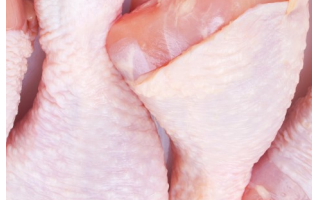


FOUNDATION FOCUS



Board Approves Research Recommendations

The Foundation's Board of Directors met in early 2022 to review and approve an ambitious research agenda for 2022. The Foundation's Research Advisory Committee recommended seven projects addressing meat and poultry safety; nutrition sciences research; and product quality. The projects are:

- Leveraging a current market hog lymph node study to further understand *Salmonella* transmission and internal colonization (funded in part by the National Pork Checkoff);
- Impact of sanitization and natural biofilm communities on *Salmonella* prevalence at processing plants (Funded by the Beef Checkoff and administered by the Foundation);
- Novel TaqMan assays for the specific detection and simultaneous differentiation of virulent and avirulent non-O157 Shiga toxin-producing *Escherichia coli* strains (Funded by the Beef Checkoff and administered by the Foundation);
- Development and validation of an antimicrobial database to predict microbial load reduction on raw pork components against *Salmonella* (funded in part by the National Pork Checkoff);
- Exploring the use of ProbiCon as a direct-fed microbial to reduce the *Salmonella* burden in market hogs (funded in part by the National Pork Checkoff);
- Dietary modeling the nutritional impact of removing/adding/substituting meat and poultry servings to the healthy dietary patterns (funded in part by the Beef Checkoff); and
- Effects of helium gas utilization in Modified Atmosphere Packaging (MAP) on beef quality.

Summaries of the newly funded projects can be found [here](#). The Foundation's Research Advisory Committee will meet in the spring to identify research topics for the 2021-2022 request for proposals.

Foundation Soliciting Beef Safety Research Proposals

The Foundation for Meat and Poultry Research and Education (Foundation) is soliciting beef safety research proposals on the priority below, developed by the industry and representing an immediate funding need.

Develop a *Salmonella* baseline in ground beef. The baseline should at least include *Salmonella* quantity and serotype in ground beef across all seasons and be representative of the entire industry. Proposals should include specific methodology researchers intend to use and a detailed sampling plan on how the research team intends to ensure samples are representative of the industry. This baseline should also be anonymous. Proposals should include a description on how the research team intends to ensure there is no identifying information in the final report. Individual sample results should not be shared with industry participants to ensure anonymity.

The Foundation will host a Zoom meeting with interested researchers to discuss the priority and answer questions on Friday, May 13 at 3 pm ET/2 pm CT, 1 pm MT/12 pm PT. Additional details on the RFP and how to submit a proposal can be found [here](#). Contact [KatieRose McCullough, Ph.D., MPH](#) with questions.

PORK PERFORMANCE STANDARDS

The Food Safety and Inspection Service (FSIS or agency) posted a *Federal Register* notice announcing new pathogen reduction performance standards for *Salmonella* in raw comminuted pork and intact or non-intact pork cuts (proposed standards). The proposed standards, if finalized, will apply to establishments that produce greater than 6,000 pounds per day of raw comminuted pork and greater than 50,000 pounds per day of intact or non-intact pork cuts. The agency intends to use a 52-week moving window to assess whether establishments meet the proposed standards.

- For raw comminuted pork, 13 positives out of the most recent 52 samples within the 52-week window will meet the standard, while 14 positives will not.
- For raw intact or non-intact pork cuts, six positives out of the most recent 52 samples within the 52-week window will meet the standard, while seven positives will not.

FSIS will post on its website about one year after finalized standards are in place the performance category of each establishment subject to the standard.

- Category 1: Establishments with 50% or less of the allowable number of positives.
- Category 2: Establishments with greater than 50% but not more than the allowable number of positives.
- Category 3: Establishments more than the allowable number of positives.

Establishments in Category 3 would be subject to corrective action requirements, follow-up sampling, and a Public Health Risk Evaluation that would likely lead to a Food Safety Assessment. FSIS estimates that 44% of establishments subject to the comminuted standard and 39% of establishments subject to the parts standard would initially be in Category 3.

