

Tactic Quick Guides Preliminary FY24 Tactics



Safety & Product Innovation
Committee

SAFETY & PRODUCT INNOVATION COMMITTEE TACTIC OVERVIEW

Pages	Tactic#	Tactic Name	Contractor
3-5	2431-A	13th Annual NIAA Antibiotics Symposium	NIAA
6-8	2431-B	CDC Engagement	NIAA
9-11	2431-C	Educational Resources & Materials	NIAA
12-14	2432-A	Consortium Development	NIAA
15-17	2413-A	Molecular epidemiology and antimicrobial-resistance profile of Salmonella isolated from Kentucky local supply chain and development of novel therapeutics for infection control in pre-harvest and post-harvest stages of beef	NIAA/UK
18-22	2410-A	Post-Harvest Beef Safety Research	FMPRE
23-25	2411-A	Safety Research and Scientific Affairs	NCBA
26-28	2411-C	Product Quality Research and Technical Expertise	NCBA

2431-A: 13th Annual NIAA Antibiotics Symposium

Name of Contractor: National Institute for Animal Agriculture

Start Date: 10/1/2023

End Date: 9/30/2024

CBB/BPOC Funding Request for this AR: \$185,000

CBB/BPOC Funding Request for this Tactic: \$75,000

Tactic A | 2431-II

13th Annual NIAA Antibiotics Symposium

National Institute for Animal Agriculture

Tactic Description:

The 13th Annual NIAA Antibiotics Symposium will continue the work and collaborations established in prior symposia, funded in part by the Beef Checkoff. The Symposium will focus on continued knowledge and insights about responsible antibiotic use and the primary efforts aimed at combating antimicrobial resistance (AMR). All components of the Symposium impact the beef value chain:

1. **Science:** understanding causal links, resistance mechanisms, bacterial genomics, the microbiome, current/future research, and more.
2. **Alternatives:** preventative and intervention strategies, ensuring antibiotic stewardship, needs and challenges, innovation, and technology.
3. **Communication:** How to effectively engage Qualified State Beef Councils (QSBCs) with reliable information, which can be shared when beef industry leaders and producers are engaging with influencers and consumers.
4. **Education:** Empowering junior high and high school STEM (Science, Technology, Engineering, and Math) educators to more effectively utilize antibiotic stewardship and antimicrobial resistance as teaching catalysts within their classrooms.

Researchers who explore the consumer decision-making process continually find that shared values are what drive human decision-making (The Center for Food Integrity, 2009).¹ Upon establishment of shared values, messengers (QSBCs and beef producers) can then share scientific and economic facts that will also be used within the decision-making process. The 2023 Symposium will ensure beef producers and their fellow attendees are prepared to engage with influencers and consumers through shared values while also having the knowledge and insights about the science behind responsible antibiotic use and measures to address antimicrobial resistance (AMR) by animal agriculture leaders. Each of these areas will be addressed in the content that will drive improvements in how animal agriculture communicates and engages, leading with common values and science.

The Symposium is unique in its design as it follows the **One Health**² approach. **One Health** recognizes the health of people is connected to the health of animals and the environment.

The Symposium creates a synergistic environment where stakeholders from the Centers for Disease Control & Prevention (CDC), the U.S. Food & Drug Administration (FDA), United States Department of Agriculture (USDA), American Veterinary Medical Association (AVMA), National Institute for Antimicrobial Resistance Research and Education (NIAMRRE), state public health offices, and experts from all points along the beef (animal agriculture) supply chain (producers, packers, retailers, etc.), industry associations, and other animal agriculture leaders can come together to celebrate the progress and diligent efforts of industry and veterinary medicine and the work that has broadened the **One Health** collaboration with human medicine and environmental activities. In addition, the Symposium fosters shared learning, networking, and collaboration as, together, food and agriculture system leaders continuously improve the responsible use of antibiotics in animal agriculture while ensuring animal agriculture is doing its part to combat antimicrobial resistance (AMR).

Through keynote addresses, panel conversations and breakout sessions that allow for further exploration and application of knowledge, beef producers will leave the 2023 Symposium and follow-up conversations with skills, knowledge, and insights to more effectively engage with key opinion leaders as they preserve and enhance trust in beef production, safety, and products.

