


FOUNDATION FOCUS

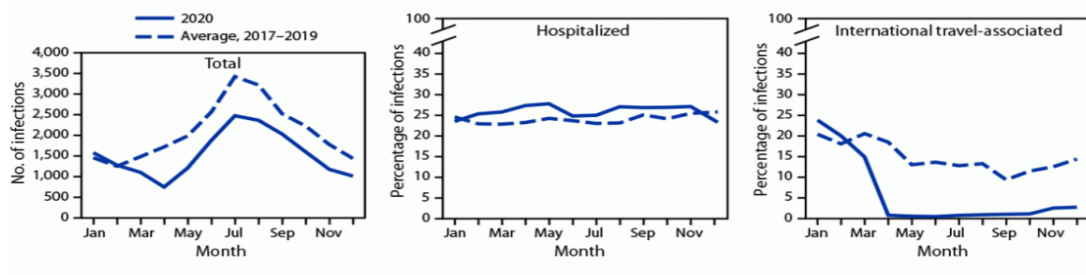


2020 FOODNET REPORT SHOWS DECLINE IN FOODBORNE ILLNESSES

Reported infections from pathogens transmitted commonly through food significantly decreased in the United States in 2020, according to [a preliminary report](#) from the Foodborne Diseases Active Surveillance Network (FoodNet). Overall incidence of infections caused by these pathogens fell by 26 percent, the largest single-year change during 25 years of FoodNet surveillance. Reported incidence decreased for almost all pathogens. *Campylobacter* and *Salmonella* remain the most commonly reported infections.

Incidents associated with international travel declined markedly due to Federal travel restrictions. The decline in incidents could also be explained through pandemic related changes to daily life and hygiene behaviors, including increased handwashing. Also, changes in health care delivery, health care-seeking behaviors, and laboratory testing practices, might have decreased the detection of enteric infections.

FIGURE 1. Number of laboratory-diagnosed bacterial and parasitic infections, percentage of patients hospitalized,* and percentage with international travel,† by month — Foodborne Diseases Active Surveillance Network, 10 U.S. sites,§ 2017–2020¶ 



2021-2022 REQUEST FOR PROPOSALS

The Foundation conducted its annual request for proposals over the summer. The research priorities were developed by the Foundation's Research Advisory Committee and represent immediate research needs for Foundation funding. Proposals were invited in the areas of [meat and poultry food safety](#); [product quality](#); and [nutrition sciences](#). Preliminary reviews are complete and proposals have been selected for further development. Proposals will be reviewed in late 2021 with recommendations made for funding to the Foundation's Board of Directors in January 2022.

MEAT INDUSTRY FOOD SAFETY CONFERENCE

From August 8 to September 9 the North American Meat Institute and the Foundation for Meat and Poultry Research and Education hosted a hybrid [Meat Industry Food Safety Conference](#), which included in-person sessions on August 25-26 in Chicago, IL. Research jointly funded by the Foundation and Pork Checkoff addressing *Salmonella* in pork lymph nodes was presented. In addition, three *Salmonella* risk assessment focused research projects funded by the Beef Checkoff and administered by the Foundation were presented. An overview of these projects are included in the Current Research Projects section of this newsletter.

The Beef Checkoff, under the Foundation's administration, also sponsored the Conference and specifically a virtual session entitled, "*Salmonella*: State of Play for the Meat Industry," which outlined regulatory and outbreak related developments over the past several years and what is expected in the near future. The Beef Checkoff also sponsored a live session on "The Curious Confounding Role of *Salmonella* enterica Serotype Dublin," which reviewed the epidemiology of the emerging pathogen *Salmonella* enterica serotype Dublin and offered an overview of research that identified an uncharacteristic relationship between S. Dublin and indicator microorganisms when compared to other non-typhoidal *Salmonella* spp. in raw beef samples.

FOUNDATION SECURES FY 22 BEEF CHECKOFF FUNDING

The Foundation for Meat and Poultry Research and Education received \$500,000 in FY22 to conduct research on behalf of the Beef Checkoff. Research will address post-harvest beef safety.

