



2006



*Beef
Industry
Safety
Summit*

EXECUTIVE SUMMARY
BEEF INDUSTRY FOOD SAFETY COUNCIL





Introduction

The first Beef Industry Safety Summit in 2003 was devoted exclusively to addressing the threat of E. coli O157:H7. That effort has already created landmark results. In his keynote address during the 2006 Beef Industry Safety Summit, U.S. Department of Agriculture (USDA) Undersecretary for Food Safety, Dr. Richard Raymond, emphasized the progress that had been made by the beef industry in reducing the threat of E. coli O157:H7. The Food Safety Inspection Service (FSIS) announced in April, that during the 2005 calendar year, just 0.173 percent of ground beef samples tested positive for E. coli O157:H7, which is similar to the 2004 level of 0.175 percent. The Food Safety Inspection Service sampling program began in 1994 to estimate the prevalence of certain pathogens in raw and ready-to-eat meat and poultry products. In 2005, FSIS collected nearly 11,000 samples and only found 19 to be positive for E. coli O157:H7.

Declines in human illness due to E. coli O157:H7 closely parallel the lower incidence in ground beef samples. According to FoodNet data released by the Centers for Disease Control and Prevention (CDC) in April of 2006, there were only 1.06 cases per 100,000 people. Overall there has been a 29 percent reduction human illness due to E. coli O157:H7 in the last 10 years. The declining trend in both the number of positive meat samples and human illness from E. coli O157:H7 are due in part to research funded through the Beef Checkoff Program. America's beef producers have supported countless research projects that have either developed or validated interventions that have been applied in commercial operations throughout the beef production chain.

“Industry, FSIS, and food handlers are all collectively doing a good job,” said Raymond during his address. “The U.S. Department of Agriculture truly does appreciate all of your efforts. The strong system that is in place is in large part due to your work.”

2006 marked the third year that all sectors of the beef industry have come together to address beef safety. While the goal of providing the safest and most wholesome product possible has not changed, some of the topics and emerging issues have changed in that short period of time.

This year’s effort built upon past successes and participants had an opportunity to develop strategies to deal with emerging issues. The 2006 Beef Industry Safety Summit included updates on recent research in beef safety with an emphasis on pre-harvest interventions; an opportunity for the production, harvest, processing, retail and foodservice sectors to revise existing best practices documents; and an issues forum to highlight emerging challenges.

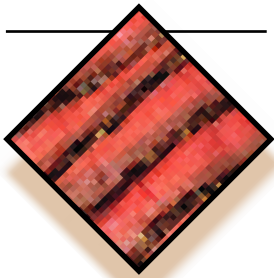
“This is an opportunity to build relationships, and is one of the only forums where we can talk openly about beef safety issues concerning producers, processors, retailers, and foodservice operators,” said Warren Mirtsching, vice president, food safety and quality for Swift & Company. “I challenge you to name a better forum where we can openly share knowledge based on science.”

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Beef Safety Research Results



Since 1993, beef producers have invested more than \$22 million in safety research. During the 2006 Beef Industry Safety Summit, participants had an opportunity to hear updates on recently conducted projects. Much of the recent research has largely focused on pre-harvest interventions, however scientists also continue to address beef safety issues in the harvest, processing, distribution and end-user sectors. Collaborative input in a non-competitive environment allowed meeting participants to openly discuss research results and future areas of focus.

Presenter: Keith Belk, Ph.D., Colorado State University

Project: *Molecular characterization of Escherichia coli O157:H7 hide contamination routes—feedlot to harvest floor*

Objective: Characterize how pathogenic *E. coli* is transmitted from the production level to harvest facilities.

Results: Virulent *E. coli* O157:H7 was recovered from all sample collection sites, except the feed and feed bunks. Slightly more than one percent (130/1,165) of all of the samples were positive for *E. coli* O157:H7, which indicated a relatively low prevalence. In total, 322 *E. coli* O157:H7 isolates were collected from the 130 positive samples. Molecular characterizations demonstrated that isolates recovered from the hides of cattle at harvest were genetically related to isolates recovered from feedlot pen floors, trailers, pen water and from the hides and colons of other animals. The molecular characterizations help researchers understand the origin of the pathogenic bacteria and will aid in developing more effective pre-harvest interventions.

Project: *Supplementation of feedlot cattle with octanoic acid to reduce prevalence of Escherichia coli O157:H7*

Objective: Determine effectiveness of supplementing octanoic acid (0.70 percent of diet) as a pre-harvest intervention in feedlot cattle.

Results: In this trial, there was no reduction in *E. coli* O157:H7 prevalence in fecal samples due to treatment. Octanoic acid was not delivered to the lower colon, which would be required to make it an effective pre-harvest intervention. Rather, the supplement was probably metabolized in the small intestine. The researchers concluded that octanoic acid is not a likely candidate for pre-harvest food safety due to the cost of developing and implementing effective delivery strategies.

Project: *Further study of hide-on carcass washing to identify alternative chemicals/conditions for lowering microbial loads on incoming slaughter cattle*

Objective: Identify and evaluate alternative chemicals and conditions that effectively reduce *E. coli* O157:H7 on cattle hides in simulated and commercial harvest operation conditions.

Results: For the most part, the various chemicals reduced *E. coli* O157:H7 more than just rinsing with water alone, however reductions did not vary to any significant degree among the chemical applications. Washing cattle with a chemical disinfectant prior to entering a slaughter facility has the potential to lessen pathogen loads, thus reducing the potential for contamination during hide removal. Pre-harvest strategies such as hide-on carcass washing can be applied in conjunction with other interventions throughout the harvesting process in a multiple hurdle approach to further reduce risks associated with pathogenic bacteria (Table 1).

TABLE 1

*Reduction of *E. coli* O157:H7 after a seven-second sanitizer application followed by a seven-second water spray.*

REDUCTIONS (LOG CFU/100 CM²)

TREATMENT	APC		TCC		ECC	
	HIGH	LOW	HIGH	LOW	HIGH	LOW
<i>Water</i>	1.1 ^{ab}	0.9 ^b	0.9 ^b	0.5 ^b	1.1 ^b	1.0 ^b
<i>10% Acetic Acid</i>	2.8 ^a	2.2 ^{ab}	2.7 ^a	2.7 ^a	2.6 ^a	2.8 ^a
<i>10% Lactic Acid</i>	2.2 ^a	2.7 ^a	2.6 ^a	2.9 ^a	2.7 ^a	2.8 ^a
<i>3% Sodium Hydroxide</i>	2.0 ^a	1.8 ^b	2.9 ^a	2.8 ^a	2.8 ^a	2.8 ^a
<i>4% Sodium Metascilicate</i>	1.8 ^{ab}	2.2 ^{ab}	2.1 ^{ab}	2.9 ^a	2.2 ^a	2.9 ^a
<i>Sodium Hydroxide and Lactic Acid</i>	2.2 ^a	1.9 ^{ab}	2.7 ^a	2.9 ^a	2.7 ^a	2.9 ^a

^{ab} Means with a column lacking common superscript letters differ ($P < 0.05$)

Project: Decontamination of beef cuts intended for blade/needle or moisture-enhancement tenderization by surface trimming versus rinsing with sanitizing solutions

Objective: Investigate the efficacy of six antimicrobial interventions at minimizing the risk of transferring *Escherichia coli* O157:H7 from the exterior to the interior of cuts during blade-tenderization or moisture-enhancement (non-intact beef).

Results: In this study, little to no *E. coli* O157:H7 was transferred to the internal surface of outside-round pieces following the application of the antimicrobial agents. The results indicated that all of the antimicrobial treatments would aid in reducing the risk of foodborne illness from non-intact beef products.

Presenter: T.G. Nagaraja, Ph.D., Kansas State University

Project: Prevalence sampling to improve understanding of the natural ecology of *E. coli* O157:H7

Objective: Develop and validate methods for *E. coli* O157:H7 detection in cattle feces and environmental samples.

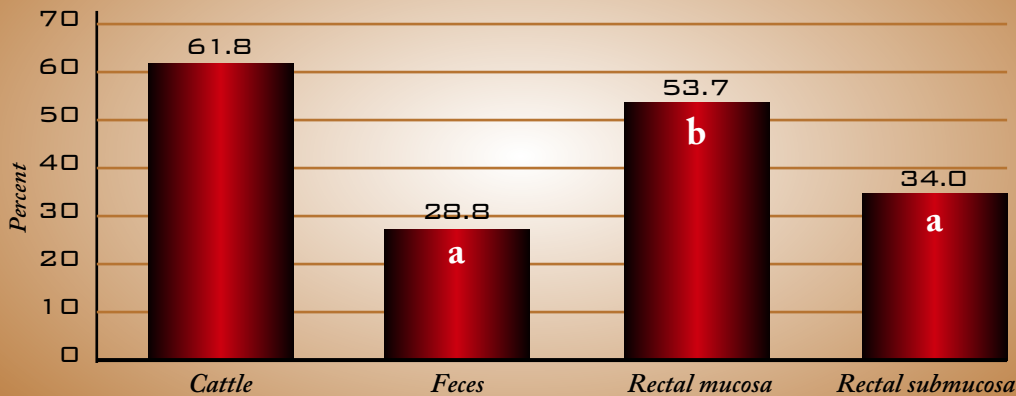
Results: In examining the prevalence in the gastrointestinal tract of cattle, researchers found that nine percent of all animals were positive for *E. coli* O157:H7 in the cecum/colon/rectum region. It was also found that prevalence in the rectum was positively associated with prevalence in the rumen (Figure 1).



FIGURE 1

Prevalence of E. coli O157 in the rectoanal mucosal region (RAMS).

(N=374)



^{ab} Prevalence differs ($P < 0.05$)

One of the biggest challenges to develop effective pre-harvest intervention measures is a lack of information about the prevalence of *E. coli* O157:H7 in cattle. Projects like this will help expand the basis of knowledge, as well as the ability to develop more effective pre-harvest intervention methods.

Project: *Prevalence sampling to better understand E. coli O157:H7's distribution in feedlots*

Objective: *Determine prevalence and distribution of genetic strains of E. coli O157 in a feedlot.*

Results: Fecal and environmental samples were collected prior to and after the arrival of cattle in a feedlot. After the arrival of the cattle, the researchers found the emergence of a new strain of *E. coli* based on pulse field gel electrophoresis (PFGE). This strain became predominant in the feedlot environment and showed evidence of increased diversity over time. This research demonstrates *E. coli* O157:H7's ability to adapt and change. The findings also underscore the importance of continued research to better understand the prevalence of *E. coli* O157:H7 in production environments.