Citations:

¹The Center for Food Integrity - Trust Model - The Center for Food Integrity

²One Health | CDC

▼ Measurable Objectives

Measurable Objective #1:

Stakeholders from all segments will attend the 2023 Symposium: Animal agriculture leaders (including beef producers), processors, retailers, research scientists, academia, environmental NGOs, human health professionals, and government. Success is:

- At least 80 percent of attendees sharing that the Symposium improves their knowledge and understanding of responsible antibiotic use and measure to combat AMR.
- A successful Symposium will have 80 percent of attendees reporting increased knowledge and skills about communicating with influencers and consumers.

Measurable Objective #2:

Engage at least two state beef councils in pre- and post-Symposium media interviews, such as commercial radio, podcasts, farm news, etc. that reach a minimum of 65,000 beef producers with key take-aways advanced by the Symposium agenda.

LRP Initiatives Addressed by this Tactic

Grow Consumer Trust in Beef Production

- Measure, document, improve, and communicate the net climate and environmental impact of beef production
- Educate medical, diet, and health professionals about beef and beef production
- Align and collaborate with traditional and nontraditional partners to tell the positive story of beef cattle production
- Engage positively in the sustainable nutrition conversation
- Intensify efforts in educating consumers as well as supply chain decision makers about the benefits of animal care programs like BQA and their impacts on animal well-being

Safeguard & Cultivate Investment in Beef Industry Research, Marketing & Innovation

- Attract innovation and intellectual capital and cultivate the next generation of talent into the beef industry
- Encourage the cooperation and collaboration of existing industry advisory committees to identify and prioritize research efforts
- Increase industry funds for beef marketing, promotion, and research
- Educate producers, lawmakers and industry stakeholders on the benefits and impact of the Beef Checkoff

▼ Checkoff Program Committee(s) to Score This Tactic

Committee(s) to Score This Tactic:

Safety & Product Innovation, Stakeholder Engagement

2431-B: CDC Engagement

Name of Contractor: National Institute for Animal Agriculture

Start Date: 10/1/2023

End Date: 9/30/2024

CBB/BPOC Funding Request for this AR: \$185,000

CBB/BPOC Funding Request for this Tactic: \$25,000

Tactic B | 2431-II
CDC Engagement
National Institute for Animal Agriculture

Tactic Description:

Previously, the Beef Checkoff has provided specific funding for beef producers to engage in antibiotic symposia events and a subsequent meeting with the Centers for Disease Control and Prevention (CDC) and related stakeholder groups. Building on the positive outcomes of previous producer engagement with the CDC, a group (approx. 15 to 20) of state beef council producer-leaders will attend and participate in the Antibiotic Symposium and after the Symposium at least 5 to 10 beef producers will attend meetings at the CDC in Atlanta, GA.

Beef producers will be empowered to use face-to-face presentations to share information on both scientific developments learned at the Symposium and at the CDC meeting specifically within the beef industry to influence their peers' commitment toward continuous improvement, related to responsible antibiotic use. In addition, they will share the results of communication strategies and effectively communicating the safety and wholesomeness of beef.

This tactic includes support for working with Qualified State Beef Councils (QSBCs) to identify targeted in-person and online tools and events that can be leveraged to engage beef producers in important antibiotics-related conversations, that can be conducted via online webinars, state and regional cattle association meeting presentations, unique social media events, sponsored producer influencer events, etc.

▼ **Measurable Objectives**

Measurable Objective #1:

Between 5 to 10 beef producers will participate in a tour, presentations, demonstrations, and discussions with officials from the Centers for Disease Control, engaging in open dialogue, questions on next steps in communication and collaboration opportunities.

- A minimum of five (5) beef producer participants will further engage with CDC leaders to serve as trusted resources on information related to farm/ranch practices. This will be measured via three-month, six-month and twelve-month surveys.
- At least two (2) CDC professionals will visit/tour a beef farm/ranch to better understand and explore how farmers and ranchers - with counsel from their veterinarians, are using antibiotics judiciously while doing their part to combat antibiotic resistance.

Measurable Objective #2:

Create a short video featuring beef producers, and professionals from CDC, FDA or USDA to share the responsible use of antibiotics across the beef value chain. Share the video with a minimum of two influencer-based organizations such as the Food Marketing Institute, Grocery Manufacturers Association, National Restaurant Association, American Academy of Pediatrics, etc.