"The Foundation is thrilled to be able to continue to administer research on behalf of the Beef Checkoff," said Susan Backus, President, Foundation for Meat & Poultry Research & Education. "The Checkoff investment in post-harvest beef safety research is critical to expanding the knowledge base; ensuring consumer and customer trust in beef products; and providing value to beef producers by demonstrating that beef products are safe and nutritious."

Research funding will be used toward projects addressing current knowledge gaps; facilitating the dissemination of research data and knowledge sharing through meetings, or other events targeted to appropriate stakeholders; assessing research impact over time by cataloging citations for research funded by the Beef Checkoff and administered by the Foundation; developing tools that share post-harvest research results or summarizing research to provide guidance and information for beef processing facilities of all sizes.

Post-harvest beef safety research could address any appropriate research priorities identified by the Foundation's Research Advisory Committee, which may include but are not limited to:

- developing rapid methods for quantitative *Salmonella*;
- identifying and validating antimicrobial interventions to reduce pathogen contamination of raw ground beef components intended for use in ground products; and
- investigating efficient and sustainable application of antimicrobials to reduce pathogens on beef products.

RECENTLY COMPLETED RESEARCH SUMMARIES

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

Diet strongly affects human metabolic health, partly by modulating gut microbiome. The study assessed the effects of adding unprocessed or processed lean red meats to a healthy U.S.-style lacto-ovo vegetarian eating pattern on gut microbiota. Cardiometabolic disease risk factors were also measured. Among healthy young adults, converting a healthy U.S.-style lacto-ovo vegetarian eating pattern to a healthy U.S.-style omnivorous eating pattern by adding moderate amounts of unprocessed or processed lean red meats, does not influence the overall gut microbial structure, or improvements in selected blood lipids and lipoproteins in the short term.

Research funded in part by the Beef Checkoff.

Validation of a novel method for the detection of select *Salmonella* serovars in raw meat enrichments, USDA-ARS-Meat Animal Research Center

The project will evaluate the sensitivity and specificity of a novel multiplex PCR assay for the detection of four of the leading disease causing *Salmonella* serotypes, including Enteritidis, Typhimurium, 1,4,[5],12:i:-, and Newport, as well as the invasive serotype Dublin (DENT serotypes). The data collected show that the assay has great efficacy for identifying DENT serotypes when isolated from meat enrichments, with overall sensitivity of 98.9% and specificity of 94.1%. However, the level of *Salmonella* reached in enrichments was not consistently sufficient to yield template DNA levels needed to produce HPS banding patterns consistent with the isolates from those enrichments.

Research funded in part by the Beef Checkoff and the National Pork Checkoff.

Using Rapid Evaporative Ionization Mass Spectrometry (REIMS) as a novel, minimally invasive, real time method for characterization of metabolic variation contributing to flavor, tenderness, and color stability of beef, Texas Tech University, USDA-ARS-Meat Animal Research Center

This project explored the ability of REIMS as a real time predictor of beef tenderness and sensory attributes, including flavor and evaluate the ability of REIMS as a real time measure and predictor of color stability of beef longissimus steaks. REIMS was successful in characterizing color and color stability differences due to the substantial amount of variability of color in the samples. Contrarily, the low levels of variability in flavor and tenderness in the samples could be the cause for the diminished ability of REIMS to separate flavor and tenderness performance groups.

FUNDED BY THE BEEF CHECKOFF AND ADMINISTERED BY THE FOUNDATION

Efficacy of common antimicrobial interventions at and above regulatory allowable pick up levels, Texas Tech University

The project evaluated the food safety efficacy of common antimicrobial interventions at (0.49%) and above required uptake levels for processing aids through spray and dip applications. The study found an increase in uptake percentage of antimicrobial intervention on beef trim results in an increase of reduction of pathogens like *E. coli* and *Salmonella*. The antimicrobial interventions did not influence the quality of ground beef at different lean levels.