The agency also posted a risk assessment describing the data and methods used to develop the proposed standards and a cost benefit analysis.

FSIS invited public comments on the proposed standards, which are currently due by June 2, 2022. The Foundation and Pork Checkoff partnership has funded numerous research projects targeting *Salmonella* in the pork industry. Related projects are listed below:

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

Risk assessment model to assess the impact on public health of pork based on the contamination level and presence of highly virulent or multidrug resistant strains, University of Minnesota

Leveraging a current market hog lymph node study to further understand *Salmonella* transmission and internal colonization, Kansas State University, Texas Tech University, Triumph Foods

Development and validation of an antimicrobial database to predict microbial load reduction on raw pork components against *Salmonella*, University of Illinois at Urbana-Champaign

Exploring the use of ProbiCon as a direct-fed microbial to reduce the *Salmonella* burden in market hogs, Kansas State University, USDA-ARS-U.S. Meat Animal Research Center, Triumph Foods

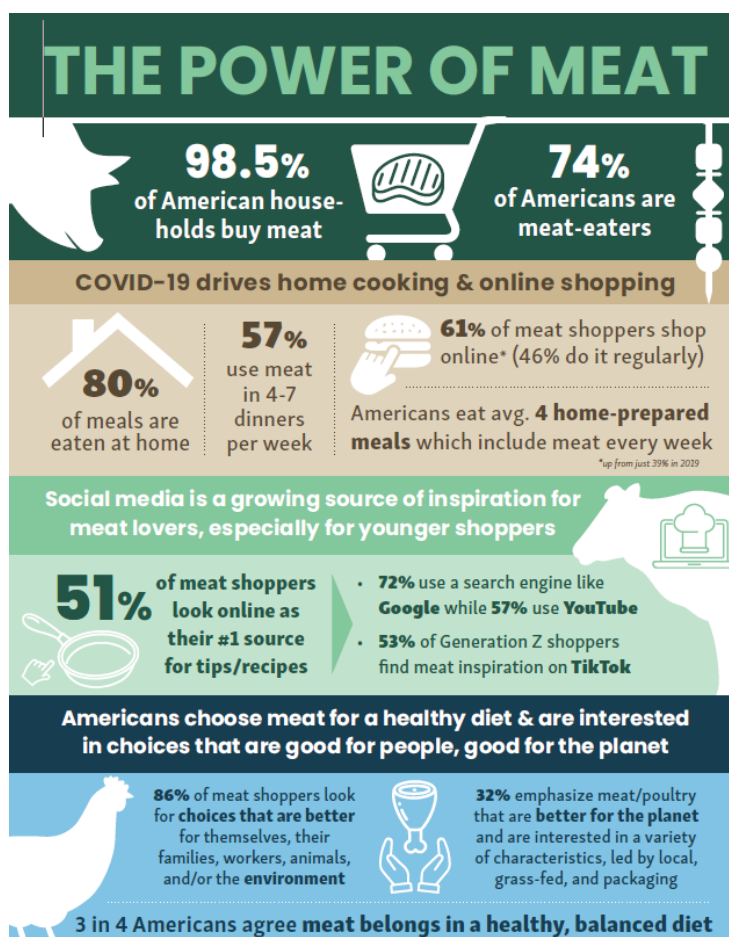
DIETARY GUIDELINES SCIENTIFIC QUESTIONS AVAILABLE FOR COMMENT

The [proposed scientific questions](#) that will inform the Dietary Guidelines are [available for comment](#). The next edition of the Dietary Guidelines will focus on diet and health outcomes across the lifespan, including the relationship between diet and risk of overweight and obesity with a new emphasis on weight loss and weight maintenance. New questions also address ultra-processed foods and food-based strategies that can be used by individuals and families to support implementation of the Dietary Guidelines and help prevent or manage overweight and obesity. All scientific questions will be reviewed with a health equity lens to ensure that resulting guidance in the Dietary Guidelines is relevant to people with diverse racial, ethnic, socioeconomic, and cultural backgrounds. The complete list of questions is available [here](#). Comments are due by May 16, 2022.