LRP Initiatives Addressed by this Tactic

Grow Consumer Trust in Beef Production

- Measure, document, improve, and communicate the net climate and environmental impact of beef production
- Educate medical, diet, and health professionals about beef and beef production
- Align and collaborate with traditional and nontraditional partners to tell the positive story of beef cattle production
- Engage positively in the sustainable nutrition conversation
- Intensify efforts in educating consumers as well as supply chain decision makers about the benefits of animal care programs like BQA and their impacts on animal well-being

Safeguard & Cultivate Investment in Beef Industry Research, Marketing & Innovation

- Attract innovation and intellectual capital and cultivate the next generation of talent into the beef industry
- Encourage the cooperation and collaboration of existing industry advisory committees to identify and prioritize research efforts
- Increase industry funds for beef marketing, promotion, and research
- Educate producers, lawmakers and industry stakeholders on the benefits and impact of the Beef Checkoff

▼ Checkoff Program Committee(s) to Score This Tactic

Committee(s) to Score This Tactic:

Safety & Product Innovation, Stakeholder Engagement

SAFETY & PRODUCT INNOVATION COMMITTEE

Tactic Score Sheet Considerations, Scores, and Notes

Tactic Considerations	Table Agreement Level
<p>Recognizing potential Beef Checkoff Contractors have drafted their tactics to align with the Beef Industry Long Range Plan and Beef Demand Drivers consider these expectations when providing scores and comments.</p> <p>For this tactic, quantify your table's level of agreement using the following 5-point scale.</p> <p><i>1 = Strongly Disagree</i> <i>2 = Disagree</i> <i>3 = Neither Agree nor Disagree</i> <i>4 = Agree</i> <i>5 = Strongly Agree</i></p>	
<p>Comments: Provide up to four constructive or actionable comments that outline what the table likes or dislikes about the tactic. These comments will be shared with the potential Beef Checkoff Contractor and the Beef Promotion Operating Committee.</p> <ul style="list-style-type: none"> • If a member(s) at the table is in favor of this tactic, list specifics about what is liked. • If a member(s) at the table does not like the tactic, list specific areas of concern and/or provide comments on what the tactic should be doing differently. 	
<p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p>	

2431-C: Educational Resources & Materials

Name of Contractor: National Institute for Animal Agriculture

Start Date: 10/1/2023

End Date: 9/30/2024

CBB/BPOC Funding Request for this AR: \$185,000

CBB/BPOC Funding Request for this Tactic: \$85,000

Tactic C | 2431-II
Educational Resources & Materials
National Institute for Animal Agriculture

Tactic Description:

Providing robust resources for Qualified State Beef Councils and NIAA partner organizations - such as the National Agriculture in the Classroom Organization, ensures the knowledge and insights garnered from Symposia and CDC engagements can be put into action. This tactic supports NIAA staff's creation of resources and materials to be shared with QSBCs. Additionally, this tactic supports curriculum development for the National Agriculture in the Classroom Organization.

In addition to multi-media materials developed in collaboration with QSBCs, junior high and high school curriculum will empower STEM educators across the U.S. National Agriculture in the Classroom is the lead agricultural literacy education organization that serves the full spectrum of Pre-K–12th grade formal education. Their total impact during the past two years was 6,106,116 youth and adults through in-person and virtual teacher training, classroom instruction and through virtual learning.

Beef Checkoff dollars will be invested in the creation of three (3) lessons that address significant challenges within beef production today.

The first challenge is the public's misperceptions of the use of animal medicines, vaccines and genetics. The more than 80,000 U.S. teachers Ag in the Classroom works with want science-based, STEM focused lessons for use with students in their classrooms. We propose the development of three (3) lessons on Antibiotics, Vaccines & Genomics with career spotlights in each lesson. We will use an agricultural lens/context for these content areas and the content will be compelling to high school science teachers and students. The National Center for Agricultural Literacy (NCAL) at Utah State University will develop these three (3) lessons, pilot test with nine (9) teachers to obtain their feedback to improve each lesson, and upon completion of the lessons, conduct teacher webinars to help them use the lessons in their classrooms.

The second challenge that the beef industry faces is a shortage of large animal veterinarians. We know that through the use of our lessons by teachers in their classrooms that students are considering careers in the agricultural industry. Teachers are very likely to discuss careers in the context of the lessons developed through this grant. These are teachable moments for students. We will include a career spotlight in each of the Antibiotics, Vaccines & Genomics lessons.

