



Beef Industry Safety Summit

Executive Summary

March 4-6, 2009 • San Diego, California



Pre-harvest Timeline

Pre-harvest safety interventions were a special area of focus for this year's summit. Research in this area has become critical to improving beef safety and has been ongoing for almost a decade. Applying pre-harvest interventions at the production stage should improve the effectiveness of safety measures already being used at the harvest and processing level.

2001

Some of the initial pre-harvest research funded through the Beef Checkoff focused on feed additives, including chlorate and Tasco, as a means to reduce pathogen shedding rates. Feedlot sample shipping protocols were also evaluated.

2002

Researchers examined the effects of on-farm management practices on pathogen shedding.

2003

During the early part of the decade, research efforts focused on gaining an understanding of the dynamics of *E. coli* O157:H7 in feedlot settings. Projects evaluated management practices on pathogen shedding rates in cattle. Bacterial colonization and the effects of transportation stress on *E. coli* shedding were investigated. Developing effective *E. coli* O157:H7 vaccine technologies and gaining a better understanding of the recto-anal junction's (RAJ) role in pathogen colonization were also key focus areas.

2004

Research efforts expanded to examine the ability of sodium chlorate to reduce pathogen shedding in cattle, as well as its safe use as a pre-harvest intervention. Work to develop effective sampling methods for cattle continued. Additional work evaluating the effect of transportation on pathogen shedding rates in cattle expanded the industry's ability to address safety challenges.

2005

Continuing investigations identified the role of persistent shedders in transferring pathogens. Work also centered on the ability of *E. coli* O157:H7 to survive on cattle hides, nutritional strategies to influence pathogen shedding and the role of dust contamination on cattle hides. Validation of two different *E. coli* vaccines also continued. Another critical hurdle in the arena of pre-harvest interventions occurred when the U.S. Department of Agriculture (USDA) clarified policies regarding licensing of products for pre-harvest safety interventions.

2006

Work continued to evaluate the efficacy of *E. coli* vaccines. Bacteriophages and pond ash were identified and examined as novel methods to reduce pathogen contamination in feedyards. During this period, lairage was identified as a potentially important area for cross-contamination of cattle. The environmental effects of supplementing chlorate were also researched.

2007

Researchers conducted additional investigations involving the RAJ, as well as the role of feeding distiller's grains on pathogen shedding in feedlot cattle. More work investigated the role of dust during cattle load-out on pathogen contamination. Chlorate continued to emerge as an effective intervention. Researchers also investigated the effectiveness of a vaccine to prevent *Salmonella* shedding in beef cattle. While not supported by checkoff funds, another pivotal event included the formation of a working group comprised of USDA, FDA and industry representatives to discuss the regulatory framework for approving interventions to reduce or eliminate *E. coli* O157:H7 at the production level.

2008

Research continued to validate previously identified technologies.

2009

Years of research culminated in a conditional license for EpiTox *E. coli* vaccine. The industry continues to explore additional effective pre-harvest interventions.



Collaboration leads to success

The Beef Industry Food Safety Council (BIFSCo) was created 12 years ago to unite an industry around one issue—providing the safest beef possible for consumers. That cause has allowed industry participants from every stage of production to pool resources and create solutions for safety challenges. The 2009 Beef Industry Safety Summit is an example of one of those solutions. From its beginning in 2003, the summit has become a forum for advancing the industry's commitment to safety.

"The Beef Industry Safety Summit is a success story," said Scott George, a dairy producer from Wyoming and vice chairman of the Federation of State Beef Councils, during his opening remarks. "We are all connected by the challenges to our industry. Thank you for sharing your expertise. Thank you for putting aside your competitive nature and thank you for your support. I take my hat off to you."

Research Update

Research is the foundation on which the industry's safety initiatives have been built. The Beef Industry Safety Summit is one of the premier forums to highlight some of the latest advances and their application within the industry.

Addressing beef safety at the pre-harvest level

Vaccinating against *E. coli* O157:H7 and *Salmonella* shows promise

Company representatives provided information on advancements for three different vaccines. One vaccine was initially developed to address *Salmonella* in turkey production and is also widely used in the dairy industry (Epitopix). Kansas State University researchers are currently testing this vaccine to determine its impact on *Salmonella* in feedlot cattle. Additionally, a second vaccine has been shown to be effective against *E. coli* O157:H7 and the U.S. Department of Agriculture has issued a conditional license to allow for further validation.