Power of Meat Report

The Foundation and FMI, the Food Industry Association, released the 17th annual [Power of Meat](#) report in March that found nearly all American households (98.5%) purchase meat, a trend supported by an increase in volume sales (up 3.9% for all meat compared to pre-pandemic levels). This increase is due, in part, to several grocery shopper trends resulting from the COVID-19 pandemic, including increased home cooking, record-high online shopping, and a shift to digital sources for recipe inspiration. The study was conducted by 210 Analytics.

For more on the consumer trends in the report go to the [Power of Meat's Top Ten](#).



The 17th annual Power of Meat study was conducted by 210 Analytics on behalf of FMI—the Food Industry Association and the Meat Institute's Foundation for Meat and Poultry Research and Education

FOUNDATION FOR MEAT & POULTRY RESEARCH & EDUCATION



For more information, visit: www.FMI.org/FreshFoods and www.meatinststitute.org

[Click here for enlarged graphic.](#)

RECENT RESEARCH FINDINGS

Research funded by the Beef Checkoff and Administered by the Foundation was recently published in the journal *BMC Genomics*. The abstract follows:

Background: Shiga toxin-producing *Escherichia coli* (STEC) O157:H7 is a pathogen known to reside in cattle feedlots. This retrospective study examined 181 STEC O157:H7 strains collected over 23 years from a closed-system feedlot. All strains were subjected to short-read sequencing, with a subset of 36 also subjected to long-read sequencing.

Results: Over 96% of the strains fell into four phylogenetically distinct clades. Clade membership was associated with multiple factors including *stx* composition and the alleles of a well-characterized polymorphism (*tir* 255 T > A). Small plasmids (2.7 to 40 kb) were found to be primarily clade specific. Within each clade, chromosomal rearrangements were observed along with a core phageome and clade specific phages. Across both core and mobile elements of the genome, multiple SNP alleles were in complete linkage disequilibrium across all strains within specific clades. Clade evolutionary rates varied between 0.9 and 2.8 SNP/genome/year with two *tir* A allele clades having the lowest evolutionary rates. Investigation into possible causes of the differing rates was not conclusive but revealed a synonymous based mutation in the DNA polymerase III of the fastest evolving clade. Phylogenetic trees generated through our bioinformatic pipeline versus the NCBI's pathogen detection project were similar, with the two *tir* A allele clades matching individual NCBI SNP clusters, and the two *tir* T allele clades assigned to multiple closely-related SNP clusters.

Conclusions: In one ecological niche, a diverse STEC O157:H7 population exhibited different rates of evolution that associated with SNP alleles in linkage disequilibrium in the core genome and mobile elements, including *tir* 255 T > A.

Weinroth, M.D., Clawson, M.L., Arthur, T.M. *et al.* Rates of evolutionary change of resident *Escherichia coli* O157:H7 differ within the same ecological niche. *BMC Genomics* 23, 275 (2022). <https://doi.org/10.1186/s12864-022-08497-6>

2021-2022 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.

Emily Arkfeld, Triumph Foods
Aaron Asmus, Hormel Foods Corporation
Sharon Beals, CTI Foods
Chris Bodendorfer, Johnsonville Sausage
Dustin Boler, Topigs Norsvin
Melissa Bonorden, Hormel Foods Corporation
Ted Brown, Cargill, Inc.
Zach Cameron, Tyson Foods
Anna Carlson, Cargill, Inc.
Cole Cheatwood, Bar S Foods
Kaitlyn Compart, Smithfield Foods
Kyle Donnelly, empirical foods
Clay Eastwood, National Pork Board
Jacquelyn Fletcher, Kayem Foods
Wade Fluckey, Clemens Family Corporation
Heather Fowler, National Pork Board
Katie Hanigan, Smithfield Foods
Barry Hays, Bar S Foods
Susan Jaxx, Cargill
Collette Kaster, American Meat Science Association