▼ Measurable Objectives

Measurable Objective #1:

Creation of three (3) science-based, STEM lessons with National Agriculture in the Classroom addressing the use of medicines, vaccines, and genomics in beef production. To be tested by nine (9) STEM educators.

Measurable Objective #2:

Providing support through state-specific infographics sharing the continuous improvement of the beef industry in antibiotic stewardship and antimicrobial resistance to five (5) Qualified State Beef Councils.

▼ LRP Initiatives Addressed by this Tactic

Grow Consumer Trust in Beef Production

- Measure, document, improve, and communicate the net climate and environmental impact of beef production
- Align and collaborate with traditional and nontraditional partners to tell the positive story of beef cattle production
- Intensify efforts in educating consumers as well as supply chain decision makers about the benefits of animal care programs like BQA and their impacts on animal well-being
- Develop a direct-to-consumer beef safety campaign

▼ Checkoff Program Committee(s) to Score This Tactic

Committee(s) to Score This Tactic:

Safety & Product Innovation, Stakeholder Engagement

SAFETY & PRODUCT INNOVATION COMMITTEE

Tactic Score Sheet Considerations, Scores, and Notes

Tactic Considerations	Table Agreement Level
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2432-A: Consortium Development

Name of Contractor: National Institute for Animal Agriculture

Start Date: 10/1/2023

End Date: 9/30/2024

CBB/BPOC Funding Request for this AR: \$50,000

CBB/BPOC Funding Request for this Tactic: \$50,000

Tactic A | 2432-II
Consortium Development
National Institute for Animal Agriculture

Tactic Description:

Through the Consortium, NIAA will continue its long history of stakeholder engagement that influences key audiences – in this case, innovators and investors, who greatly affect the future of animal agriculture. The work of the Consortium is imperative to foster improved knowledge of how animal agriculture remains a viable industry sector. Consortium work will increase innovators and investors' knowledge of animal agriculture, allowing for greater innovation and investment in animal agriculture – a behavior change.

For example, many innovators and investors may be hearing and feeling that cell-cultured or plant-based meat alternatives are the future of the food system. This "noise" could be coming from other innovators and investors "talking their positions up" or from non- governmental organizations (NGOs) with a specific mission - to decrease or eliminate animal-derived proteins. The Consortium will counter this narrative with data and verified information demonstrating to societal, economical, and nutritional necessity of animal- derived proteins.

NIAA will reach innovators and investors through in-person engagements as well as through e-blasts, LinkedIn, and various trade publications. A constant "drum-beat" of information and engagement will solidify the role of animal agriculture – and its allied sectors. Engagements that seek to collectively improve the viability of animal agriculture will foster greater demand for beef.

Ideal spaces for engagement are where Agri-Food Tech innovators and investors are already gathering. One such space is the Animal Ag-Tech Innovation Summit. NIAA already serves as an advisor for this Summit that annually draws over 1,000 innovators and investors.

Upon launch of the Consortium, NIAA will manage a digital resource library. This will ensure a robust, up-to-date resource for innovators and investors exploring the animal agriculture sector of today's food system. In addition, NIAA will regularly engage with key stakeholders within animal agriculture and innovators and investors to advocate for greater investment in animal agriculture.

The Resource Library will house a directory of innovators and investors with an animal agriculture thesis, Beef Industry-facilitated research, farmer and rancher feedback/needs, key opinion leader commentary, and additional insights that innovators and investors can learn from and build upon as greater collaboration is fostered to enhance innovation and investment in animal agriculture.

Like many industry sectors, innovation and investment in animal agriculture is highly relationship-based. NIAA will continue fostering and building relationships that benefit animal agriculture and beef producers.

▼ Measurable Objectives

Measurable Objective #1:

An initial, digital resource library that aggregates animal agriculture innovation and investment needs, funds with an animal agriculture investment thesis, and innovators/entrepreneurs with animal agriculture applications/technologies.

Measurable Objective #2:

Direct support via technical knowledge and expertise in an animal agriculture-focused fund with a minimum of \$3 million in funding to support multiple \$250,000 to 500,000 projects.

