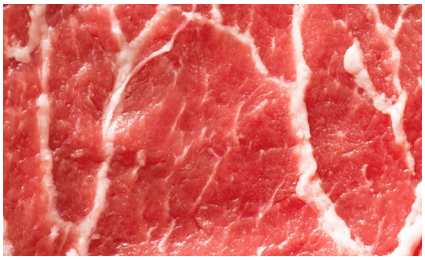
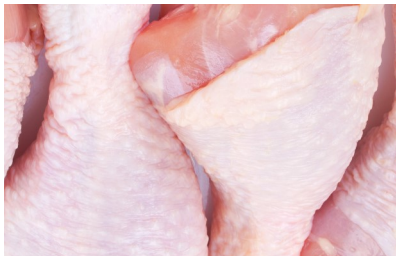
FOUNDATION FOCUS


BOARD APPROVES RESEARCH RECOMMENDATIONS

The Foundation's Board of Directors met in January to review and approve an ambitious research agenda for 2021. The Foundation's Research Advisory Committee recommended five projects addressing meat and poultry safety and nutrition sciences research. Three projects already initiated are jointly funded by the Foundation and the Beef Checkoff under the Foundation's contract to administer research on post-harvest beef safety and processed beef nutrition.

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.

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 *C. perfringens* and *B. 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.

Research funded in part by the Beef Checkoff

Details on the additional research projects will be shared in future newsletters.

BEEF SAFETY REQUEST FOR PROPOSALS

On behalf of the Beef Checkoff, the Foundation for Meat and Poultry Research and Education and National Cattlemen's Beef Association issued an expedited beef safety request for proposals addressing three high priority research topics.

1. Develop a quantitative microbiological risk assessment model using currently existing data sources to assess the impact of *Salmonella* enumeration and virulence evaluation strategies on public health after consumption of contaminated ground beef in the US.
2. Determine the effect of region and season on *Salmonella* prevalence, virulence, and quantity in ground beef and trim.
3. Determine the public health risk of *Salmonella* in ground beef. Research may include 1) evaluating the inclusion or removal of the 6-7 lymph nodes known to potentially pose a *Salmonella risk;* 2) increasing preharvest knowledge and impact on finished product; 3) evaluating the relationship between trim and grind *Salmonella levels*; or 4) other considerations.

Proposals are being evaluated and selected projects will be awarded funding. Additional project details will be provided in future editions of this newsletter.

NCBA National Cattlemen's Beef Association

FOUNDATION FOR MEAT & POULTRY RESEARCH & EDUCATION

BEEF

Funded by the Beef Checkoff.