Another vaccine (Bioniche) acts by stimulating cattle's immunity against a certain class of proteins that facilitate bacterial attachment to intestinal cells. A recently published study demonstrated a 92 percent reduction in *E. coli* O157 colonization in vaccinated cattle. Another study conducted by the University of Nebraska, Lincoln (UNL) demonstrated that vaccinated (Bioniche) feedlot steers were 43 percent less likely to shed *E. coli* O157:H7 than unvaccinated steers.

Presenters:

Jim Sandstrom, DVM, Epitopix

Gary Weber, Ph.D., Bioniche

David Smith, DVM, Ph.D., University of Nebraska

David Renter, DVM, Ph.D., Kansas State University

Diet and feed supplementation can impact *E. coli* O157:H7 shedding rates

Feeding high levels (40 percent) of wet distiller's grains (WDG) has been shown as a potential risk factor influencing *E. coli* O157:H7 shedding rates in cattle. A UNL study showed cattle fed WDG were 2.1 times more likely to shed *E. coli* O157:H7 than cattle fed the control diet; however, more work should be done in this area as other research studies have demonstrated conflicting results. A separate study conducted by the Meat Animal Research Center indicated that feeding 40 percent wet distiller's grains may increase the prevalence of *E. coli* O157:H7 in cattle, but the differences were not statistically different.

Past research has demonstrated that sodium chlorate supplementation can be an effective means to reduce *E. coli* O157:H7 shedding in cattle. A private company (Ivy Natural Solutions) will be conducting additional efficacy studies during 2009 to satisfy Food and Drug Administration licensing requirements that will potentially expand the use of this compound in pre-harvest beef safety.

Presenters:

David Smith, DVM Ph.D., University of Nebraska

Mike Bosilevac, Ph.D., Meat Animal Research Center

Pat Mies, Ph.D., Ivy Natural Solutions



Novel strategies to decrease the prevalence of pathogens on cattle hides

A washing system that incorporates bacteriophages to reduce pathogen levels on the hides of cattle has been shown to reduce *E. coli* O157:H7 in beef trim by more than 50 percent. Phage technology has been approved for use by the Food and Drug Administration to reduce *Listeria* prevalence in cheese and ready-to-eat meats. Utilizing phages in a hide-washing system is an application that shows promise for improving beef safety.

Colorado State University researchers screened more than 64,000 small molecules for bactericidal activity against *E. coli* O157:H7 and found that 46 were effective against a natural *E. coli* O157:H7 strain isolated from cattle feces. Further investigation revealed that two of the bioactive antimicrobials damage bacterial outer cell layers and alter membrane permeability, suggesting that they will be effective in controlling a broad spectrum of pathogens. These novel chemical compounds may have potential for spray-washing systems.

Presenters:

Pat Mies, Ph.D., Ivy Natural Solutions

Kendra Nightingale, Ph.D., Colorado State University

Salmonella's effect on beef safety

Kansas State University investigators monitored *Salmonella* in feedlot cattle and are currently conducting research to determine if the *Salmonella* detected on the day of harvest is genetically the same as the *Salmonella* isolates identified when the cattle first arrived at the feedlot. The findings will give the beef industry a better understanding of how *Salmonella* is spread and harbored in beef cattle.

A separate study involving several research institutions examined the prevalence of *Salmonella* from cull dairy cows. The project leader said while *Salmonella* was commonly recovered from cull dairy cattle in the Texas High Plains region, most appeared to be of serotypes that are unrelated to human or animal disease, and they were broadly susceptible to antimicrobials. Additionally, any dairies that practiced whole-herd vaccination for *Salmonella* had a significantly lower prevalence than those dairies that did not.

Presenters:

David Renter, DVM, Ph.D., Kansas State University

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

Antimicrobial resistance in pathogenic bacteria

The emergence of multi drug-resistant (MDR) bacteria is an important human health problem currently being addressed through research. A USDA-ARS research project funded by the Beef Checkoff characterized MDR *Salmonella* isolated from cull and fed cattle at harvest in the United States. While prevalence rates were significant on pre-evisceration carcasses, the study also demonstrated that multiple hurdle interventions reduced *Salmonella* carcass contamination by 98.4 percent.

Colorado State University researchers conducted a study examining the prevalence of potentially antibiotic-resistant bacteria in water and fecal samples from farm, urban and natural environments. The results show antibiotic-resistant bacteria were most prevalent in fecal samples from urban environments, but were similar for water samples from all of the areas. This type of research contributes to a better understanding of the levels and distribution of antibiotic-resistant bacteria in agricultural and non-agricultural environments.