LRP Initiatives Addressed by this Tactic

Safeguard & Cultivate Investment in Beef Industry Research, Marketing & Innovation

- Attract innovation and intellectual capital and cultivate the next generation of talent into the beef industry
- Increase industry funds for beef marketing, promotion, and research
- Educate producers, lawmakers and industry stakeholders on the benefits and impact of the Beef Checkoff

▼ Checkoff Program Committee(s) to Score This Tactic

Committee(s) to Score This Tactic:

Safety & Product Innovation, Stakeholder Engagement

2413-A

Molecular epidemiology and antimicrobial-resistance profile of *Salmonella* isolated from Kentucky local supply chain and development of novel therapeutics for infection control in pre-harvest stages of beef

Name of Contractor: National Institute for Animal Agriculture

Start Date: 10/1/2023

End Date: 9/30/2026

CBB/BPOC Funding Request for this AR: \$1,250,000

CBB/BPOC Funding Request for this Tactic: \$1,250,000

Tactic A | 2413-R

Molecular epidemiology and antimicrobial-resistance profile of Salmonella isolated from Kentucky local supply chain and development of novel therapeutics for infection control in pre-harvest and post-harvest stages of beef
National Institute for Animal Agriculture

Tactic Description:

Salmonella is the leading cause of bacterial foodborne poisoning with significant public health importance worldwide. Beef and beef products (ground meat) are considered one of the primary sources of *Salmonella* infections in humans. Beef cattle raised on open pastures can be infected with *Salmonella* from different sources such as food, water, soil, or other environmental sources. There is also a high risk of circulating different *Salmonella* serotypes, increasing the risk of its transmission to humans through the food chain. We hypothesize that early detection of *Salmonella* in beef cattle will help track the source of infection, reduce the risk of infection transmission between different animal species and humans, reduce the incidence of outbreaks, reduce the prevalence of antimicrobial resistance, and consequently improve *Salmonella* prevention and treatment strategies. This hypothesis can be achieved through specific objectives:

1. Monitor the burden of *Salmonella* infection and determine the frequency and distribution in beef's pre-harvest, harvest, and post-harvest stages of the Kentucky local supply chain. In this specific aim, we will:
2. Collect samples from beef cattle at pre-harvest and post-harvest locations.
3. Isolate, identify, and confirm *Salmonella* strains.
4. Determine the phenotypic and genotypic antimicrobial drug resistance in *Salmonella* isolated from food animals.
5. Assess the risk factors, identify the contamination source, and tackle the transmission dynamics of Salmonellosis.
- In this specific objective, we will use whole genome sequencing to understand where the *Salmonella* infection originates—allowing us to know where to apply the mitigation measures, either at the pre-harvest or post-harvest stage.
6. Develop novel therapeutics for the control of antibiotic-resistant *Salmonella* in pre- and post-harvest stages. Here, we propose using some of the novel approaches we have discovered and developed at the University of Kentucky.

Rationale of this study

***Salmonella* infection is estimated to cause 1.35 million infections, 26,500 hospitalizations, and 420 deaths in the USA alone per year. The estimated annual cost of medical treatment for *Salmonella*-related foodborne illnesses in the USA alone is between \$2.3 and \$11.3 billion (CDC, 2022).**

The long-term goal of this study is to improve disease prevention and treatment strategies for Salmonellosis in locally produced and processed beef products. Control of the bacterial dissemination and transmission and prevention of the disease will consequently decrease the medical and economic burdens, expenses, efforts of healthcare professionals, and places for hospitalized patients and reduce the risk of mortality and morbidity. Additionally, studying *Salmonella* species in local Kentucky beef cattle will help to monitor and control the sources of infection that may not only lead to outbreaks but also control the epidemic and endemic crises caused by bacterial dissemination. The surveillance study will specify the exact contributing factors and the causes of Salmonellosis in beef cattle raised and processed in

Kentucky. Once the contributing factors have been identified, further research will determine the most effective practices (probiotics, bacteriophage, quorum sensing small molecule inhibitors, or established agriculture/processing practices) to mitigate the Salmonella risk. These practices will be shared with the industry to reduce the risk of antibiotic-resistant *Salmonella* in the Kentucky local beef food supply.

While previous Beef Industry-funded research on Salmonella has consisted primarily of literature reviews and correlational studies, this study is unique in its seeking of causal relationships pre- and post-harvest. Furthermore, this study can serve as a model for other geographies and sectors of the beef value chain.