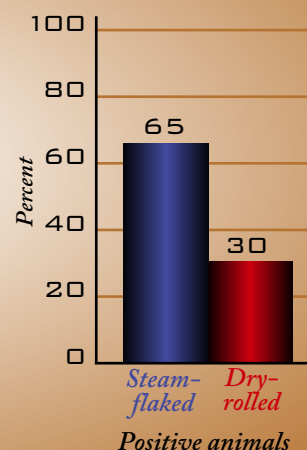
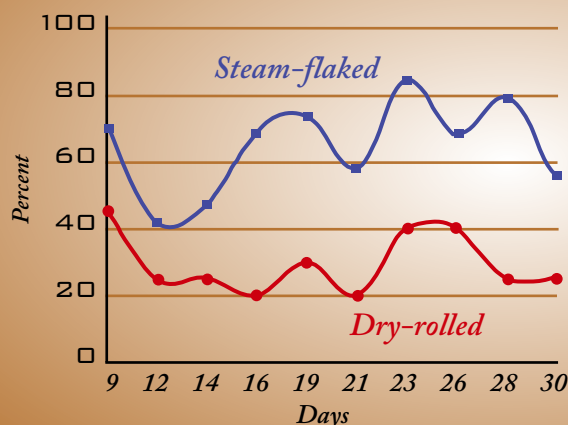
Project: *Feed rations as a means to reduce pathogen loads in feedlot cattle*

Objective: *Examine the effect of different feed rations on reducing the prevalence of E. coli O157:H7.*

FIGURE 2

The effect of grain processing on E. coli O157:H7 prevalence in feedlot cattle.

($P < 0.01$)



Results: Since the hindgut is the major site of pathogen colonization, diets that influence the ecology of the hindgut will potentially have an effect on the ability of *E. coli* O157:H7 to survive and colonize. Changes to a feed ration can serve as a means to decrease *E. coli* O157:H7 shedding in feces. In this project, researchers compared steam-flaked and dry-rolled corn rations. The prevalence of *E. coli* O157:H7 positives was much lower for cattle fed

the dry-rolled ration. Results from this project support other research that modifications to feeding rations can reduce pathogen shedding rates and might serve as a cost-effective pre-harvest intervention (Figure 2).

Mohammad Koohmaraie, Ph.D., U.S. Meat Animal Research Center (MARC)

Project: *Prevalence of E. coli O157:H7 in feedlots*

Objective: 1) Determine the prevalence of *E. coli* O157:H7 on the hides and in the feces of feedlot cattle in adjacent pens over time, and 2) determine or estimate the number of cattle shedding *E. coli* O157:H7 that are necessary to contaminate the hides of over 50 percent of the animals in the pen.

Results: This study demonstrated that large variations in prevalence rates of *E. coli* O157:H7 may exist between neighboring feedlot pens. Additionally, large fluctuations in hide and fecal prevalence rates can occur within a pen in a short span of time, as exemplified by the increase in hide prevalence from 3 percent to 94 percent in only a two-week period. Animals shedding *E. coli* O157:H7 at high levels in their feces greatly affects the hide prevalence within a pen. One pen containing only two fecal-positive animals, one shedding at a high level, had a hide prevalence rate of 84 percent. Transport and lairage at the processing plant also led to large increases in hide prevalence of *E. coli* O157:H7.

Project: *Contamination of beef cattle hides with E. coli O157:H7 during transportation*

Objective: To determine the prevalence of *E. coli* O157:H7 on the hides of cattle after transportation. Pulse-field gel electrophoresis (PFGE) fingerprinting was used to match the *E. coli* O157:H7 isolates from hides with those of feces. This analysis will allow, within the limits of PFGE, determination of the source of *E. coli* O157:H7 hide isolates.

Results: Hides were sampled at load-out at the feedlot, and then again at the slaughter facility to determine how *E. coli* O157:H7 populations were affected by transport and lairage. The researchers also evaluated the strains of *E. coli* using genetic fingerprinting technologies. Unrelated strains of bacteria have unique fingerprints and by tracking those fingerprints, researchers can determine common sources of bacterial contamination. In this study, seventy percent of the isolates collected from the hides at the plant were not related to those collected from the trucks or feedlot and their origin is unknown (Table 2).

TABLE 2

E. coli O157:H7 hide prevalence before and after transport.

TRIAL	LOCATION	PERCENT POSITIVE
1	Load Out	28
1	Plant	89
2	Load Out	74
2	Plant	96
3	Load Out	21
3	Plant	100



“I think the Beef Industry Food Safety Council acts as an impetus for research; it acts as an impetus for communication among the industry and I think it is an invaluable part of our industry.”

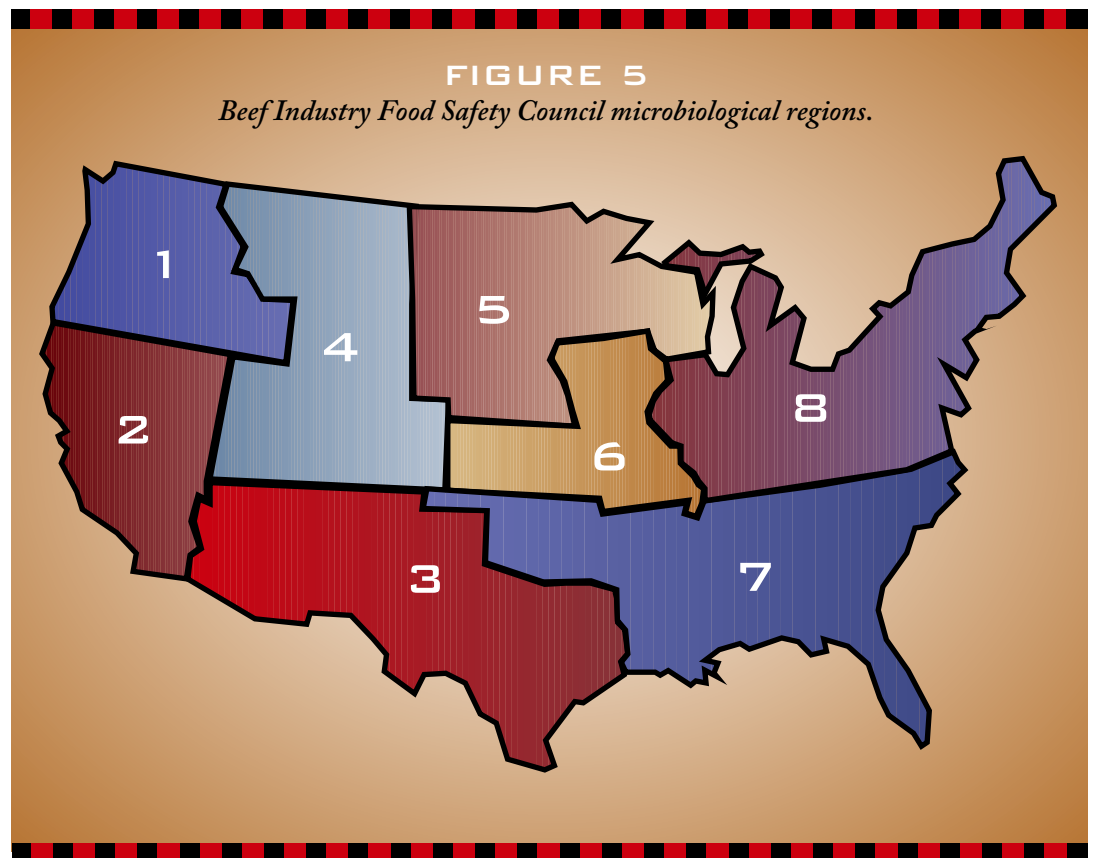
*Mark Anderson,
Senior Product Manager
of Product Evaluation
and Food Safety,
Jack-in-the-Box*

Project: *Examination of commercial ground beef and beef trim before grinding for multi-drug resistant (MDR) bacteria*

Objective: *To determine in commercially available ground beef, 1) the prevalence (with enumeration) and serotype of multi-drug resistant *Salmonella*, 2) the prevalence of other antibiotic resistant *Enterobacteriaceae* by polymerase chain reaction (PCR) for a common marker of antibiotic resistance gene carriage, and 3) the prevalence of *L. monocytogenes* (LM) and characterize isolates for serovar and tetracycline resistance.*

Results: Sample collections began in July 2005 and were sourced from each of the eight BIFSCo Microbiological Regions (Figure 5). *Salmonella* prevalence varied by region, but as expected, ranged from approximately 2 to 5 percent. Based on an 80 percent prevalence of intI gene, there may exist a large population of multi-drug resistant *Enterobacteriaceae* capable of transmitting resistance genes to other bacteria such as *Salmonella*. *Listeria* species were prevalent in 42 percent of samples and *Listeria monocytogenes* was present in 17 percent of samples. The most severe serovar of *Listeria monocytogenes* was isolated from four of the five regions at a low rate.

E. coli O157:H7 has garnered the most attention in the area of beef safety research, however it is extremely important that the industry continues to monitor risks associated with other pathogens such as *Salmonella* and *Listeria monocytogenes*. This study also emphasized the importance of conducting additional research to better understand the risks associated with strains of antibiotic resistant *Salmonella*.



**Tom Edrington, Ph.D., U.S. Department of Agriculture,
Agricultural Research Service (USDA-ARS)**

Project: *Assessing the ruminal and gastrointestinal metabolism of nitroethane, a potential cost-recoverable feed supplement to reduce Escherichia coli O157:H7, Salmonella and Campylobacter in fed cattle*

Objective: Determine the effectiveness of nitroethane as a pre-harvest intervention method.

Results: Researchers proposed that nitroethane, a feed additive that has the potential to improve utilization of gross energy intake in fed cattle, can also be used as a pathogen control strategy. Nitroethane administration caused no apparent adverse effect on feedlot steers and was metabolized by ruminal bacterial populations. Ruminal methane-producing activity, a digestive inefficiency that results in losses of 2 to 12 percent gross energy intake was reduced by 50 to 70 percent for up to 14 days. While pathogen control tests were inconclusive in this study due to initial low levels of *Campylobacter*, *E. coli* O157:H7 and *Salmonella*, nitrocompound administration to pigs and poultry has significantly reduced cecal and rectal *Campylobacter* and/or *Salmonella* concentrations, thus providing justification for further investigation in cattle.