Presenters:

Dayna Harhay, Ph.D., Meat Animal Research Center

John Sofos, Ph.D., Colorado State University

There is no other model like BIFSCo in the food industry where there is no veil of secrecy about what competitors are doing when it comes to food safety. For the beef industry, safety has become a non-competitive issue, and as a result everyone benefits. — Tim Biela

American Foodservice Corporation

Small beef processors benefit from safety research

Research addressing beef safety has been limited in small and very small processing facilities; however, these operations are critical to the industry's success. BIFSCo participants have advocated sharing best practices with smaller facilities, and additional research work is being conducted in this segment. One study presented by a Meat Animal Research Center researcher evaluated *E. coli* O157:H7 and *Salmonella* in small processing plants to provide baseline data for facilities processing less than 1,000 head. Another study evaluating the impact of antimicrobial interventions in very small facilities found that carcasses receiving three interventions had greater reductions in aerobic bacterial plate counts versus those that only received one intervention.

Presenters:

Mick Bosilevac, Ph.D., Meat Animal Research Center

Dennis Burson, Ph.D., University of Nebraska



Technical Workshops

Designing a safer ground beef patty

Panelists:

Tim Biela, American Foodservice

Angie Siemens, Ph.D., Cargill Meat Solutions

It's one of America's favorite foods, and in fact, approximately 14 billion pounds of ground beef were consumed in 2007, but ground beef has also been a safety challenge due to its inherent nature. Many of the beef-related food safety recalls over the past several years have been associated with frozen retail ground beef patties. According to the panel, several reasons for this exist, including the fact that consumers often prefer undercooked ground beef. Additionally, findings have demonstrated that the cooking instructions for various types of ground beef products do not align themselves to the cooking method that is often employed, and not all product formulations will be equally as safe depending on the type of cooking method used.

The panel and workshop participants explored recommendations for processors to offset these challenges, including:

- Focus on ground beef texture as it will impact how patties cook.
- Evaluate patty configuration, including weight, size and shape, which all impact how a product performs when cooked

In summary, the panel made several best practice recommendations for processors to improve the safety of frozen ground beef patties destined for the retail segment.

- Control supply and work with targeted sources
- Create and implement supportable testing programs
- Focus on proper processing and product attributes that enhance safety and ensure consistent cooking performance in a variety of situations
- Focus on cold chain management throughout the production system
- Formulate products that meet consumer needs and limitations



The summit is a very good example of how the checkoff dollar is being used in a very productive and very focused way and I think the results of what this initiative has achieved over the last 10 to 12 years no doubt will speak for itself. — Forrest Roberts

National Cattlemen's Beef Association

Recall wisdom

Panelists:

Lon Doty, United Food Group

Daren Williams, NCBA

Two speakers with firsthand knowledge about the impact of food recalls on the industry's reputation and business survival offered summit attendees insights on how to prepare for and address such a crisis. Both panelists emphasized the need to prepare for crisis situations before they happen, and to develop a crisis process that can adapt to a variety of different situations.

In his presentation, Williams emphasized that the integrity of a company can be at stake when dealing with a recall situation, and it is important to put consumers first to protect a company's position in the marketplace. "Compliance with the law is the minimum ethical standard, when communicating with your customers," he said.

Doty spoke about his experiences in 2007 when 5.7 million pounds of ground beef were recalled by his company due to an *E. coli* O157:H7 contamination. He said conflicts between state and federal agencies were a major challenge as his company was trying to address the recall. One of the largest ground beef processors in the country, United Food Group, has emerged from this crisis with a newfound focus. "We used this as a huge learning opportunity to improve our traceability speed and to improve our supplier programs. The recall was also an opportunity for us to improve our media preparedness, which is critical in this type of situation."

Williams also recommended that companies conduct mock recalls, and involve their customers if possible. "You can use this drill to find vulnerabilities and test your system after hours, on holidays, and when key personnel aren't present," he added.

How do you define adulteration?

Panelists:

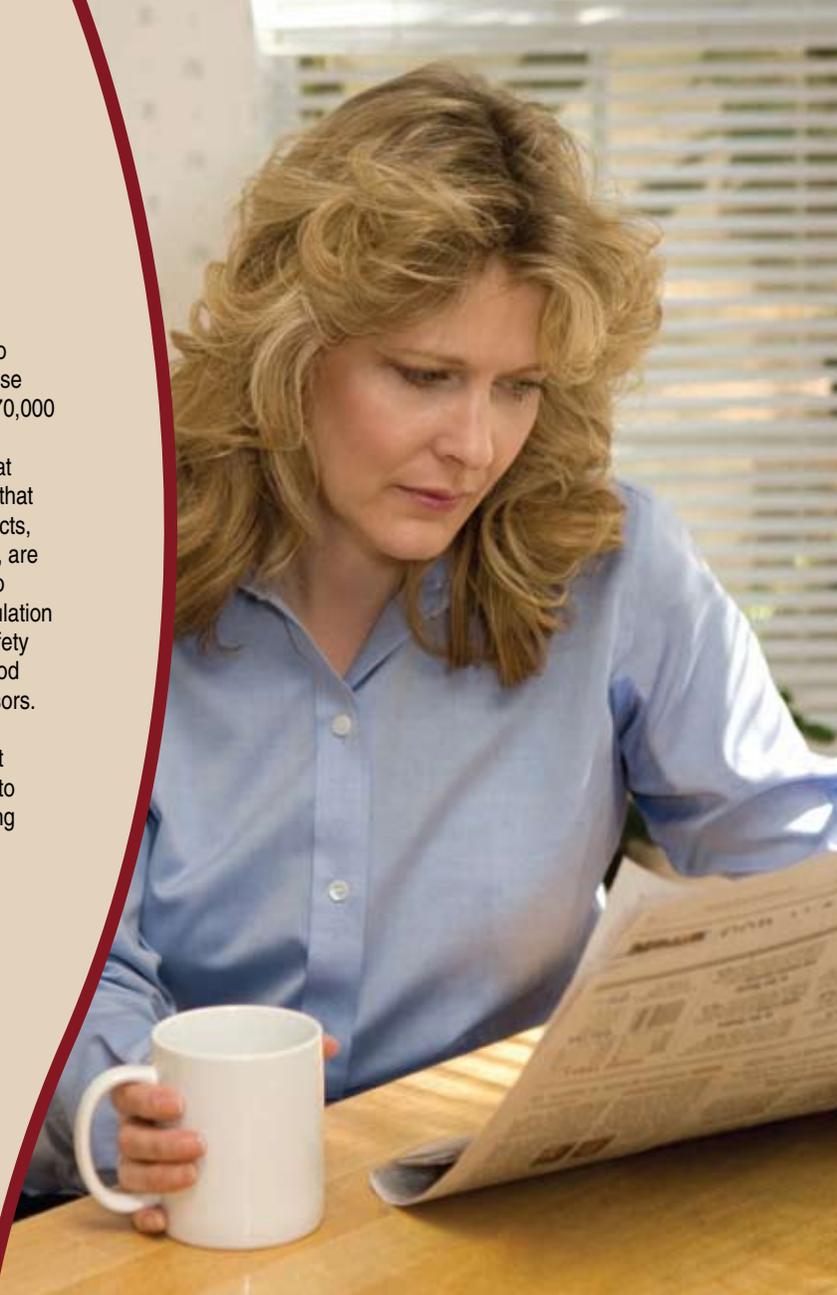
Mel Kramer, Ph.D., M.P.H., EHA Consulting
James Reuss, Lane Alton & Horst, LLC

In the beef industry, “adulteration” takes on a whole new meaning in terms of consumer safety and regulatory requirements. The panelists reviewed the impacts of *E. coli* O157:H7 on human health since this pathogen was first recognized as a disease-causing organism in 1982. The presenters also discussed procedures that are commonly employed by government in disease outbreak investigations. The Centers for Disease Control (CDC) estimates 70,000 cases of illness due to *E. coli* O157:H7 in the United States annually. In 1999, the FSIS administered a regulatory program under the Federal Meat Inspection Act (FMIA) aimed at preventing the distribution of meat products that are adulterated by pathogens. FSIS explained that “if non-intact beef products, including beef that has been mechanically tenderized by needling or cubing, are found to be contaminated with *E. coli* O157:H7, they must be processed into ready-to-eat product, or they would be deemed to be adulterated.” This regulation has had a significant impact on how processing facilities implement their safety programs. The panelists reviewed past outbreaks and litigation related to food safety outbreaks and their impact on the regulatory environment for processors.

The speakers reminded all beef suppliers and processors in attendance that documentation of their standard operating procedures are key components to not only ensuring the integrity and safety of their products but also minimizing negative impacts on their businesses in the event of a foodborne illness.

