individuals are between 15 and 21 years. Crohn's is a lifelong disease which shortens an individual's lifespan slightly. Mortality rates vary from two to four percent.

Commonly known as the MAP Hypothesis, the idea that Johne's and Crohn's are related was first introduced in 1905 by United Kingdom surgeon Dalziel. The organism is difficult to culture, which makes it harder to establish the connection. Advocates of the MAP Hypothesis believe consumption of contaminated food or water with a cell wall deficient form of the bacteria causes Crohn's Disease in susceptible people. For dairy products, standard pasteurization methods, which were originally created to destroy Mycobacterium Tuberculosis Complex, show mixed results in destroying *Mycobacterium Paratuberculosis* according to laboratory studies.

For beef products, fecal contamination appears to be the most likely route of exposure, based on current research. Research also indicates that MAP in edible tissues could occur in systemically infected animals. The presence of MAP is not a potential concern, unless the bacteria survive cooking.

Summary

Challenges in establishing a connection between Crohn's and Johne's:

- Working with MAP is very time consuming and very expensive, and there are only a few properly qualified scientists to do the research.
- Investigative methods for meat must be developed as almost no published literature exists.
- Based on current level of knowledge, research community probably needs at least two to five years to develop solid answers to the basic questions about a possible connection between Johne's and Crohn's Diseases.

Foot and Mouth Disease (FMD) Preparedness

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Background

Foot-and-mouth disease (FMD) is a severe, highly communicable viral disease of cattle and swine. It also affects sheep, goats, deer, and other cloven-hooved ruminants. The United States has been free of FMD since 1929. Characterized by fever and blister-like lesions followed by erosions on the tongue and lips, in the mouth, on the teats, and between the hooves, FMD causes severe losses in the production of meat and milk. Animals may survive exposure to FMD, but they are usually severely debilitated.

Because it spreads widely and rapidly and because it has grave economic as well as clinical consequences, FMD preparedness has taken on added importance with the growing threat of agroterrorism.

Government and industry have heightened their awareness and efforts at addressing not only food safety issues, but also food security. Since the release of the Homeland Security Presidential Directives (HSPD), risk management approaches have been implemented by the federal government. There are 10 areas of focus, including protection of U.S. agriculture and food.

Summary

Government preparedness efforts have identified the following areas as priorities in addressing any risks due to FMD:

- Key focus is prevention, and then mitigation.
- HACCP principles are being applied to address the risk of a Foot and Mouth Disease outbreak.
- The National Identification System (NAIS) is a key priority in preparing for agroterrorism events, especially in the case of an introduced foreign animal disease, such as FMD.

For more information contact:

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