Project: *Use of bacteriophage to reduce E. coli O157:H7 in cattle (2005) and on hides (2006)*

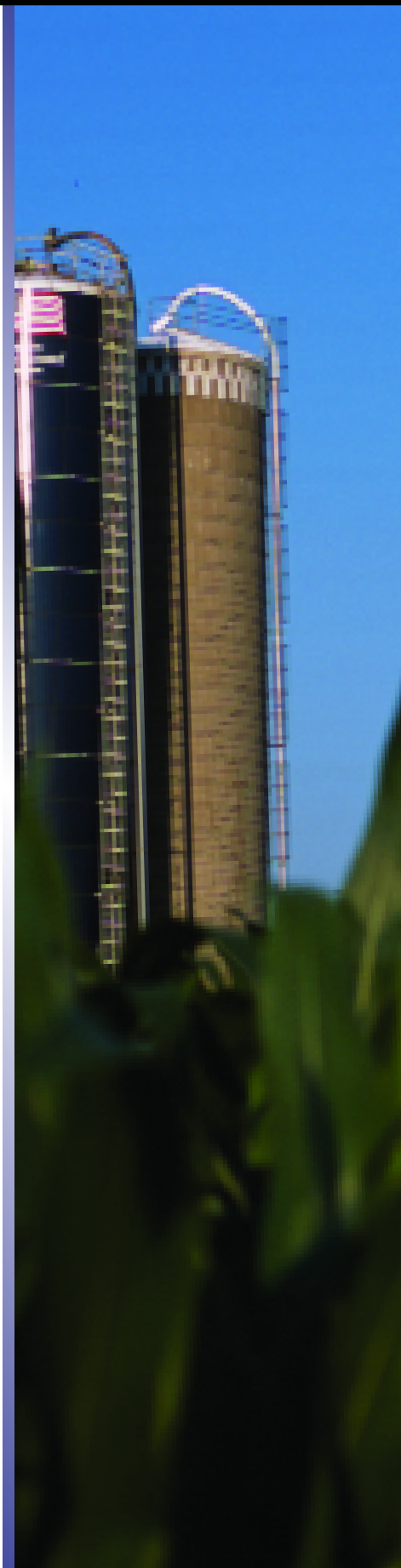
Objective: Bacteriophage are viruses that target specific bacteria. Phage invade, replicate and kill a targeted bacterium, but not other species. The researchers sought to determine the incidence of anti-*E. coli* O157:H7 phage in feedlots.

Results: The incidence of anti-*E. coli* O157:H7 phage in feces was similar to the incidence of *E. coli* O157:H7 in the same animals (55 percent of pens, 15 percent of animals in four feedlots in two states). However, there was little overlap of anti-O157:H7 phage and O157:H7 in the same samples or pens. Anti *E. coli* O157:H7 phage were active against several *E. coli* O157:H7 strains and were used in *in vivo* studies. In follow-up studies, the researchers determined that phage can reduce intestinal populations of *E. coli* O157:H7 in cattle and on hides. A 2005 project found that a phage cocktail was successful in reducing intestinal *E. coli* O157:H7 populations. Additional studies are ongoing to determine potential applications of phage as an effective pre-harvest intervention strategy.

Project: *Competitive fitness of multi-drug resistant pathogenic Salmonella enterica serotype Newport isolates from cattle*

Objective: 1) To compare phenotypic and genotypic resistance and virulence traits between *Salmonella* Newport isolates from beef and dairy cattle and 2) to analyze the ability of resistance and virulence determinants to be transferred to other bacteria.

Results: Researchers developed a short oligonucleotide microarray to characterize antibiotic resistance and virulence of genetic profiles of pathogenic and non-pathogenic bacteria isolated from cattle. The project is still in progress, but initial characterization is being done on 50 *Salmonella* Newport samples from cattle carcasses, hides and feces. The data will provide information on virulence and antibiotic resistance of *Salmonella* Newport strains of significance to the beef industry. This information will allow researchers the opportunity to clarify the incidence, mechanism and the amount of resistance and virulence that is transferred among bacterial strains.





Project: *Examination of the seasonal variation of *E. coli* O157:H7 in beef cattle—effect of day length and subsequent changes in hormone concentrations*

Objective: Melatonin is a hormone that is influenced by day-length. Researchers sought to determine if there was any correlation between fluctuations in serum melatonin levels and observed seasonal changes in *E. coli* O157:H7 shedding rates.

Results: Previous research has shown that a large oral dose of melatonin decreased shedding in “naturally-infected” cattle, however serum melatonin levels did not account for the effect; but the researchers did observe an alteration in gut melatonin levels. Subsequent research sought to determine if tryptophan, a melatonin precursor, had any effect on *E. coli* O157:H7 shedding rates. No differences were observed based on treatments. The researchers did find a correlation between tissue melatonin (rectum) and *E. coli* O157 in rectal contents. A seasonal variation in rectal tissue melatonin was also observed. Additional investigations are in progress to determine if melatonin influences the attachment of *E. coli* O157:H7 to cells isolated from the small intestine and the rectum.

As part of this research, effect of day length was also examined. Earlier research has indicated that a hyper-thyroid status, following thyroid inhibition, may influence shedding of *E. coli* O157:H7. Researchers found that a hyperthyroid status decreased shedding during the summer months. Subsequently, the researchers provided artificial lighting to feedlot cattle, which extended the duration of fecal shedding compared to the seasonal decline exhibited by the control animals. The findings supported the hypothesis that shedding is a response to day length not the ambient temperature. This information will be helpful in understanding seasonal decreases and increases in *E. coli* O157:H7 shedding rates in cattle and the effects that environmental conditions have on the incidence of *E. coli* O157:H7 in cattle.

Project: *Source and prevalence of multi-drug resistant *Salmonella* in dairy cattle*

Objective: Determine prevalence of multi-resistant *Salmonella* in dairy cattle (calves, heifers, lactating cattle, dry cows, and cull cows) and determine if commingling of calves from multiple farms at a heifer feedlot serves as a transmission vector for multi-resistant *Salmonella* to be carried back to the dairy.

Results: The researchers found that in two sample collections (October 2005 and March 2006) there was a wide range in prevalence of multi-drug resistant *Salmonella*. The prevalence was much lower in the March collection and consisted mostly of multi-drug resistant *Salmonella typhimurium* and *Salmonella reading*. Positive samples were found primarily among the calves and from animals in the sick pens. Information about the prevalence of *Salmonella* in production environments will help in the development of more effective intervention strategies, including management changes that might be effective in reducing pathogen loads.

Project: *Influence of ractopamine on fecal shedding of *E. coli* O157 in cattle*

Objective: Determine if ractopamine, a hormone used as a feed additive to repartition nutrients or increase feed efficiency, can reduce *E. coli* O157:H7 populations and fecal shedding in cattle.

Results: The researchers hypothesized that ractopamine acts similarly to catecholamines (hormones including epinephrine and norepinephrine), and that supplementing it to cattle would affect *E. coli* O157:H7 populations and fecal shedding. The researchers found that supplementation caused a decrease in *E. coli* O157:H7 shedding indicating its possible use as a pre-harvest safety intervention. More work will need to be conducted to validate these findings.

David Smith, Ph.D., University of Nebraska

Project: *Multi-year study—the effect of vaccination for Escherichia coli O157:H7*

Objective: Determine the efficacy of an experimental vaccine in reducing *E. coli* O157:H7 shedding in cattle.

Results: A vaccine (Bioniche Life Sciences, Inc.) was developed that stimulates immunity against Type III secreted proteins that mediate bacterial attachment to intestinal cells. University of Nebraska researchers have for the past several years examined the efficacy of this vaccine in reducing *E. coli* O157:H7 shedding rates (Table 3).

TABLE 3							
Summary of University of Nebraska, Lincoln vaccine efficacy studies (2002–2004)							
Year	No. of Cattle	Regimen	Outcome	Odds Ratio	Vaccine Efficacy	P-Value	Comments
2002	192	3-dose	Feces		59%	0.04	“Bench-top” vaccine
2003	608	1-dose	Feces	0.25	68%	0.0001	
		2-dose	Feces	0.26	67%	0.0001	
		3-dose	Feces	0.20	73%	0.0001	
		0-dose	Feces	0.36	59%	0.0003	Herd immunity?
2003	1003	3-dose	RAMS	0.67	NS	>0.10	Ranch vaccination
			Feces	0.81	NS	>0.10	Low prevalence
2004	288	3-dose	TRM	0.014	98%	0.0001	
			Feces	0.81	NS	0.56	Low prevalence
2004	20,556	2-dose	TRM	0.20	75%	0.03	
			ROPES	0.59	27%	0.004	19 feedlots

Project: *The effect of regional vaccination within the feedyard on Escherichia coli O157:H7 on colonization, fecal shedding and hide contamination*

Objective: Determine if reducing of *E. coli* O157:H7 shedding in feedlot cattle translates into reduced hide contamination immediately before and after harvest.

This project also sought to contribute to the industry’s knowledge of the ecology and epidemiology of *E. coli* O157:H7 from the production level to harvest stage.

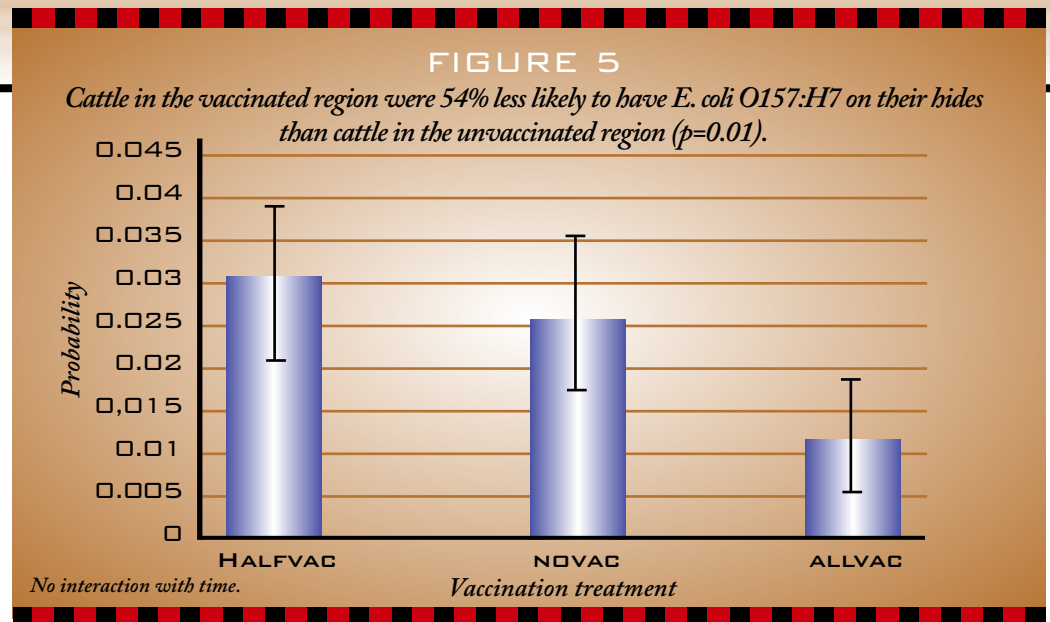
Results: Cattle were randomly assigned to a vaccination treatment or a nonvaccinated control group, and then sorted into a feedlot where they were in one of three groups:

- 1)Unvaccinated
- 2)Vaccinated
- 3)Commingled vaccinated and unvaccinated

The probability for cattle to shed *E. coli* O157:H7 in feces depended on the time and the condition of the pen surface. There was a greater likelihood that cattle would shed *E. coli* O157:H7 during wet or muddy conditions. Additionally, cattle in the vaccinated sector of the feedlot were 62 percent less likely to shed *E. coli* O157:H7 than cattle in the unvaccinated region. Within the commingled pens, vaccinated cattle were 58 percent less likely to shed *E. coli* O157:H7 than unvaccinated cattle.