The Beef Checkoff Program has invested approximately \$28 million in beef safety research since 1993. The relationships developed with other sectors of the beef industry, including packers and processors, have meant that the information generated through checkoff-funded research is being implemented in facilities across the United States. As a result, those sectors are adding approximately \$350 million worth of private funding per year to the checkoff investment in beef safety. — Bo Reagan

National Cattlemen’s Beef Association



Communicators’ Forum

A Communicators’ Forum was held during the Beef Industry Safety Summit to discuss safety communication challenges, opportunities for proactive outreach and the various resources available to contribute to those efforts. Major challenges identified by the group included:

- Consumer and media lack of understanding regarding bovine spongiform encephalopathy
- Misconceptions that locally produced products are safer than conventionally produced products
- Distribution of large amounts of misinformation versus few opportunities to proactively address issues
- Anti-beef and activist information that pervades consumer media
- Emerging issues such as *C. difficile* and non-O157 *E. coli* that are unfamiliar to consumers
- Lack of industry knowledge by regulators, thus complicating issues

Issues Update Forum

The Beef Industry Safety Summit concluded with presentations focused on emerging topics that have the potential to impact beef safety.

Non-O157 shiga toxin-producing *E. coli* presented by Mansour Samadpour, Ph.D., IEH Laboratories

While *E. coli* O157:H7 has emerged as the most virulent form of *E. coli*, other strains can potentially represent consumer safety risks. Generic *E. coli* that do not necessarily represent a health risk could become infected with shiga toxin phages and become pathogenic. Researchers are working on gaining a better understanding of non-O157 shiga toxin *E. coli* (STEC) and their impact on beef safety and public health.

Samadpour expressed concerns that regulatory agencies and the research community have not agreed on the definition of these organisms, and as a result no official methods are available for screening. The lack of distinction between the pathogenic and non-pathogenic STEC will have tremendous consequences for the food industry should STEC be regulated as adulterants.

***Mycobacterium avium* subspecies *paratuberculosis* presented by Robert Whitlock, DVM, University of Pennsylvania**

Johne's Disease (caused by *Mycobacterium paratuberculosis*) is a cattle disease related to the tuberculosis organism. This chronic bacterial infection leads to weight loss and diarrhea in cattle. A possible relationship has been suggested between Johne's Disease in cattle and Crohn's Disease in humans; however, no definitive conclusions regarding this potential connection have been drawn and, according to Whitlock, more research needs to be done.

ProSafe Beef presented by Robert Mandrell, Ph.D., USDA-ARS

Beef safety is not just an issue that the U.S. beef industry has had to address. *E. coli* O157:H7 and other pathogenic bacteria have also had damaging effects on consumer confidence and demand in the European Union. On behalf of Geraldine Duffy, Ph.D., Head of the Food Safety Department for Ashtown Food Research Centre, Dublin, Ireland, Mandrell presented an overview of ProSafeBeef. The project aims to boost consumer confidence and ensure sustainability of the European beef industry by providing assurances about beef safety and enhancing beef safety, quality and diversity in healthy beef products.

Consumer perceptions of beef safety presented by Jacque Matsen, NCBA

This is really where the "rubber meets the road," when it comes to ensuring that not only are the real risks of beef safety addressed, but also the perceived risks, which can have a potentially negative effect on beef demand. Matsen presented results from checkoff-funded research that showed consumers will consider limiting their beef intake or completely eliminating beef from their diet for perceived safety reasons. The Beef Demand Index indicated that a 10 percent increase in beef recalls correlates to a 0.2 percent decline in beef demand. "From 2006 to 2007, beef recalls increased from 18/year to 38/year and retail demand dropped 2.6 percent," said Matsen.

Additional research showed consumers do believe the industry has improved beef safety compared to five years ago. Eighty-eight percent of consumers surveyed believe beef is as safe, or safer than it was five years ago. Consumers also appear to recognize industry efforts to improve beef safety. "When we asked consumers whether or not they agreed or disagreed with the statement that 'the entire beef industry is working together to assure safe and wholesome products,' 81 percent responded favorably," said Matsen.

To offset the negative impact beef recalls and safety issues can have on demand, Matsen said proactive messages should focus on the industry's commitment to safety, including publicizing research results on safety interventions. It is also important to reach consumer influencer organizations with the safety commitment message. Secondary messages should focus on consumers' role in beef safety including safe storage, handling and preparation tips.

The road ahead leads in one direction

Dave Theno, Ph.D., former senior vice president for quality and logistics for Jack In the Box, knows firsthand the devastating effects a food safety crisis can have on a company and the customers it serves. In his closing remarks at the 2009 Beef Industry Safety Summit, Theno reminded the attendees, "Safety is the one thing you bet your business on every day." Theno added, "We have to collaborate. We are stronger working in a collaborative world than when we are working apart."



Please plan to join us for the
2010 Beef Industry Safety Summit
in Dallas, Texas.
March 3-5, 2010
Plans for next year's Summit
will be posted on www.bifsc.org.



Funded in part by
The Beef Checkoff

For more information about the Beef Industry Food Safety Council's activities, visit www.bifsc.org.