

## Foundation Board Approves Research Recommendations

The Foundation's Board of Directors met in January 2019 to review and approve research funding recommendations made by the Foundation's Research Advisory Committee. Three new projects were approved for funding. Two of the three projects focus on nutrition sciences, which was added to the research scope in 2018.

### **How Does Analytic Approach Impact Pathogen Population Structure When Analyzing Whole Genome Sequence Data?, University of Minnesota, IBM**

The overall goal of this project is to support an accurate, reproducible, transparent and uniform approach to whole-genome sequence (WAGS) analysis for purposes of outbreak detection and pathogen surveillance. The overarching objective is to demonstrate how different analytic approaches to whole-genome sequence analysis can impact analysis results.

*Research funded in part by the Beef Checkoff.*

### **Effects of Red Meat Consumption on Gut Microbiota in Young Adults, Purdue University, University of Colorado**

Gut microbiota are an important contributor to human metabolic health and the impact of animal-based foods — unprocessed and processed red meat in particular requires investigation. Results from a recent study with rats suggest that consuming processed vs. unprocessed red meats may differentially influence gut microbiota profile. This project intends to determine the effect of unprocessed and processed red meat on gut microbiota.

*Research funded in part by the Beef Checkoff.*

### **Meat as a First Solid Food on Risk of Overweight and Neurodevelopment in Infants, University of Colorado Anschutz Medical Campus, University of Colorado Denver**

Early complementary feeding is a unique and malleable period to prevent rapid weight gain and later obesity, and is also a critical phase for neurodevelopment. Meat is an excellent source of high-quality protein and micronutrients, which are critical for the normal development of older infants. This research will conduct a randomized controlled trial to comprehensively evaluate the effect of meat on growth, body composition, risk of overweight and neurodevelopment, with a protein intake at the reported population median. Findings from this study will be generalizable and help inform future dietary guidance.

*Research funded in part by the Beef Checkoff.*

All three projects are jointly funded under the Foundation's contract with the Beef Checkoff to conduct post-harvest beef safety and processed beef nutrition research. Additional details will be shared on these projects as research is underway.

The Foundation's Research Advisory Committee will meet in late April to identify research topics for the 2019-2020 request for proposals.



## Research on Antimicrobial Resistance in Ground Beef Presented at IPPE TECHTalks

Research funded by the Foundation through its contract with the Beef Checkoff was presented during TECHTalks at the International Production and Processing Expo (IPPE) in Atlanta, GA in February. TECHTalks are designed to provide exhibiting companies with an additional opportunity for dialogue and discussion with IPPE attendees about specific, individual topics. The study, conducted at Colorado State University and USDA-ARS-U.S. Meat Animal Research Center, characterized and determined the extent of antimicrobial resistance in retail ground beef products from naturally-raised (raised without antibiotics) and conventionally-raised cattle. Ground beef products were collected from retailers from six major metropolitan areas throughout the United States. A total of 50 natural and 50 conventional ground beef products were sampled from each city. All samples collected differed in packaging types, lean points, brands, and retailers.

Research findings provide strong evidence against claims suggesting that production systems significantly impact the resistome of ground beef samples purchased at retail. The impact of variations in tetracycline resistance between production systems on human health are likely negligible considering that treatment using tetracyclines in humans is extremely rare. Of the genes detected that confer resistance to critically important antimicrobials, most were detected at low concentrations making it difficult to interpret the clinical relevance as the differential threshold at which AMR in meat becomes clinically relevant is not defined. Overall, the results from this study suggest the impact of antimicrobial use during beef production on the ground beef microbiome and resistome are minimal since the city that samples were collected from frequently had a greater impact on the microbiome and resistome.

## Research on the Contribution of *Salmonella* Harborage Sites in Ground Poultry Published

Research funded in part by the Foundation was recently published in *Frontiers in Sustainable Food Systems*. The abstract follows:

The role of invasive *Salmonella* in contamination of ground poultry is poorly defined. *Salmonella* harborage sites were determined in experimentally infected chickens and turkeys. Bioluminescent-tagged *Salmonella* were used to follow their spread in bone, meat, and skin following infection. Immunohistochemistry and culture were used to localize *Salmonella*. Chicken neck skin was positive for *S. Heidelberg* and *S. Typhimurium* throughout the experimental period, and the bacteria were localized on the stratum corneum of the epidermis and feather follicles. *S. Heidelberg* and *S. Typhimurium* were intermittently detected in drumstick muscle of chickens, with *Salmonella* primarily localized in connective tissues and lymphatics. Twenty percent of the drumstick muscles were culture positive for *Salmonella* in chickens at 42 days of age. Blood and tibiotarsus bone were culture positive for *S. Heidelberg* and *S. Typhimurium* during the first two weeks of infection. *Salmonella* levels in neck skin and muscle were <102 CFU/g in chickens at 42 days of age. Multiple *S. Heidelberg* isolates associated with foodborne outbreaks were used to infect chickens and turkeys to determine whether some strains attained high abundance in the muscle of infected birds. No chicken drumsticks or thighs were *Salmonella* positive by bioluminescence in chickens at 42 days of age (n = 210). In turkeys, all drumstick muscles (n = 132) and tibiotarsus bone (n = 93) were negative for *S. Heidelberg*. Thirty percent of the breast skins (n = 93) were culture positive for *S. Heidelberg* when turkey hens were 11 weeks old. *S. Heidelberg* were primarily localized on the stratum corneum of the epidermis in turkeys. Exclusion of skin from ground poultry products may be the best option for reducing *Salmonella* contamination in ground chicken and ground turkey.