“Research has been extremely critical in expanding our knowledge relative to the organisms we are trying to manage.”

*Tim Biela,
Chief Food Safety and
Quality Officer,
American Foodservice
Corporation*



The level of hide contamination increased the longer the cattle were in the feedlot facility and was the highest immediately before evisceration at the slaughter facility. The level of hide contamination and the probability of detecting *E. coli* O157:H7 rose dramatically after cattle were transported from the feedlot to the harvest facility. Vaccinated cattle were 54 percent less likely to have *E. coli* O157:H7 on their hides than cattle in the unvaccinated region. The researchers concluded that vaccinating an entire group was more effective as it allowed control of the colonization levels, and subsequently the cattle were not reexposed.

According to the researchers, vaccination for *E. coli* O157:H7 can be an effective pre-harvest intervention. Based on several years of data, this vaccine reduced the probability of cattle shedding *E. coli* O157:H7 in feces, and reduced colonization. Researchers were also less likely to detect *E. coli* O157:H7 in the environment, which reduced hide contamination and improved herd immunity.

D. Guy Loneragan, Ph.D., B.V.Sc., West Texas A&M University

Project: *Salmonella*, drug resistance and serotypes in cattle populations

Objective: Identify and characterize specific populations of cattle most likely to be harboring multi-drug-resistant *Salmonella* at the time of harvest and to determine if prevalence of *Salmonella* varies across season.

Results: Collaborative research is being conducted by West Texas A&M University, Washington State University and the U.S. Department of Agriculture Meat Animal Research Center. West Texas A&M Researchers have targeted the Texas High-Plains region and collected hide samples from two fed beef plants and two cull cow plants that process both beef and dairy animals. Researchers also collected fecal samples from six feedlots from both healthy harvest-ready cattle and from cull animals or “realizers.” The fecal samples are being collected throughout the year and to date, half of the collections have been made. The samples are being processed at the International Center for Food Industry Excellence, Texas Tech University under the supervision of Mindy Brashears, Ph.D.

The researchers are currently determining the presence of *Salmonella* and also performing a quantification analysis. Serotyping is also being performed by the U.S. Department of Agriculture, National Veterinary Services Laboratory. A bank of *Salmonella* isolates is being created for further characterization.

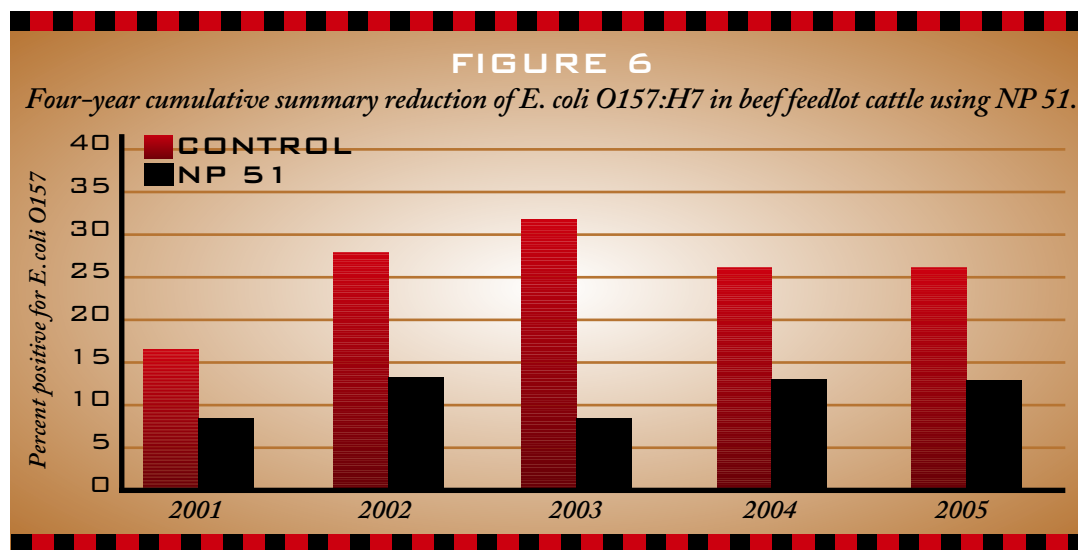
Preliminary findings reported at the Beef Industry Safety Summit found that *Salmonella* is widely prevalent in cattle populations of the Texas High-Plains and was frequently recovered from healthy cattle. Multi-drug resistance, particularly high-level resistance, appears to be rare in all groups. Sixty-eight percent of the serotypes were susceptible to all of the antibiotics evaluated. Slightly less than 2 percent were resistant to four or more antimicrobials. Most of the multi-drug resistant serotypes were recovered from cull animals, however they were unlike those associated with human disease.

Mindy Brashears, Ph.D., Texas Tech University

Project: *Development of a direct-fed microbial to reduce E. coli O157:H7*

Objective: *Validate the effect of NP 51, a direct-fed microbial on reducing E. coli O157:H7 shedding in feedlot cattle.*

Results: The researchers have concluded, based on several years of data that direct-fed microbials consistently reduce *E. coli* O157:H7 in feces and on hides when fed prior to slaughter. Studies have shown that lower doses (10^7 cfu/g per head per day) appear to be as effective as the higher doses (10^9 cfu/g per head per day) and are more cost effective for cattle producers. (Figure 6).

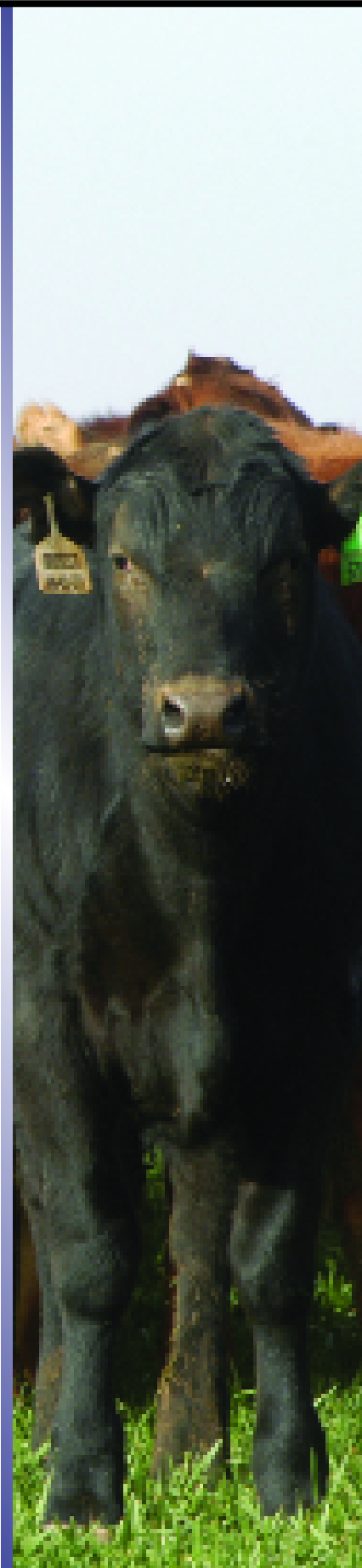


Project: *Cross contamination of hides during loading at the feedlot due to dust cloud exposure*

Objective: *1) Determine the impact of transportation of beef animals to harvest facilities on the prevalence of E. coli O157:H7 and Salmonella spp, 2) determine the impact of animal location (upper vs. lower decks) during transportation on the prevalence of E. coli O157:H7 and Salmonella spp. and 3) determine the effectiveness of trailer washing as a means to minimize hide contamination during transport.*

Results: During a 2004 study, researchers from Texas Tech University found that trucks had no significant impact on the pathogen load of feedlot cattle. However, the researchers did observe a large dust cloud made up of dry fecal material from the feedlot that is typically present when cattle are loaded on a truck. A project was initiated to determine the effect of the dust on *E. coli* O157:H7 and *Salmonella* levels.

The researchers found that there was no increase in the prevalence, or number of cattle shedding the pathogen after the cattle were exposed to the dust cloud, but there was a significant increase in the quantitative or number of pathogens in the samples. The researchers surmised that this could be due to the presence of pathogens in the dust. Additional studies will be conducted during the summer of 2006.



“At this meeting we have heard some of the research that we as producers have been funding, and that to me is extremely important. We’ve also heard discussions among the people in other parts of the industry about how they are going about solving the problem. All of those things make me feel really good that our industry is moving forward.”

*Roger West,
Florida Cow-Calf Producer*

Project: *Education needs for producers to disseminate information about production pre-harvest safety interventions*

Objective: **Determine the best methods to communicate with cattle producers about beef safety research and pre-harvest intervention methods..**

Results: Surveys were used to determine the self-perceived knowledge of pre-harvest food safety practices of beef cattle producers. Based on the results, the researchers developed recommendations for information delivery methods for food safety information. Of the 62 percent of participants that identified themselves as cattle producers, 66 percent considered themselves cow-calf producers, 24 percent were stocker operators and 10 percent were feedlot operators (Table 4).

TABLE 4

How knowledgeable are you about using the following interventions to reduce E. coli O157:H7 shedding in live cattle?

INTERVENTION	MEAN	STD. DEV.
<i>Vaccines</i>	2.78*	1.06
<i>Direct-fed microbials</i>	2.32	1.01
<i>Neomycin sulfate</i>	2.07	.96
<i>Sodium chlorate</i>	1.90	.93
<i>Seaweed/Tasco</i>	1.69	.93

** Scale from 1 to 4, with 4 being “very knowledgeable.”*

Project: *Reduction of foodborne pathogens in beef trim and ground beef using various chemical interventions*

Objective: **Validate the effectiveness of acidified sodium chlorite and organic acids in reducing pathogen levels in beef trim prior to grinding using a belt turning and spray application (Chad Company Inc., Olathe, Kan.).**

Results: The researchers found significant reduction of both *E. coli* O157 and *Salmonella* spp in beef trim, and as a residual effect in ground beef, after treatment with acetic or lactic acid. All reductions were less than one log cycle, indicating that the application and use of these technologies may be limited.

Strains of lactic acid bacteria were applied to packaged beef products to determine their effect on reducing *E. coli* O157:H7 and *Salmonella*. The pathogens were reduced by one to two log cycles when cultures were used individually. When the cultures were combined, *E. coli* O157:H7 was reduced by two log cycles after three days and 2.5 log cycles after five days in refrigerated ground beef. *Salmonella* spp. were reduced by three log cycles after three days and non-detectable after five days in refrigerated ground beef. Additional tests indicated that there were no negative impacts on sensory properties. These results support the use of specific strains of lactic acid bacteria as a means to reduce *E. coli* O157:H7 and *Salmonella* incidence in fresh beef products (Figure 7).