▼ Measurable Objectives

Measurable Objective #1

The long-term goal of this study is to improve disease prevention and treatment strategies for Salmonellosis in locally produced and processed beef products.

Measurable Objective #2

Once the contributing factors have been identified, further research will determine the most effective practices (probiotics, bacteriophage, quorum sensing small molecule inhibitors, or est agriculture/processing practices) to mitigate the Salmonella risk. These practices will be shared with the industry to reduce the risk of antibiotic-resistant Salmonella in the Kentucky local beef food supply.

Measurable Objective #3

Applicable conversation guides will be developed for qualified state beef councils and Beef Industry leaders to best communicate the research results and how the findings affect beef [food] safety. At least one shareable infographic will be developed to highlight in succinct form the research results.

LRP Initiatives Addressed by this Tactic

Grow Consumer Trust in Beef Production

- Educate medical, diet, and health professionals about beef and beef production
- Align and collaborate with traditional and nontraditional partners to tell the positive story of beef cattle production

Improve the Business & Political Climate of Beef

- Drive continuous improvement in food safety

Safeguard & Cultivate Investment in Beef Industry Research, Marketing & Innovation

- Attract innovation and intellectual capital and cultivate the next generation of talent into the beef industry
- Increase industry funds for beef marketing, promotion, and research

▼ Checkoff Program Committee(s) to Score This Tactic

Committee(s) to Score This Tactic:

Safety & Product Innovation, Stakeholder Engagement

SAFETY & PRODUCT INNOVATION COMMITTEE
Tactic Score Sheet Considerations, Scores, and Notes

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2410-A: Post-Harvest Beef Safety Research

Name of Contractor: Foundation for Meat and Poultry Research and Education

Start Date: 10/1/2023

End Date: 9/30/2024

CBB/BPOC Funding Request for this AR: \$800,000

CBB/BPOC Funding Request for this Tactic: \$800,000

Tactic A | 2410-R

Post-Harvest Beef Safety Research

Foundation for Meat and Poultry Research and Education

Tactic Description:

Food safety is critical to ensuring consumer confidence in the beef products they choose to buy and feed their families. While current levels of pathogen contamination on beef remain relatively low, there continue to be areas for improvement in its safety profile. Let's look first at pathogens that are adulterants in beef products. Sampling results from the Food Safety and Inspection Service (FSIS) show the prevalence of Shiga toxin-producing *Escherichia coli* (STEC) O157:H7 at 0.52 percent for raw ground beef components and 0.04 percent for ground beef in calendar year (CY) 2022.¹ Beginning February 1, 2023, FSIS expanded its routine verification testing for six Shiga toxin-producing *E. coli* (STEC) that are adulterants (non-O157 STEC; O26, O45, O103, O111, O121, or O145), in addition to the adulterant *E. coli* O157:H7 in samples of raw ground beef, bench trim, and other raw ground beef components collected at official establishments. FSIS also began testing for these non-O157 STEC in ground beef samples collected at retail stores and in applicable samples of imported raw beef products. This expansion could have a significant impact on the number of beef samples testing positive for STEC as FSIS estimates that for every one O157:H7 positive there are 2-3 non-O157 positives.²

While not adulterants, there are additional pathogens of concern on beef products. The prevalence of *Salmonella* spp. on raw ground beef components is 4.56 percent and 2.55 percent in raw ground beef in CY 2022.³ FSIS' "Nationwide Microbiological Baseline Data Collection Program: Beef-Veal Carcass Survey," conducted from August 2014 – December 2015 showed 27 percent of beef carcasses tested positive for *Salmonella* post hide removal.⁴ Because of the public health concerns around *Salmonella*, FSIS issued a "Roadmap to Reducing *Salmonella*" as well as held a public meeting on the state of science in 2020.^{5,6} More recently, FSIS proposed to declare that not-ready-to-eat breaded stuffed chicken products that contain *Salmonella* at levels of 1 colony forming unit (CFU) per gram or higher are adulterated within the meaning of the Poultry Products Inspection Act (PPIA). FSIS includes that, "Comminuted products are those that are ground, mechanically separated, or hand- or mechanically deboned and further chopped, flaked, minced, or otherwise processed to reduce particle size. Because of the nature of comminuted processes, *Salmonella* contamination in chicken skin and bone can spread throughout an entire batch or lot through cross contamination."⁷ Through this logic FSIS has addressed previous lawsuits that ruled *Salmonella* was inherent to the product and therefore could not be an adulterant but claiming *Salmonella* is only inherent to certain products within a carcasses (i.e. lymph nodes) and not all products like intact muscle. Although the proposal addresses chicken there likely could be an application of the same reasoning to comminuted beef products. An application of such logic to beef would likely be spurred by an event such as a widespread foodborne illness outbreak. As of June 20, 2023, there is an ongoing foodborne illness investigation of *Salmonella* Typhimurium officially attributed to ground beef. Together, these activities outline programs that FSIS and industry can undertake to reduce *Salmonella* on meat products, including performance standards and research among other efforts. FSIS has also indicated they are considering replicating activities undertaken to reduce *Salmonella* in poultry for beef if they are successful. Contamination of ready-to-eat meat and poultry, which is not broken out by species, by *Listeria monocytogenes* has remained relatively steady at a little more than one-half of one percent over the last few years.⁸