Rimet C-S, Maurer JJ, Pickler L, Stabler L, Johnson KK, Berghaus RD, Villegas AM, Lee M and França M (2019) *Salmonella* Harborage Sites in Infected Poultry That May Contribute to Contamination of Ground Meat. *Front. Sustain. Food Syst.* 3:2. doi: 10.3389/fsufs.2019.00002

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## Foundation Exhibits at Consumer Food Safety Education Conference.

The Foundation, through its contract with the Beef Checkoff, sponsored the Consumer Food Safety Education Conference on March 6-8, 2019, in Orlando, FL. Conference attendees explored influences on consumers, ways to affect behavior change and ways forward to better engage everyone in modeling proper food preparation and hand hygiene practices. The Conference also provided an opportunity to network and engage with nearly 400 food safety professionals. A survey of attendees found that 93 percent of respondents learned strategies for increasing adherence to safe food handling behaviors among consumers. The Foundation shared beef safety resources during exhibit hours.



## Foundation Education Programs Schedule of Events

### **Advanced *Listeria monocytogenes* Intervention and Control**

Hilton KCI  
Kansas City, MO  
April 17-18, 2019

### **Center of the Plate Training**

Aloft College Station  
College Station, TX  
June 18– 20, 2019

### **Pathogen Control and Regulatory Compliance in Beef Processing Conference**

Rosemont, IL  
September 4-5, 2019

*For more information on these programs, please visit the events page at [www.meatinstitute.org](http://www.meatinstitute.org).*

## **Current Research Projects**

### **Effects of Product Moisture and Process Humidity on Pathogen Lethality during Continuous Cooking of Meat and Poultry Products, Michigan State University**

The overall goal of the project is to provide supporting scientific evidence to document compliance with Appendix A, particularly with respect to the impact of process humidity on *Salmonella* lethality in high-temperature, short-time cooking processes. Research will be conducted using beef patties; restructured chicken patties; breaded, chicken nuggets; whole-muscle chicken breasts; and whole-muscle steak strips. *Research funded in part by the Beef Checkoff, Beef Industry Food Safety Council, and the U.S. Poultry and Egg Association.*

### **Development and Validation of Dynamic Predictive Models for Growth and Toxin Formation by *Staphylococcus aureus* in Low Temperature Cooked Products, University of Georgia**

The overall project goal is to develop and validate predictive models for growth and toxin formation of *Staphylococcus aureus* in uncured roast beef, bacon and hams. *Research funded in part by the Beef Checkoff and Beef Industry Food Safety Council.*

### **Pathogen Growth in Alternatively Cured Ham and Bacon during Cooking, Cooling, and Process Deviations, Iowa State University and Smithfield Foods**

The overall goal of the project is to determine the inhibitory effect of nitrite from a natural source (i.e., pre-converted celery juice powder) in processed meat products with a natural label during “real world” cooking and chilling procedures, which often include instances of process deviation, as well as non-continuous cooling.

### **Validating Growth Models for *Clostridium perfringens*, *Clostridium botulinum*, and *Bacillus cereus* during Cooling of Uncured Meat and Poultry Products, University of Wisconsin**

This project will develop data to determine the validity of the revised Option 2 cooling guidelines for uncured meat products, specifically to determine if Phase 1 cooling (from 120 to 80°F) can be extended from the currently outlined 1 hour limit. An uncured turkey breast meat will be used in the model. *Research funded in part by the Beef Checkoff, Beef Industry Food Safety Council, and the U.S. Poultry and Egg Association.*

### **Maintenance for Literature Review: Efficacy of Interventions on Pathogens in Processed Meats and Poultry Products, University of Wisconsin**

This project will update and expand the version one of the tabular summary of references describing antimicrobial interventions that have been tested in processed meat and poultry products. The key project objective is to provide small and very small establishments with an accessible, searchable, user-friendly tool to help them identify interventions and suitable scientific support to meet HACCP system validation requirements. *Funded in part by the Beef Checkoff.*

### **Intervention Validation: A Review — Continued Maintenance, Texas A&M University**

This project will review newly identified and/or published literature that encompass multiple commercially applicable intervention strategies against biological hazards of concern for fresh meat and poultry. *Funded in part by the Beef Checkoff.*

### **Tests of *Salmonella* Sub-unit Proteins as Vaccines for Broiler Chickens, USDA-ARS U.S. National Poultry Research Center**

This project will identify the *Salmonella* protein antigens that are able to induce humoral immune response in broilers, and consequently these antibodies can prevent *Salmonella* colonization in the broiler gastrointestinal tracts.

## Current Projects Continued

### Validation of Post-Harvest Antimicrobial Interventions to Control *Salmonella* on Market Hog Carcass Surfaces and Pork Products, Kansas State University

This study will validate the efficacy of lactic acid, sulfuric acid sodium sulfate, bromine, 180°F water, and peracetic acid as post-harvest interventions against *Salmonella*, as well as the impact on product color attributes, on pork carcasses and trim.

### Research Priority Setting Meeting for Certain By-Products

There is limited research on the impact of rendering on foodborne pathogens, particularly with the implementation of the Food Safety Modernization Act. The Foundation will work with allied stakeholders in the rendering, pet food and cosmetic industries throughout North America to assemble a meeting where industry standards can be discussed to better inform future research priorities and projects. There is a dearth of critical parameters for this type of research.

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