FIGURE 7

Strains of lactic acid bacteria used to reduce foodborne pathogens

Strain NP 51— <i>Lactobacillus acidophilus</i> (cattle)
Strain NP 35— <i>Lactobacillus cristipatus</i> (cattle)
Strain NP 3— <i>Pediococcus acidilactici</i> (commercial hot dogs)
Strain NP 7— <i>Lactobacillus lactis</i> subsp <i>lactis</i> (alfalfa sprouts)

An application to use this specific mix of cultures under the “generally recognized as safe” (GRAS) status in all meat and poultry products was granted by the Food and Drug Administration on Dec. 7, 2005.

Texas Tech University researchers are also investigating the following post harvest safety interventions:

- Carbon monoxide packaging for ground beef and its effect on reducing spoilage and improving product safety
- Oregano in ground beef and its effect on reducing spoilage and improving product safety
- Interventions for non-intact beef products to be applied after needle tenderization
- Impact of condensation on product safety
- Impact of dry chilling carcasses on product safety

Presenter: Dave Lovetro, Ph.D., EKA Chemicals

Project: *The effect of an experimental chlorate product on the reduction of E. coli O157:H7 and Salmonella in the gastrointestinal tracts of cattle*

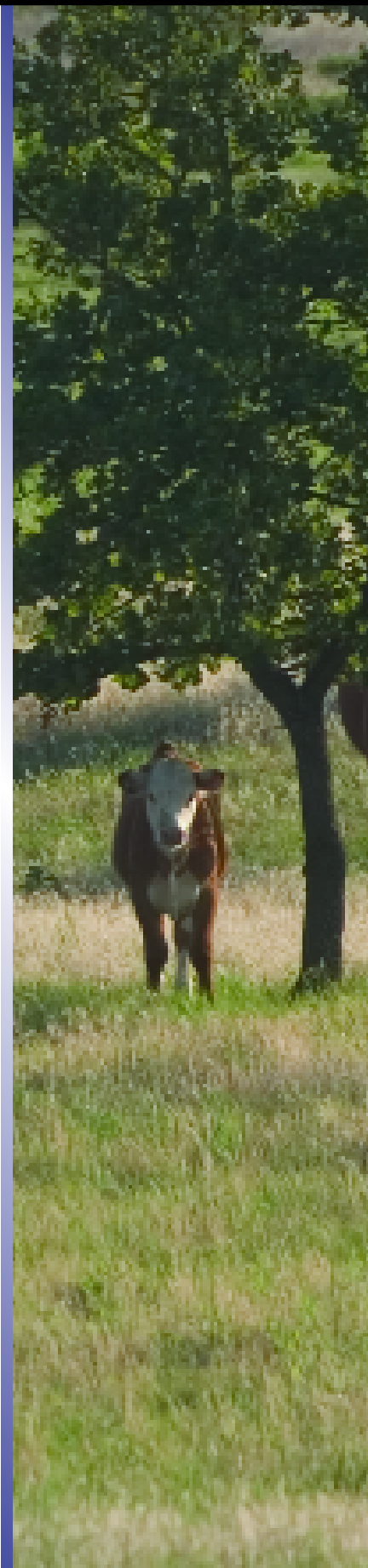
Objective: To determine if chlorate can reduce *E. coli* O157:H7 and *Salmonella* in the gastrointestinal tracts of cattle.

Method: Tissues were examined for chlorate content after aging (14 days) and cooking to determine any potential implications for human health.

Results: Addition of an experimental chlorate product (ECP) to animal feed diet has been shown to reduce *E. coli* and *Salmonella* populations by more than 99 percent. The supplement has also been shown to decrease the incidence of animals testing positive for *E. coli* O157:H7 and *Salmonella*

In order to use ECP as a pre-harvest intervention, the Food and Drug Administration (FDA) must approve its use as a feed additive. To do so, requires that human food safety must be demonstrated to ensure that ECP does not leave an unsafe level of residual chlorate in edible tissue.

Based on this research, chlorate was effectively converted to chloride (Cl^-) in cattle, swine and poultry. Chlorite (ClO_2) was not detected in excreta or edible tissues of any species. Chlorate residues were below provisional FDA safe tissue concentrations in all edible tissues. Based on this research, an ECP feed additive appears to be a safe and effective pathogen control strategy for use as a pre-harvest food safety initiative. Future research efforts will address the environmental fate of excreted chlorate in soil and animal wastes.





Breakout Group Reports



Beef safety has to be addressed from all levels of the industry, and while the goal across all sectors is the same—to produce the safest product possible—each segment must address safety challenges differently.

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. The best practices documents undergo constant revisions 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 Web site at www.bifsc.org.

As in previous Beef Industry Safety Summits, the participants took part in breakout sessions to accomplish the following tasks:

- Review the best practices documents
- Discuss new issues
- Develop a list of research needs

PRODUCTION AND HARVEST/FABRICATION BREAKOUT GROUP

Moderators: Dell Allen, Guy Loneragan and Mohammad Koohmaraie

The production and harvest/fabrication groups met jointly at the 2006 Beef Industry Safety Summit to better facilitate discussion between these two segments of the beef production chain. The application of multiple-hurdle pathogen interventions has been very successful in reducing food safety risks associated with the harvest of beef cattle. In order to not overwhelm the existing technologies that have proven so effective, the industry is examining strategies that can be applied further back in the production chain. Much of the discussion in this joint breakout group revolved around pre-harvest safety research and interventions.

PRODUCTION DISCUSSION TOPICS

Research Results

Recent research, including some that was presented during the 2006 Beef Industry Safety Summit, is examining the presence of other pathogens besides *E. coli* O157:H7 that can have negative effects on beef safety. Most notably, researchers are focusing on *Salmonella* and multi-drug resistant strains. It was recommended to apply the regulatory definition used by government agencies such as the Food Safety and Inspection Service in investigative studies.

The group also spent considerable time discussing the research results obtained by the U.S. Meat Animal Research Center (USMARC) that identified a high incidence of pathogens of an unknown origin after cattle were offloaded from trucks and prior to slaughter (see Beef Safety Research Results section, *Contamination of beef cattle hides with E. coli* O157:H7 during transportation, Mohammed Koohmaraie).

Pre-harvest Tools

The production segment asked the harvest and fabrication sector for a “benchmark” target when trying to address food safety at the pre-harvest level. In discussion during the summit, members of the harvest sector responded with the following recommendations:

FOOD SAFETY— 100 YEARS OF PROGRESS

*Richard Raymond, M.D.,
Under Secretary of Agriculture
for Food Safety*

- Consistency in the amount of contamination on animals entering the facility is important. While some degree of contamination on live animals is unavoidable, large fluctuations make it difficult to adequately address the risks through intervention systems.
- The harvest participants also stated that they need incoming contamination levels to be below the “saturation” level of their available interventions.
- It was recommended that the best pre-harvest interventions would be those that reduce incoming contamination levels to a point below the “saturation” of a plant’s intervention systems.
- The group recommended that pre-harvest intervention research and product development should:
 - ◆ Focus on pathogen load, rather than percent shedders.
 - ◆ Use standardized measurement methods. The group recommended that fecal counts were probably the best measurement of pre-harvest intervention effectiveness.
 - ◆ Produce results that can be validated.
- The group also discussed pre-harvest tools that are currently commercially available, which include only two products:
 - ◆ Bovamine Culture Complex Probiotic (NPC, Guymon, Okla.)
 - ◆ PROBIOS FS (CHR-Hansen, Milwaukee, Wisc.)

Production Research Needs

- Develop a database to better understand what the pathogen “saturation” level at the harvest stage is, so that objective pre-harvest goals can be established.
- Develop projects to determine the unique attributes of animals that do not shed pathogens versus those that do.
- Develop data sets that examine the long-term effects of pre-harvest interventions applied in feedlots to determine if there is any reduction over time of pathogen levels on animal hides.
- Determine environmental effects on contamination and examine effective environmental controls.
- Broaden research to all shiga-toxin producing organisms, not just *E. coli* O157:H7.
- Conduct follow-up research on cross-contamination that appears to occur during shipping cattle from feedlots to harvest facilities and may be attributable to the dust cloud that occurs when cattle are loaded on trucks (see Beef Safety Research section, *Cross contamination of hides during loading at the feedlot due to dust cloud exposure*, Mindy Brashears, Texas Tech University).
- Determine reasons for large documented pathogen loads present between truck offloading and preevisceration (see Beef Safety Research Results section, *Contamination of beef cattle hides with E. coli O157:H7 during transportation*, Mohammed Koohmaraie, U.S. Meat Animal Research Center).
- Conduct a pre-harvest audit to determine what pre-harvest interventions are being used, and to what degree.

“If you don’t believe public health changes, just think, in 1901, one out of every five coffins was a child who didn’t reach his or her fifth birthday. Now, only one out of every 100 coffins is a child who didn’t reach the age of five.”

Those were the statistics cited by Dr. Richard Raymond, Undersecretary for Food Safety, U.S. Department of Agriculture (USDA), Food Safety Inspection Service (FSIS). Raymond credited much of the improvement in childhood survival rates to the safety of the national food supply.

2006 marks the one hundredth anniversary of the Federal Meat Inspection Act. “It is overwhelming to think where we’ll be in another 100 years,” said Raymond. “As we produce food from ‘farm to fork,’ it is important to bring different parties together to reach a consensus – we need to work together as we all have the same goal.”



The Beef Industry Food Safety Council is undertaking a variety of efforts to ensure the industry is adequately addressing any food safety challenges. The safety of non-intact beef products that have either been mechanically tenderized or enhanced with solutions was recently addressed in a workshop held in December of 2005. Results from the workshop, including conclusions outlined in a white paper, were shared with the participants of the 2006 Beef Industry Safety Summit. For more information, visit www.bifsc.org. The workshop was organized in part to help industry participants address a notice published in May 2005 by the Food Safety Inspection Service. The notice required establishments that produce mechanically tenderized beef products to include in their next annual 2006 Hazard Analysis Critical Control Point (HACCP) reassessment, consideration of three *E. coli* O157:H7 outbreaks associated with the consumption of mechanically tenderized beef (August 2000, June 2003, and August 2004).

Non-intact products are considered by FSIS to be high-risk due to the potential internalization of pathogens via the mechanical tenderization process. Consumers perceive non-intact beef products to be whole muscle cuts, and subsequently may not cook them to a sufficient internal temperature to destroy harmful bacteria.

The Non-Intact Products Processing Workshop was coordinated by the Beef Industry Food Safety Council to:

- 1) Examine the current regulatory environment
- 2) Summarize the current body of research related to the safety of non-intact beef products
- 3) Determine future research needs
- 4) Summarize current interventions to enhance the safety of non-intact beef products
- 5) Review the Best Practices for Pathogen Control During Tenderizing/Enhancing of Whole Muscle Cuts

Production Best Practices

- Development of a Production Best Practices document is in progress and once finalized, will be posted on www.bifsc.org.

Harvest Research Needs:

- Focus research on strains of multi-drug resistant *Salmonella* that have the potential to affect or influence human illness, and use this information to influence regulatory efforts.
- Develop a general consensus of the definition of multi-drug resistance.