Mark Kreul, In-N-Out Burger
John Luchansky, USDA, Agricultural Research Service
Deidrea Mabry, American Meat Science Association
Kiano Manavi, OSI Group
Pat Mies, National Beef Packing Co., Inc.
Cindy Moore, Tyson Foods
Nandini Natrajan, Food Safety Net Services
John Scanga, Meyer Natural Foods
Sue Schwartz, Ed Miniat LLC
Mark Seyfert, Birchwood Foods
Sarah Sholly-Luchansky, National Pork Board
Subash Shrestha, Cargill, Inc.
Sally Staben, Hormel Foods Corporation
Ben Stellmacher, Johnsonville Sausage, LLC
Tommy Wheeler, USDA, ARS, U.S. Meat Animal Research Center
Barry Wiseman, Triumph Foods

2022 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.

Kevin Adesso, Johnsonville Sausage, LLC
Al Almanza, JBS USA
Jonathan Amidei, Swaggerty's Sausage Company
Tim Arndt, Jack Link's Protein Snacks
Stephanie Benson, Certified Meat Products
Peter Bozzo, Michael's Finer Meats & Seafoods
Robert Cannell, National Beef Packing Co, LLC
Doug Clemens, Clemens Family Corporation
Brian Coelho, Central Valley Meat Co.
Brian Covington, Lopez Foods / Dorada Foods
Jeff Cromer, AB Foods, LLC, an Agri Beef Company
Henry Davis, Greater Omaha Packing Co., Inc.
Clay Eastwood, National Pork Board
Martin Eckmann, Alaska Sausage Company
Neil Genshaft, Fresh Mark, Inc.
Brad Hamilton, Seaboard Foods
Denise Heard, US Poultry and Egg Association

Megan Hobbs, Cargill, Inc.
Randy Huffman, Maple Leaf Foods, Inc.
Carlos Lopez, Sigma/Bar-S
Sandy Luckcuck, Tyson Foods, Inc.
Shane MacKenzie, Superior Farms
Jim Monroe, Smithfield Foods, Inc.
Kevin Myers, Hormel Foods Corporation
Kathleen O'Donnell-Cahill, Wegman's Food Markets
Ken Petersen, OSI Group, LLC
Clif Rhodes, Boar's Head Provisions Co., Inc.
Scott Rich, Wasatch Meats
Justin Still, Surlean Foods
Suzanne Strassburger Reidy, Strassburger Meats
Hilary Thesmar, FMI – The Food Industry Association
Steve Van Lannen, American Foods Group, LLC
Dennis Vignieri, Kenosha Beef International, Ltd.
Russell Yearwood, Indiana Packers Corporation

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.

AB Foods, LLC*
American Foods Group, LLC*
Susan Backus
Broadleaf Venison (USA), Inc.*
Brown Packing Co., Inc.*
Cargill, Inc.*
Casey Gallimore
Catelli Brothers, Inc. *
Caviness Beef Packers Ltd*
Central Valley Meat Company, Inc.*
Certified Meat Products*
Clemens Family Corporation*
Coast Packing Company*
Costco Wholesale Meats*
CS Beef Packers LLC
Ed Miniati, LLC*
empirical foods*
Evergood Fine Foods
Fair Oaks Farms, LLC
FPL Foods LLC*
Fred Usinger, Inc.*
Fresh Mark, Inc.*
Greater Omaha Packing Co., Inc.*
Indiana Packers Corporation*
Jensen Meat Company*
Johnsonville Sausage, LLC*
Jones Dairy Farm*
JTM Food Group*
Kayem Foods, Inc.*
Kenosha Beef*
Koegel Meats, Inc.
Land O' Frost*
Lopez-Dorada Foods, Inc*
Mary Ann's Foods
KatieRose McCullough
Meats by Linz
Nueske's Applewood Smoked Meats*
Kathleen O'Donnell-Cahill
Old Trapper Smoked Products
OSI Group, LLC*
Perdue Premium Meat Co.*
P.G. Molinari and Sons
Julie Anna Potts
Quality Processing Services
Norm Robertson
Seaboard Foods*
Sigma*
Smithfield Foods*
Stephen Sothmann
Superior Farms*
Strassburger Meats, LLC*
Swaggerty Sausage Co., Inc.*
The Taylor Provision Company
Tyson Foods, Inc.*
Unibright Foods, Inc.
West Michigan Beef Co. LLC
William Westman
Yosemite Foods, Inc.
Eric Zito

CURRENT FOUNDATION RESEARCH PROJECTS

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.