RECENT RESEARCH FINDINGS

Research funded by the Foundation and Beef Checkoff was recently published in the journal *Applied Microbiology*. The abstract follows:

In the US, sodium and potassium nitrite are regulated food preservatives that prevent the germination of *Clostridium* spores in cured and processed meats. In recent years, the use of vegetable-derived nitrite (i.e., vegetable nitrate fermented to nitrite) has been designated as 'natural nitrite' to accommodate natural meats that cannot use artificial ingredients, and such meat products can be labeled as having 'no added preservatives'. This new status and labelling allowance for microbially-modified nitrite provides for a 'clean label' application of nitrite against the stigma of chemical ingredients and has found increased use within the processed meat industry. The objectives of this study were to examine *Clostridium sporogenes* as a pathogen-surrogate challenge organism and the use of vegetable (celery) nitrite to prevent spore germination in cooked meat products. A three-strain spore crop of *C. sporogenes* ATCC 3584, ATCC 19404 and ATCC BAA-2695 was applied during ingredient formulation of low and high-fat hotdogs that were divided into three sub-batches (control without nitrite, hotdogs with sodium nitrite, hotdogs with celery nitrite). In both low and high-fat processes, sodium nitrite was compared to hotdogs made with comparable levels of celery nitrite (156 ppm). All treatments were performed with duplicate trial replication and triplicate sample testing within each trial. Comparisons were analyzed by repeated measures analysis of variance to determine significant difference ($p < 0.05$) of time course treatments. In shelf-life assays, growth was inhibited at both 5 °C and 15 °C, even if nitrite was absent; however, spore germination and growth readily occurred at 35 °C. Comparison of nitrite effects was best evaluated at 35 °C as a permissive condition to examine the effects of nitrite treatments. Celery nitrite showed no significant difference from sodium nitrite when used in both low and high-fat hotdogs, and spore outgrowth was only observed after 2–3 days at 35 °C compared to hotdogs without nitrite. Application of bacteriocin preparations in the formulation that were effective against *Listeria monocytogenes*, and moderately inhibitory towards the 3-strain spore mixture of *C. sporogenes*, were not effective in spore control in manufactured hotdogs. The nitrite validation hotdog trials described herein demonstrates that (celery or sodium) nitrite may prevent *Clostridium* spore germination for 24–48 h even under permissive conditions to help keep processed meat safe.

Bhusal, Arjun, Jacob Nelson, Dennis Pletcher, and Peter M. Muriana 2021. "Comparison of Sodium Nitrite and 'Natural' Nitrite on the Inhibition of Spore Germination and Outgrowth of *Clostridium sporogenes* in Low- and High-Fat Frankfurters" *Applied Microbiology* 1, no. 1: 104-122. <https://doi.org/10.3390/applmicrobiol1010009>

2021 BOARD OF DIRECTORS

The Foundation for Meat and Poultry Research and Education is governed by a Board of Directors, which provides scientific leadership and financial oversight, and acts upon recommendations from the Foundation's Research Advisory Committee. The North American Meat Institute's Executive Board is afforded the opportunity to serve on the Foundation's Board of Directors or appoint a designee to serve on their behalf. In an effort to broaden the scope of influence and direction, representatives from the livestock (beef, pork, poultry and egg), retail, academic, government agency and consumer sectors, among others, are invited to serve on the Board of Directors. Terms are for one year.

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2020-2021 RESEARCH ADVISORY COMMITTEE

The Foundation's Research Advisory Committee (RAC) develops meat and poultry research priorities which serve as the basis for the Foundation's research agenda and also communicates the areas of greatest research needs to the government, public and interested stakeholders. The RAC is made up of four subgroups across minimally processed (fresh) meat and poultry safety, further processed meat and poultry safety, nutrition sciences and product quality.

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Tommy Wheeler, USDA, ARS, U.S. Meat Animal Research Center
Barry Wiseman, Triumph Foods

CURRENT FOUNDATION RESEARCH PROJECTS

Current Knowledge and Gaps on the Mechanistic Development of Cancer in Humans Associated with Processed Meat and Poultry Product Components, University of Wisconsin-Madison

The overall goal of this proposed project is to deliver a comprehensive, current, and objective review of the mechanisms by which components found specifically in processed meat and poultry products have been proposed to influence the development of human cancers. A key supporting objective is to identify potential gaps in mechanistic knowledge to inform future research in this area.