Harvest Best Practices

- Participants in this breakout session conducted a comprehensive review of the Harvest Best Practices document. Once finalized, the revisions will be posted on www.bifsc.org.

PROCESSING BREAKOUT GROUP

Moderators: Tim Biela and Mark Anderson

During the 2006 Beef Industry Safety Summit, the Processing Group did a comprehensive review of its best practices document. Once completed, the revisions will be posted on www.bifsc.org. In order to adequately address needed changes, a subgroup was formed. This was done to address in more detail revisions to the lotting and reprocessing sections based on recent Food Safety Inspection Service (FSIS) policy actions.

In 2005 FSIS issued a revised 10,010.1 Directive, which gives guidance for sampling and testing for *E. coli* O157:H7. Although somewhat similar to previous interpretations one significant factor has emerged that is extremely important for processors to understand—the use of common source raw materials. If a processor uses only part of a shipment (e.g. combo bin from a truckload) that has a regulatory positive *E. coli* O157:H7 test from the day's grind, FSIS requires that the "common source material," i.e. the rest of the truckload be included in a product recall.

FSIS claims that if a facility has a regulatory positive, then its prescreening practices did not work and all of the product could potentially be adulterated. This can potentially be avoided if the facility also has a testing program for finished product to verify the other lots are not contaminated. However, if FSIS does not consider a facility's end-product sampling program to be adequate, then the facility may still be liable. The Processing Breakout Group recommended developing best practices for testing procedures. Finished product testing programs for raw ground beef will be stressed more than ever as a way to limit the scope of a recall. The Processing Group also recommended that future edits to the best practices should:

- Provide more information on prescreening and validating suppliers' testing programs.
- Address pathogens and other issues beyond *E. coli* O157:H7, most notably *Salmonella*.
- Continue research on validated interventions and revise the Processing Best Practices document to reflect those interventions that have been approved such as acidified sodium chloride.

RETAIL AND FOODSERVICE BREAKOUT GROUP REPORT

Moderator: Nick Nickelson

The retail and foodservice groups also met jointly during the 2006 Beef Industry Safety Summit. Both sectors did comprehensive reviews to their respective best practices documents in 2005, so in this year's summit the two groups focused on emerging issues specific to their sector.

Discussion Topics

TRACEABILITY AND RECALLS

Presenter: Mike John, NCBA President, Missouri cow-calf operator

John shared with the group efforts within the cattle industry to offer traceability solutions that are voluntary and market driven. The actions have been undertaken to provide commercially viable solutions to the National Animal Identification System. John stressed to the attendees that there is a difference between traceability for animal disease tracking purposes and source verification for marketing purposes. Developing such a system will be necessary to maintain and grow global competitiveness. John stated that it is a consumer perception that a standardized national animal identification system is already in place, when in fact it is not. He also added that cattle producers are looking for market signals from retailers and foodservice operators as an indication of what these two sectors desire from cattle producers.

COLD CHAIN MANAGEMENT

Presenter: Mark Anderson, Ph.D., Jack-in-the-Box

Anderson spoke to the Retail and Foodservice Breakout Group about the need to develop best practices for cold chain management. He emphasized that even the best safety interventions will not prevent foodborne illness if end-users temperature abuse fresh beef products.

MICROBIOLOGICAL PRODUCT SPECIFICATIONS

Presenter: Ann Marie McNamara, Ph.D., Silliker, Inc.

McNamara presented recommendations for establishing purchase specifications to address microbiological evaluations. Recommended steps for doing so would include:

- Define objectives
- Set purchase specifications
- Establish supplier certification programs that include:
 - ◆ Microbiological evaluation of product
 - ◆ Audits of suppliers
 - ◆ Physical evaluation of product at time of delivery
- Supplier categorizations

In her presentation, McNamara also compared European Union (EU) microbiological standards to those of the United States.

EMPLOYEE SAFETY TRAINING PROGRAMS

Presenter: Janet Anderson, M.S., R.D., Utah State University

Anderson offered recommendations for developing employee safety training programs and said it was important to define objectives of training based on best practices and the “science of learning.” She also emphasized that it was important to develop training programs that the employees could relate to and shared training program examples that had been conducted with retail employees and their children.

CONSUMER SAFETY COMMUNICATIONS

Presenter: Michele P. Murray, National Cattlemen's Beef Association

Murray shared with the group a summary of efforts coordinated by NCBA and funded through the Beef Checkoff Program to develop communication strategies about beef safety with the primary goal of maintaining consumer confidence. She stressed the importance of developing and maintaining strong relationships through BIFSCo and other third party networks. The communications program depends on an extensive information base and conducts media outreach efforts both on a proactive and response basis. She emphasized the importance of telling the story of beef production and cited the recent release of an activist-inspired children's book and movie as examples of the need for targeted communications efforts.

*“I think we
know how to ask the
right questions,
how to get the right
research done,
and then how
to get those results
implemented
to make our
product as safe
as it can be.”*

*Mel Kramer,
President of
EHA Consulting Group*



Issues Forum

Identifying future challenges is key to continuing the successes that the beef industry has had in creating a safer product.

In 2006, the Beef Industry Safety Summit once again featured speakers on topics of emerging importance.

Global Prevention and Management of Foreign Animal Disease

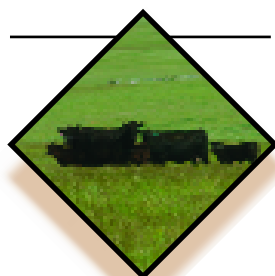
During the Houston International Livestock Congress (HILC) experts from around the world gathered to discuss animal diseases of international importance, most notably bovine spongiform encephalopathy (BSE), foot and mouth disease (FMD) and avian influenza (AI). The International Livestock Congress hosted more than 140 participants from 11 countries. Members of the “think tank” sessions shared a summary of the discussions for the participants in the 2006 Beef Industry Safety Summit.

Bovine Spongiform Encephalopathy Think Tank

Presenter: Guy Loneragan, Ph.D., B.V.Sc.

The Houston International Livestock Congress BSE Think Tank made the following recommendations to adequately address BSE in the future:

- 1) Global community needs to improve definition of what constitutes BSE. If it is not transmissible, then it should not be identified as BSE. Additionally, any incidences of atypical disease need to be better described.
- 2) A better definition of the “prevention” of BSE should be developed. The definition should focus on transmission/amplification and not simply prevention. Prevention of only a few cases of BSE or vCJD is not plausible, however preventing amplification or the spread is achievable. If research reveals that spontaneous occurrences do arise, then the participants concluded that the disease cannot be completely prevented.
- 3) Risk communications must be improved to include stakeholders, admit the possibility of future cases, be transparent in nature and avoid over-assurances.
- 4) Atypical cases, such as those in very old or very young animals, need to be thoroughly reviewed. There is some evidence that some cases that were diagnosed as BSE were not transmissible, and thus should not have been classified as such.
- 5) Review scientific information to assess the quality of the science and the appropriateness of the conclusions prior to the release to popular press.
- 6) Avoid ambiguous/changing test results (e.g. “inconclusive”), but still attempt to be as transparent as possible. Results should only be reported after confirmatory testing is complete. The BSE Think Tank proposed that there be three test result categories in the U.S. Department of Agriculture’s screening system:
 - Positive
 - Negative
 - Requires additional analysis (e.g. atypical BSE)
- 7) The National Veterinary Services Laboratory (NVSL) should seek immediate accreditation.
- 8) The U.S. Department of Agriculture-Animal Plant Health Inspection Service (USDA-APHIS) should reduce the number of samples tested annually and sharpen its focus on older, high-risk animals.



9) It should be acknowledged (domestically and internationally) that the control measures required to manage BSE are in place in the United States. Modeling and surveillance programs support this statement.

10) Because the feed ban was not one hundred percent, the U.S. should consider positive and negative ramifications of broadening the ban.

11) There is a need to communicate current knowledge about chronic wasting disease (CWD). There is no evidence of natural transmission to livestock, nor is there evidence of transmission to people despite extensive investigations and research. That information has not been clearly communicated to the general public.

Foot and Mouth Disease

Presenter: Valerie Ragan, DVM

Foot and mouth disease (FMD) is an extremely contagious, viral disease of domestic cloven-hoofed and many wild animals, characterized by fever, vesicular lesions and subsequent erosions of the epithelium of the mouth, tongue, nares, muzzle, feet and teats.

The charge for the Think Tank participants was to discuss the prevention of FMD. The group developed three subtopics under that context.

- Prevention of introduction
- Prevention of spread should it be introduced
- Minimization of impacts in the case of introduction

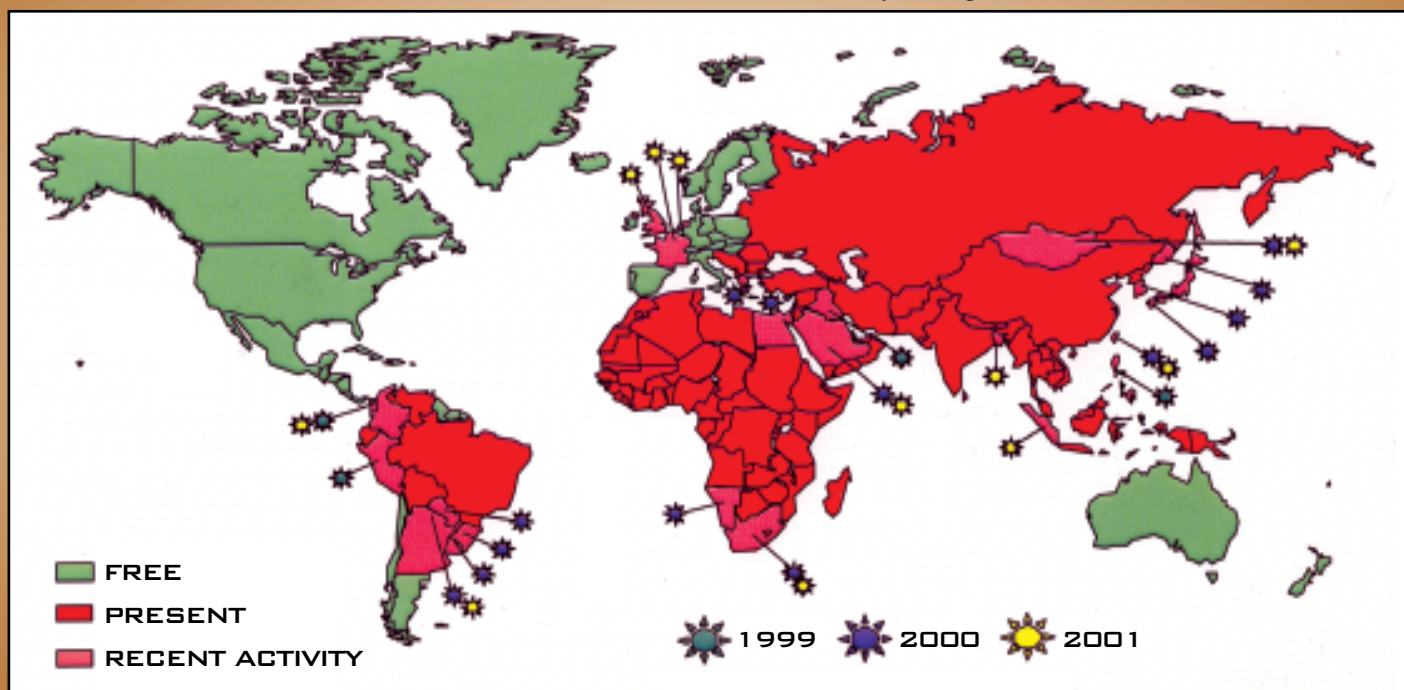
A globally unified strategy towards the eradication of FMD is a key prevention measure. Ragan said there is a need to reduce the risk globally by collaborating on eradication efforts internationally (Figure 8).