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.



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.



CURRENT FOUNDATION RESEARCH PROJECTS (CONT.)

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.

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.

Funded by the National Pork Checkoff and Administered by the Foundation Risk assessment model to assess the impact on public health of pork based on the contamination level and presence of highly virulent or multidrug resistant strains, University of Minnesota

This project will build upon a risk assessment model developed using existing FSIS prevalence and enumeration data to assess the impact of raw pork characterized by contamination level and presence of highly virulent or multidrug resistant strains on public health. Results of this model could evaluate potential impact on public health of model performance standards based on *Salmonella* spp. enumeration level and strain characteristics to reduce the number of human cases due to pork consumption.

Risk assessment model to assess the impact on public health of ground beef lots based on the contamination level and presence of highly virulent or multidrug resistant strains, University of Minnesota

This project will develop a risk assessment model using existing Food Safety and Inspection Service prevalence and enumeration data to assess the impact of ground beef lots characterized by contamination level and presence of highly virulent or multidrug resistant strains on public health. Results of this model could be used to evaluate potential impact on public health of model performance standards based on *Salmonella* spp. enumeration level (CFU/g) and strain characteristics to reduce the number of human cases due to ground beef consumption.

Evidence-based, quantitative risk assessment to control salmonellosis attributable to ground beef: Evaluating and mitigating the contribution of lymph nodes to *Salmonella* contamination, University of Nebraska-Lincoln, U.S. Meat Animal Research Center, USDA ARS, Michigan State University, The University of Vermont, University of California

This project will characterize the distribution of both prevalence and concentration of *Salmonella enterica* in bovine deep tissue lymph nodes (DTLNs) by lymph node type, production source, region and season using systematic review and meta-analysis approaches. The relative contributions of DTLNs and the efficacy of their removal at processing on salmonellosis risk associated with ground beef consumption will be evaluated using a quantitative microbial risk assessment approach.

Using empirical evidence, modeling, and risk assessment methods to estimate the public health impact of incorporating enumeration and virulence as part of the criteria for evaluation of *Salmonella* contamination in ground beef in the US, EpiX Analytics, Colorado State University

This project will develop a quantitative microbial risk assessment of the potential public health impact of incorporating enumeration and virulence evaluation strategies as part of the criteria for evaluation of *Salmonella* contamination in ground beef in the U.S. Additionally, using existing surveillance data the effect of season and regional sources of the live cattle on changes in *Salmonella* prevalence, virulence, and enumeration in ground beef and trim will be estimated.

Effects of deep cleaning sanitation on biofilms and pathogens, USDA-ARS-Meat Animal Research Center

The overall goal of this project is to examine the disruption and reformation of natural biofilm communities present in processing plants and attempt to correlate biofilm phenotypes, such as mass, sanitizer resistance, and pathogen protection with their microbial community structures.

Effect of Minimally Processed Meat and Further Processed Meat on Biomarkers and Risk Factors for Cancer and Cardiovascular Disease—Phase I, USDA-ARS-Beltsville Human Nutrition Research Center

A randomized diet controlled crossover study will be conducted with diets containing either minimally processed or further processed meat to assess how the diet effects biomarkers associated with cardiovascular disease. This study will also examine the effect of the background diet on health outcomes.

Funded by the Foundation for Meat and Poultry Research and Education and the National Cattlemen's Beef Association (NCBA) on behalf of the Beef Checkoff. NCBA has primary oversight responsibility for this project.