CONSUMER FOOD SAFETY EDUCATION CONFERENCE

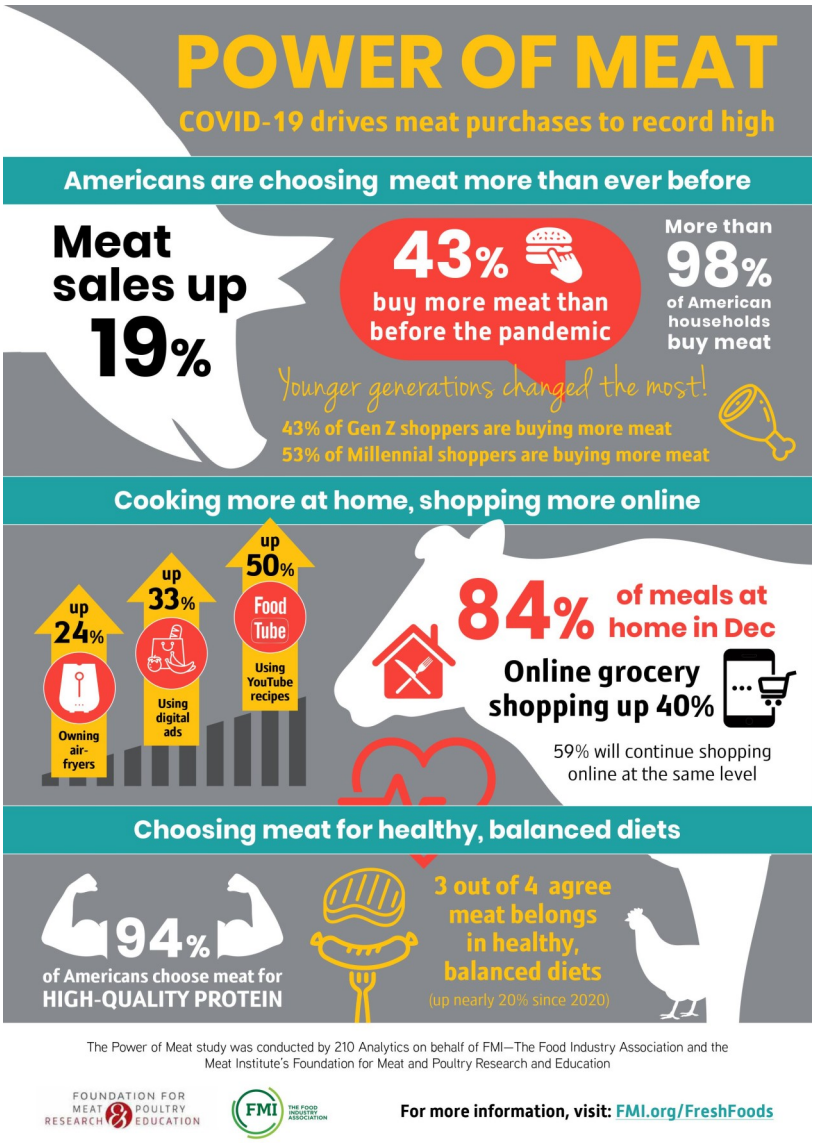
The Beef Checkoff, through its contract with the Foundation, sponsored the Partnership for Food Safety Education's Consumer Food Safety Education Virtual Conference on March 9-12, 2021. This conference supports food safety educators in their work to communicate the science of food safety to consumers. As a sponsor, the Beef Checkoff was provided an opportunity to engage with attendees directly through Community Connectors sessions. These sessions allowed for a video briefing and was followed by a live question and answer session. "Beef Safety and Date Labels: What Does it All Mean?" addressed the confusion behind date labeling on certain types of beef products, including further processed and ready-to-eat products. Of the 500 registered attendees, more than 400 viewed the video and 150 participated in the live questions and answers session.

ANNUAL POWER OF MEAT STUDY

The 2021 Power of Meat study released at the Annual Meat Conference showed that three out of every four Americans agree meat belongs in healthy, balanced diets (up by nearly 20% since 2020), and 94% say they buy meat because it provides high-quality protein. Americans are buying more beef, pork, poultry, and lamb than ever as increased time at home during the pandemic sent meat grocery sales soaring by 20% (IRI) from 2019 to 2020.

Power of Meat was conducted by 210 Analytics on behalf of FMI—The Food Industry Association and the Foundation for Meat and Poultry Research and Education.

View the Power of Meat 2021 infographic here and click here for details on media access or to purchase the full report.



RECENT RESEARCH FINDINGS

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

> In the US, sodium nitrate is used as a preservative and curing agent in processed meats and is therefore a regulated ingredient. Nitrate reducing bacteria (NRB) can convert vegetable nitrate into nitrite allowing green/clean label status in the US as per the USDA-FSIS definition of 'natural nitrite'. The current 'in-liquid' test tube assay for detecting nitrite is not suitable for screening mixtures of bacteria nor is commercial nitrate broth suitable for growth of many Gram (+) bacteria. M17 broth was therefore used to develop M17-nitrate broth to be inclusive of Gram (+) bacteria. An 'on-agar' colony-screening assay was developed to detect the conversion of nitrate to nitrite on agar plates and could detect one NRB^{+} colony among ~300–500 colonies on a single plate. Samples that might have NRB were spread-plated on M17 agar plates, sandwiched with nitrate agar, and after incubation followed with sequential agar overlays containing the reagents used in the nitrate reduction assay; the appearance of red color zones above colonies indicated the presence of nitrite. NRB derived from various samples were confirmed for nitrate conversion and both nitrate and nitrite were quantified by C_8 reversed-phase (RP) ion-pairing high performance liquid chromatography (HPLC) analysis (1 ppm limit of detection). Staphylococcus carnosus, a strain commonly used for nitrate reduction, was able to convert 1100 ppm M17-nitrate broth to 917 ppm nitrite. Staphylococcus caprae and Panteoa agglomerans, NRB isolated using the M17-nitrate agar assay, were also able to ferment the same broth to 916 ppm and 867 ppm nitrite, respectively. This is the first report of an on-agar colony screening assay for the detection and isolation of nitrite reducing bacteria allowing NRB to be readily isolated. This may allow for the identification of new bacteria that may have a more efficient process to generate nitrite, and possibly concomitant with production of additional natural antimicrobials, as vegetable nitrite becomes more widely used to prevent spore germination.