*"We've always said
that there is no
competitiveness when
it comes to food safety.
It's something that
we've all got to work
on together."*

*Nick Nickelson,
Chief Scientific Officer,
Standard Meat Company*

FIGURE 8

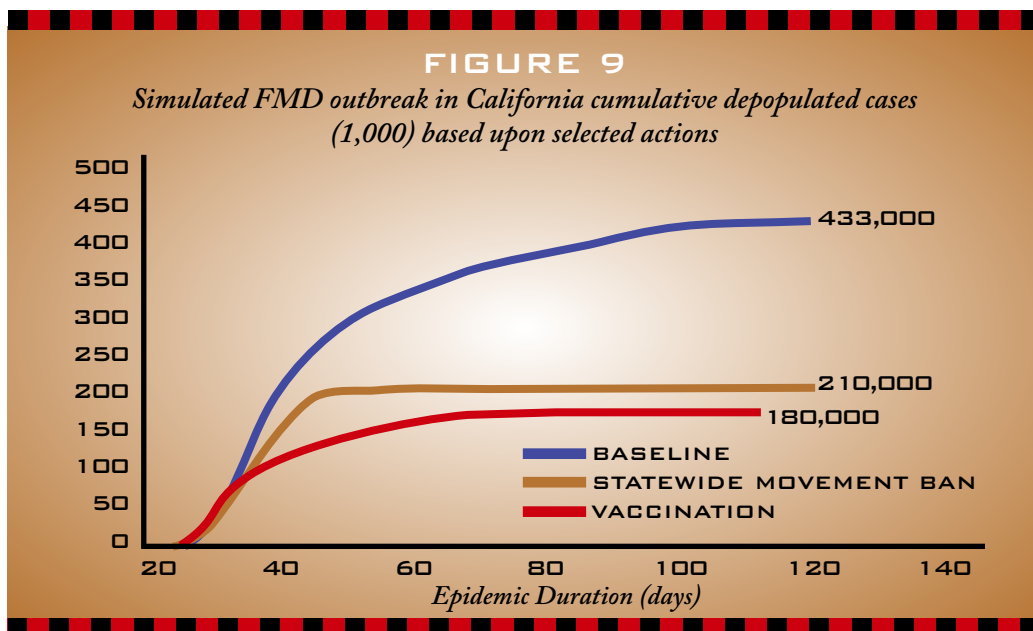
Foot and mouth disease distribution and activity through 2001





spread, and reducing the risk of introduction into at-risk populations, however there are seven serotypes of FMD and more than 60 subtypes within these that complicate vaccine development. The development of vaccines that differentiate infection-induced titers from vaccine-induced titers is needed.

In the event of an outbreak, a movement ban will be necessary to prevent the spread and minimize the impacts of the disease. The FMD Think Tank participants agreed on the need for an immediate stop movement order should introduction occur, but stressed that the economic impacts and resultant animal welfare issues should be planned for and mitigated. A movement ban will also further complicate the already difficult task of rapidly procuring and deploying decontamination equipment.



Source: Tom Carpenter, School of Veterinary Medicine, U.C. Davis

In summary, Ragan outlined the critical components of FMD risk reduction as:

- Prevention
- Detection
- Response
- Recovery

Under each of those risk reduction components, the FMD Think Tank felt that the following areas would also need to be addressed:

- Policy development
- Research and development
- Education, training and evaluation

Complicating factors that should be considered:

- Risk-benefit analysis of policy options
- Animal identification and challenges associated with traceability and harmonization
- Uniform information and communication platform

In summary, Ragan said that the group concluded that the prevention of the introduction of FMD is critical and must be addressed globally. In the case of accidental or intentional introduction, the prevention of the spread and prevention of impacts on industry will be critical. As a result, other facets of the risk matrix must be fully addressed and proactively planned for.

Avian Influenza

Presenter: Mel Kramer, Ph.D.

The avian influenza (AI) Think Tank participants cited recreational fowl, such as game cocks and back yard flocks as the weakest link in developing containment-control strategies. The group was also concerned that in spite of the considerable amount of information available from various agencies and organizations, such as the U.S. Department of Agriculture, Centers for Disease Control, World Health Organization, and academia, that planning strategies of the various groups and constituencies are not unified, consistent or effectively communicated. The group is also concerned as to whether the U.S. has sufficient capacity in its veterinary services at the national and state levels to address an avian influenza outbreak in the U.S.

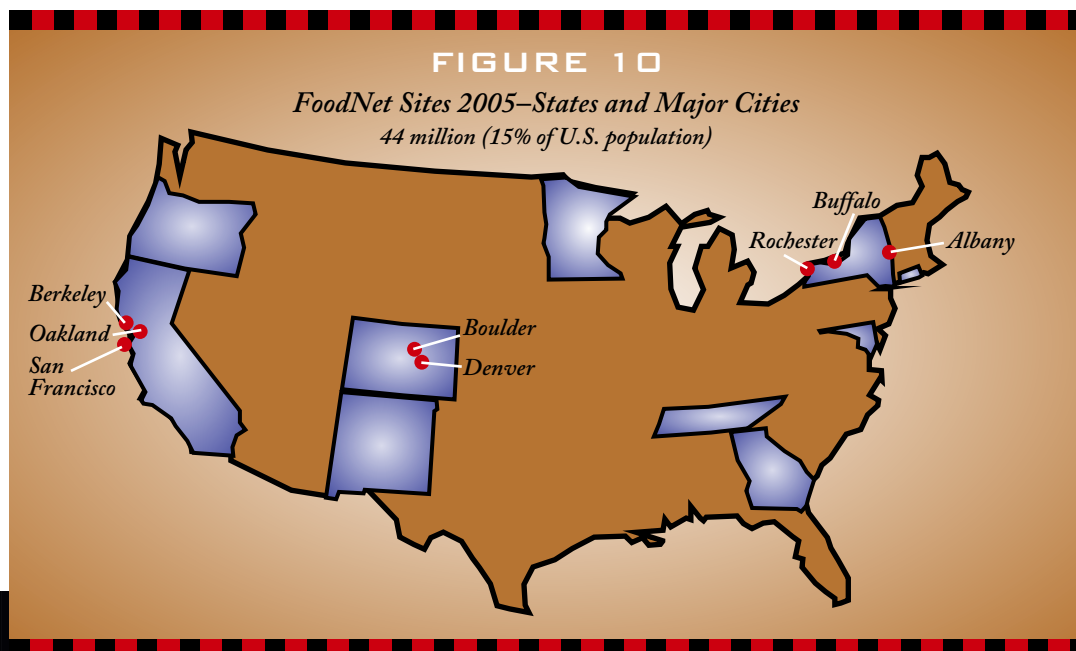
The HILC AI Think Tank identified the following areas as requiring immediate attention:

- Policies to better control non-industrial or recreational fowl, in both normal production scenarios and also in containment-control actions.
- Assure that biosecurity measures are in place and functioning properly.
- Effective leadership is needed to immediately begin to have more interaction between government and industry so that the information provided to the public and the activities that go forward to contain the situation, if it occurs, is done in the most effective and efficient manner possible.
- Conduct an “emergency AI tabletop exercise” with appropriate stakeholders to identify strengths and weaknesses of the identified approaches and address them before an actual crisis has occurred.
- Public interest groups should be engaged in discussions to gain their viewpoints so that communication to the consuming public can be as consistent as possible.
- A credible risk assessment is needed, similar to the Harvard BSE Risk Assessment, to bring better focus to science-based decisions and to support risk communication facts to the public.
- Provide education about risk factors and limit human exposure to potentially hazardous bird populations.

OTHER EMERGING ISSUES

Multi-Drug Resistant *Salmonella* and FoodNet Update

Presenter: Elaine Scallan, Ph.D. Chief of the Foodborne Diseases Active Surveillance Network (FoodNet) at the Foodborne and Diarrheal Diseases Branch, Centers for Disease Control and Prevention (CDC)



*“Safety is
the bedrock.
Whether that be
human safety or
food safety,
you’ve got to
have those
two resources to
build anything
else in your
business on.”*

*Warren Mirtsching,
Senior Vice President,
Food Safety and Quality,
Swift and Co.*

The Foodborne Diseases Active Surveillance Network (FoodNet) was established in 1996 to determine the cause of foodborne illnesses, monitor illness trends, and develop and assess safety interventions.

Scallan said that the CDC considers the advances in reducing risks associated with *E. coli* O157:H7 an industry success story. Since 2004, the number of *E. coli* illnesses has fallen below government goals set for 2010. Compared to the 1996-1998 baseline data, *E. coli* O157:H7 cases of foodborne illness decreased 29 percent in 2005.

TABLE 5

*Reductions in *E. coli* O157 foodborne illness cases compared to 1996-98 baseline.*

Cases per 100,000

Pathogen	2004	2005	2010 Objective
STEC O157	0.9	1.06	1.0

Additionally, the Food Safety Inspection Service has continued to find decreasing rates of *E. coli* O157:H7 contamination in ground beef in its annual assessment.