Research funded in part by the Beef Checkoff.



Effect of clean label antimicrobials on the inhibition of *Clostridium perfringens* and *Bacillus cereus* during extended cooling of uncured beef and poultry products, University of Wisconsin-Madison, Cargill

This study will compare the effect of clean label antimicrobial ingredients on the inhibition of *Clostridium perfringens* and *Bacillus cereus* in model uncured beef and poultry products, having different moisture, pH, and salt contents, with a primary focus on extending Phase 1 cooling from 120 to 80°F.

Research funded in part by the Beef Checkoff.



Maximizing the dietary pattern of older adults: the effects of protein intake on protein kinetics, University of Arkansas for Medical Sciences

The overall project goal is to demonstrate how easily prepared animal-based protein-rich food sources can be used by older adults to increase protein intake within pre-existing dietary patterns. The current dietary pattern of older Americans will be augmented by readily available quality protein sources and the effects of recommended and common protein intakes on the maintenance of whole-body protein balance and potential for muscle protein anabolism will be assessed.

Research funded in part by the Beef Checkoff.



A Cross-Sectional Investigation of Salmonella in Market Hog Lymph Nodes, Kansas State University, Texas Tech University, Triumph Foods, LLC, Smithfield Foods, Inc., JBS Foods, Clemens Food Group

A cross-sectional study design will be employed to investigate the prevalence and concentration of *Salmonella* in up to 6 lymph nodes and tonsils of market hogs. Prevalence and concentration data will be subsequently used to design a risk-assessment mapping of the carcass for prioritization of node-removal for pathogen control. The study also intends to address knowledge gaps regarding *Salmonella* prevalence by region and/or season in the United States.

Research funded in part by the National Pork Checkoff.



CURRENT FOUNDATION RESEARCH PROJECTS (CONT.)

Improving Validation Methods of *Salmonella* Lethality on the Surface of Multiple Impingement - Cooked Meat and Poultry Products, Michigan State University, University of Wisconsin

The study will identify critical limits (i.e., humidity, air velocity, surface time-temperature), relative to achieving target *Salmonella* lethality on the surface of impingement-cooked products. A spreadsheet-based solution for calculating surface lethality of *Salmonella* on multiple products will be developed and cross-validated. Findings are intended to improve the ability of the meat and poultry industry to comply with Appendix A requirements.

Research funded in part by the Beef Checkoff and the Pork Checkoff.



Effects of proportioning meat and plant-based protein-rich foods within the U.S. Healthy Eating Pattern on cardiovascular disease risk factors, Purdue University

This project will assess the effects of consuming different proportions of red meat and plant-based protein-rich foods incorporated into a U.S. Healthy Eating Pattern on cardiovascular disease risk factors in adults at high risk of developing a heart-related disease.

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.



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.

CURRENT FOUNDATION RESEARCH PROJECTS (CONT.)

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.

Detection of African swine fever virus (ASFV) in pork meat products by PCR assay, Iowa State University

The study is intended to validate PCR assay tests for ASFV in various pig offal and pork products, including blood, and meat to determine the best sample(s) for testing and monitoring.

FOUNDATION EDUCATION SCHEDULE

Annual Meat Conference

February 7-9, 2022
National Harbor, MD

Workers Safety, Labor & Employment, and Environmental Conferences

March 29-30, 2022
San Antonio, TX

Advanced *Listeria monocytogenes* Intervention and Control Workshop

April 27-28, 2022
Kansas City, MO

For more information on these programs, please visit the events page at www.meatinstitute.org.



THANK YOU TO THE FOUNDATION'S 2021 CONTRIBUTORS

The Foundation is supported through generous contribution of companies and individuals. Company names with an asterisks indicate NAMI Board of Directors companies.

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