Bhusal A, Muriana PM. Isolation and Characterization of Nitrate Reducing Bacteria for Conversion of Vegetable-Derived Nitrate to 'Natural Nitrite'. *Applied Microbiology*. 2021; 1 (1):11-23. https://doi.org/10.3390/applmicrobiol1010002.

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.

Kevin Addesso, Johnsonville Sausage, LLC
Al Almanza, JBS USA
Jonathan Amidei, Swaggerty's Sausage Company
Tim Arndt, Jack Link's Protein Snacks
Van Ayvazian, Boar's Head Provisions Co., Inc.
Chad Bower, 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.
Jeff Cromer, AB Foods, LLC, an Agri Beef Company
Andy Curliss, Smithfield Foods, Inc.
Henry Davis, Greater Omaha Packing Co., Inc.
Martin Eckmann, Alaska Sausage Company
Adam Edwardson, empirical foods
Neil Genshaft, Fresh Mark, Inc.
Eric Gustafson, Coast Packing Company
Barry Hays, Sigma
Denise Heard, US Poultry and Egg Association
Megan Hobbs, Cargill, Inc.
Randy Huffman, Maple Leaf Foods, Inc.
Neal Leonard, Surlean Foods
Joe Maas, JTM Food Group
Shane MacKenzie, Superior Farms
Matt Malott, Multivac, Inc.
Dave Miniat, Miniat Holdings
Kathleen O'Donnell Cahill, Wegman's Food Markets
Ken Petersen, OSI Group, LLC
Dave Pyburn, National Pork Board
Scott Rich, Wasatch Meats
Ed Sanchez, Lopez Dorado Foods, Inc.
Suzanne Strassburger Reidy, Strassburger Meats
Hilary Thesmar, FMI - The Food Industry Association
John Randal Tyson, Tyson Foods, Inc.
Steve Van Lannen, American Foods Group, LLC
Dennis Vignieri, Kenosha Beef International, Ltd.
Russell Yearwood, Indiana Packers Corporation

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.

Emily Arkfeld, Triumph Foods [Q]
Aaron Asmus, Hormel Foods Corporation [R, P, FP]
Sharon Beals, CTI Foods [R, B, FP]
Chris Bodendorfer, Johnsonville Sausage LLC [R, FP]
Dustin Boler, Top Pigs [R, P, Q]
Melissa Bonorden, Hormel Foods Corporation [R, N]
Jordan Bowers, Hormel Foods Corporation [CT]
Anna Carlson, Cargill, Inc. [R, CT]
Cole Cheatwood, Bar S Foods [FP]
Cindy Moore, Tyson Foods [N]
Joel Coble, Tyson Foods [R, B, P, FP, Q]
Kaitlyn Compart, Smithfield Foods [R, FP]
Clay Eastwood, National Pork Board [R, P]
Jacquelyn Fletcher, Wellshire Farms [R, FP, N, Q]
Heather Fowler, National Pork Board [R, P]
Devin Gredell, Tyson [Q]
Wade Fluckey, Clemens Food Group [R, P]
Katie Hanigan, Smithfield Foods [R, P]
Barry Hays, Bar S Foods [R, FP]
Susan Jaxx, Cargill, Inc. [N]
Collette Kaster, American Meat Science Association [R, P, Q]
Mark Kreul, In n Out [R, B, Q]
John Luchansky, USDA ARS [R, B, P, FP, N, Q, CT]
Mike Luczynski, Boars Head Provisions [R, FP]
Deidrea Mabry, American Meat Science Association [B]
Pat Mies, National Beef Packing Co., Inc. [R, B]
Curtis Pittman, Harris Ranch Beef Company [R, B, FP]
John Scanga, Meyer Natural Foods [R, Q]
Sue Schwartz, Miniat [R, FP]
Mark Seyfert, Birchwood Foods [R, B, FP]
Subash Shrestha, Cargill, Inc. [R, FP]
Sally Staben, Hormel Foods Corporation [P, FP]
Ben Stellmacher, Johnsonville Sausage [P]
Tommy Wheeler, USDA ARS MARC [R, B, P, Q]
Amanda Wilder, Boars Head Provisions [FP]
Barry Wiseman, Triumph Foods [R, P, N]

[R] – *Research Advisory Committee*
[P] – *Minimally Processed Pork Safety Subgroup*
[B] – *Minimally Processed Beef Safety Subgroup*
[FP]- *Further Processed Meat and Poultry Safety Subgroup*
[CT] – *Minimally Processed Poultry Safety Subgroup*
[Q] – *Product Quality Subgroup*
[N] – *Nutrition Sciences Subgroup*

CURRENT FOUNDATION RESEARCH PROJECTS

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.