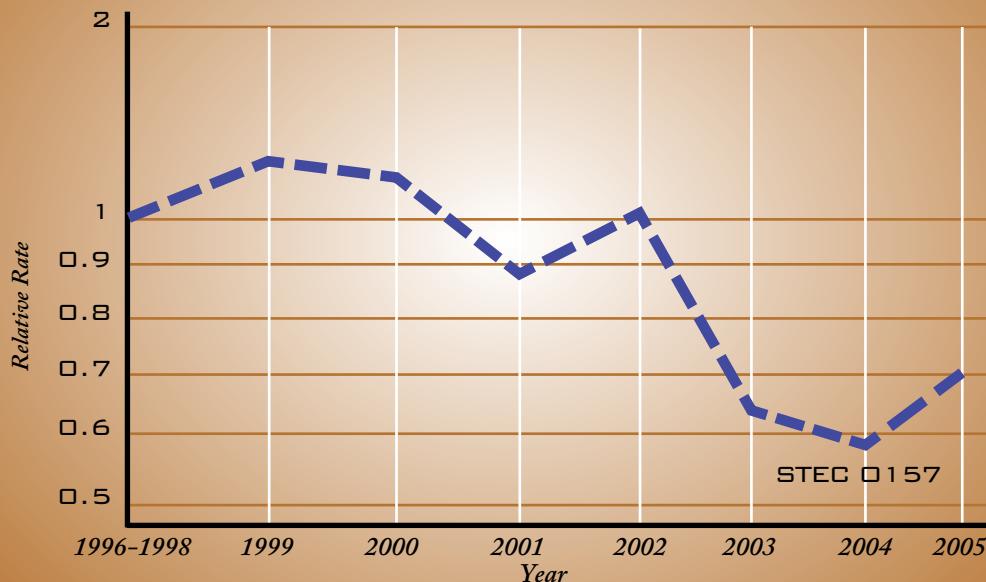
The CDC is currently working with the American Meat Institute to document industry practices to determine what factors contributed to the decline of shiga toxin producing *E. coli*. "We need to take what we have learned from *E. coli* and translate that knowledge to reducing the occurrence of *Salmonella*," said Scallan.

In February 2006, the U.S. Department of Agriculture's Food Safety and Inspection Service announced a comprehensive initiative to reduce the presence of *Salmonella* in raw meat and poultry products. Since the establishment of the 1996-98 baseline data, there has been little reduction in the occurrence of human illness. Of the five most common *Salmonella* serotypes, only the incidence of *S. Typhimurium* has decreased and the majority of the reduction occurred prior to 2000. The CDC in cooperation with the University of Minnesota is conducting a *Salmonella* attribution study to compare subtypes from humans and food animal groups to determine where the majority of infections originate. Attribution for *Salmonella* illnesses is a priority of the FoodNet program.

FIGURE 11

Relative rates compared with 1996-1998 baseline period of laboratory-diagnosed cases of infection with STEC O157 by year.

Foodborne Diseases Active Surveillance Network, United States, 1996-2005



Source: Foodborne Diseases Active Surveillance Network, United States, 1996-2005

TABLE 6

*Healthy People 2010 objectives for *Salmonella**

Cases per 100,000

Pathogen	2004	2005	2010 Objective
Salmonella	14.7	14.55	6.8

In addition to these efforts, the CDC is accumulating evidence of human health consequences of antimicrobial resistant *Salmonella*. The National Antimicrobial Resistance Monitoring System (NARMS) was established in 1996 to monitor development of antimicrobial or multi drug resistance (MDR) among foodborne bacteria. Integrated surveillance programs are conducted by the FDA, CDC and USDA.

Scallan said that based on NARMS data, the CDC has concluded that MDR infections cause more severe illness. The CDC also feels the trends in resistance are high, but stable. The agency does, however, want to identify ways to reduce prevalence of MDR organisms in beef. This comment raised concern among participants about the lack of sufficient attribution data to indicate that beef is a primary source of MDR *Salmonella*. Two of the primary issues that the CDC is concerned about is the prevalence of MDR *Salmonella* in cull dairy cows and identifying predictors for multi-drug resistance.

The CDC currently has programs to address multi drug resistance at the farm level. The Get Smart Program on the Farm includes educational programs to encourage judicious use of antibiotics.

Consumer Food Safety

Presenter: Janet Anderson, Safe Food Institute

Anderson summarized a research project that addressed consumer food safety practices. Participants were told that they were taking part in a consumer research project and were given no indication that their food safety practices were being evaluated. Participants were videotaped as they prepared a recipe and also completed a survey that included questions about food safety.

Highlights from the research project underscored consumers' lack of understanding about proper food handling and preparation techniques. Forty-six percent of the participants undercooked the ground beef entrée. Overall, the results indicated that consumers are not doing what they say they are doing when it comes to safe food handling. The survey was useful for assessing consumer food safety knowledge and attitude, but observational methodologies were necessary to assess consumer food safety behavior.

Consumer Perceptions of Foot and Mouth Disease

Presenter: Rick McCarty, Executive Director, Issues Management, NCBA

McCarty shared recent results of an independently conducted consumer study that highlighted the general public's lack of understanding about foot and mouth disease (FMD).

Consumer perceptions about foot and mouth disease illustrate the need to proactively communicate accurate information. According to McCarty, three principal findings in the study complicate current communication efforts.

- Consumers have little awareness or knowledge about FMD
- Consumers confuse FMD with BSE
- Consumers think FMD is a human health threat

"I think any time you have an industry-wide issue that has consequences for everyone, you're going to get the best answer if you involve everyone in the discussion."

*Mike John,
President,
National Cattlemen's
Beef Association*

FIGURE 12

CONSUMER PERCEPTIONS: FMD IS A HEALTH CONCERN

Nearly 70 percent of consumers think FMD affects humans and 65 percent say people can get it by consuming infected meat.

"People cannot get foot-and-mouth disease—it only affects animals."



"Foot and mouth disease can affect humans who eat meat from infected animals."



FIGURE 13

CONSUMER PERCEPTIONS: FMD VERSUS BSE

Many consumers associate BSE characteristics—recent cases, infected feed—with FMD, which may explain why two-thirds think FMD is a human health concern.



"The best practices documents are guidelines that can be used by every segment of the industry, whether you're a very small facility or whether you're the largest plant out there. The best practices documents define those kinds of procedures or practices that enhance food safety in red meat products."

*Tim Biela,
Chief Food Safety and
Quality Officer,
American Foodservice Corporation*

Communicating Safety in International Markets

Presenter: Lynn Heinze, Vice President, Information, U.S. Meat Export Federation

Food safety issues, whether real or perceived, have had significant effects on foreign trade of U.S. beef products. After the announcement of the first case of BSE in the United States on December 23, 2003 export markets were closed to U.S. beef. While many of these markets have since reopened, two of the largest and most important, Japan and South Korea, have yet to fully reopen their borders to the importation of U.S. beef products. Even after the markets are reopened, there will be significant challenges in regaining lost market share. Much of the promotional work will be conducted by the U.S. Meat Export Federation (USMEF) and will emphasize the safety of U.S. beef. USMEF is a public-private sector cooperative organization with the goal of expanding international markets for U.S. meat products.

Lynn Heinze shared survey information about international consumer attitudes about the safety of beef. Many of the results emphasize that the majority of international consumers say "freshness" is the factor that most impacts their buying decision. For consumers used to "wet markets" however, fresh often means hot meat products. In spite of that, trade barriers still exist that include zero-tolerance requirements on imports for:

- Specific bacteria
- Certain drug and hormone residues
- Bone chips

Heinze also outlined various communication and marketing programs conducted by USMEF. Several campaigns are ongoing in Mexico where trade has already been reopened. Efforts are also present in Japan and South Korea, and are intended to provide assurances to consumers about the safety of U.S. beef and create an environment among consumers conducive to the reintroduction of U.S. beef. Brochures, print advertising, Internet communications, advertorials and television have all been used to communicate with international consumers about the safety of U.S. beef.

Heinz concluded by saying developing confidence in U.S. beef products among international consumers is challenging because:

- Safety is relative
- Safety is the price of admission to the market
- Safety can be a trade barrier
- Confidence favors “locally grown” and “fresh”
- Communication must be culturally sensitive and adapted
- Confidence can only be built over time

FIGURE 14
Mexican attitudes about the safety of U.S. beef are stable

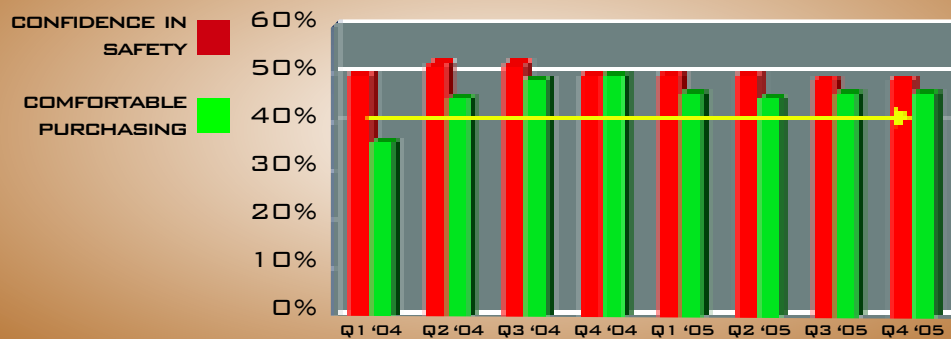


FIGURE 15
South Koreans are more trusting of the safety of U.S. beef

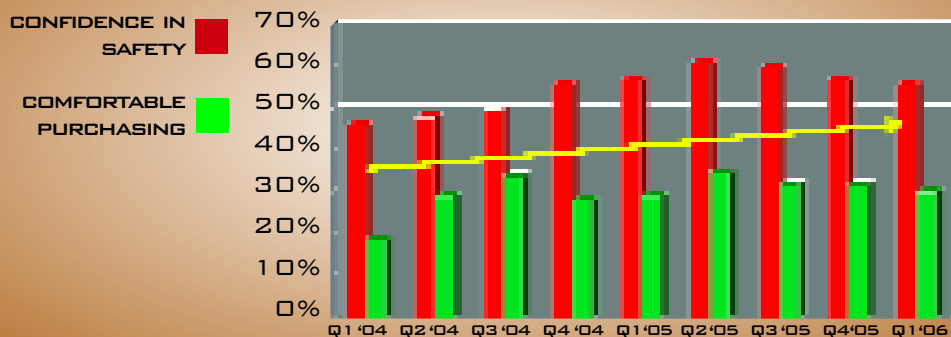
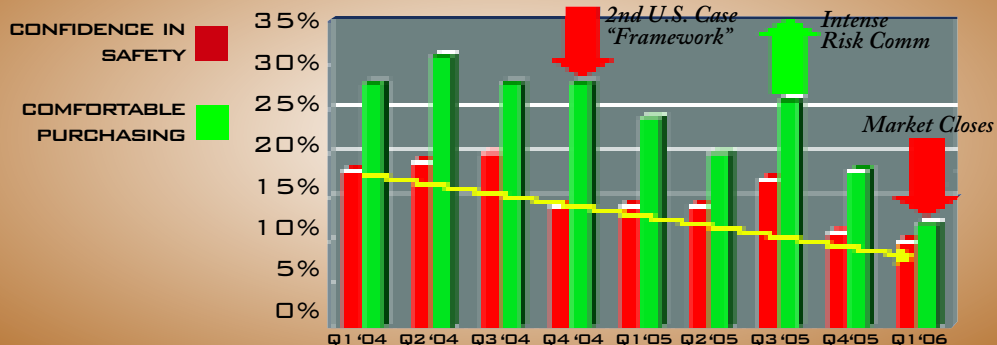


FIGURE 16
Japanese are more wary about the safety of U.S. beef





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FOR MORE INFORMATION CONTACT:

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