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. This assay will be used to detect *Salmonella* in raw meat enrichment samples that will be analyzed using current industry methods so that the results are readily applicable to the needs of the meat industry.

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.

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 will explore 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.

How Does Analytical 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 (WGS) 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.

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.

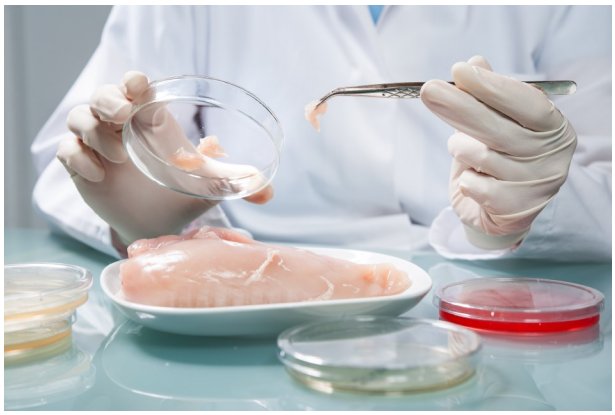
Tests of *Salmonella* Sub-unit Proteins as Vaccines for Broiler Chickens, USDA-ARS U.S. National Poultry Research Center

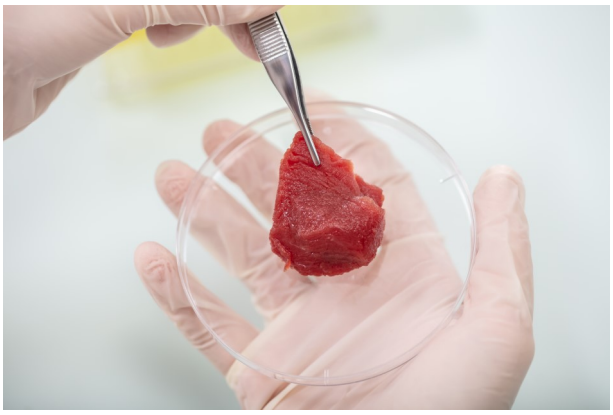
This project will identify the *Salmonella* protein antigens that are able to induce humoral immune response in broilers, and consequently these antibodies can prevent *Salmonella* colonization in the broiler gastrointestinal tracts.

CURRENT FOUNDATION RESEARCH PROJECTS (CONT.)

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.





FOUNDATION EDUCATION SCHEDULE

Advanced *Listeria monocytogenes* Intervention and Control Workshop
May 3-14, 2021
Virtual Event Series

Center of the Plate
July 2021
College Station, TX

Meat Industry Food Safety Conference
August 24-26, 2021
Chicago, IL

Animal Care and Handling Conference
October 14-15, 2021
Kansas City, MO

Advanced *Listeria monocytogenes* Intervention and Control Workshop
October 19-20, 2021
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.

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.*
Clemens Family Corporation*
Costco Wholesale Meats*
Ed Miniat, LLC*
Evergood Fine Foods
Fair Oaks Farms, LLC
Fred Usinger, Inc.*
Fresh Mark, Inc.*
Greater Omaha Packing Co., Inc.*
Indiana Packers Corporation*
Jensen Meat Company*
Kenosha Beef International, Ltd.*
Johnsonville Sausage, LLC*
Jones Dairy Farm*
JTM Food Group*
Kayem Foods, Inc.
Koegel Meats, Inc.
Land O' Frost*
Lopez Foods, Inc*
Mary Ann's Foods
KatieRose McCullough
Meats by Linz
Nueske's Applewood Smoked Meats*
Old Trapper Smoked Products
OSI Group, LLC*
P.G. Molinari and Sons
Perdue Premium Meat Co. *
Julie Anna Potts
Quality Processing Services
Norm Robertson
Seaboard Foods*
Stephen Sothmann
Superior Farms*
Swaggerty Sausage Co., Inc.*
The Taylor Provision Company
Unibright Foods, Inc.
William Westman
Yosemite Foods, Inc.
Eric Zito

FOUNDATION FOR MEAT & POULTRY RESEARCH & EDUCATION