Research shows that pre-harvest, post-harvest, multiple hurdle beef safety interventions and other process controls are effective in reducing the prevalence of pathogenic bacteria. However, the threat posed by pathogens is not static, rather it is constantly emerging and antimicrobial interventions and other process controls must be constantly upgraded to address these emerging threats. Without these continuous improvements, incidence levels would have most likely increased. Many of the interventions and process controls now used in the beef industry are the result of Checkoff-funded research and continued investment is necessary for further improvement.

The Interagency Food Safety Analytics Collaboration (IFSAC) released foodborne illness attribution estimates for 2020 in late 2022. IFSAC used outbreak data to update previous analyses to estimate which foods are responsible for illness related to *Salmonella*, *Escherichia coli* O157, *Listeria monocytogenes*, and *Campylobacter*. IFSAC considers these priority pathogens because of the frequency (estimated 1.9 million illnesses each year combined) and severity of illness they cause, and because targeted interventions can significantly reduce these illnesses. The report noted that *Salmonella* illnesses came from a wide variety of foods, with 78 percent coming from seven food categories. Beef is attributed as the source to 6 percent of foodborne *Salmonella* illnesses. While beef caused fewer illnesses as a percent than in 2019, it increased to the sixth, up from eighth, most likely cause of *Salmonella* illness.

Nearly 81 percent of *E. coli* O157 illnesses were linked to vegetable row crops, e.g., leafy greens, and beef. Specifically, beef is estimated cause 22.8 percent of STEC O157 illnesses, which is down from 23.4 percent in 2019.⁹

Pathogens in beef remain a critical public health concern and ground beef remains a significant vulnerability. Over the last few years, there have been several high profile pathogen outbreaks attributed to ground beef. In early June 2023, the Illinois Department of Public Health announced an outbreak of *Salmonella* infections causing 26 illnesses has been linked to ground beef.¹⁰ Healthy People 2030 have set public health goals to reduce illnesses attributed to STEC, *Salmonella* and *Listeria* as well as to reduce outbreaks attributed to STEC, *Campylobacter*, *Listeria*, and *Salmonella* infections linked to beef.¹¹ It is clear regulatory and public health agencies are committed to reducing foodborne illnesses attributed to beef. While most consumers trust America's meat industry to create products that are safe to eat, research shows that food safety is an ongoing concern, with concerns about raw meat contamination higher than that of raw produce.¹²

Like pathogens, science and detection technologies have also continued to evolve. Public health officials and regulatory agencies are using whole genome sequencing (WGS) technology for genetic typing of bacteria, including pathogens relevant to food safety. WGS allows for significant improvement in foodborne disease outbreak detection and source traceback compared to earlier technologies. FSIS announced changes to the laboratory sampling datasets to include the FSIS Number – the whole genome sequencing (WGS) identifier assigned for pathogens – and allele codes with date stamps. The FSIS Number update applies to sampling results for *Listeria monocytogenes*, *Salmonella*, *Campylobacter*, and Shiga toxin-producing *Escherichia coli*, or STEC. FSIS publicly posts this information. To improve public health, it is important to gain a better understanding of the virulence factors of pathogens found on beef. Learning why and how pathogens cause illness will enable the beef industry to more appropriately target interventions to minimize their presence and make improvements in public health.

The economic burden of illness is another factor in the costs associated with pathogen contamination. According to the U.S. Department of Agriculture's Economic Research Service, illnesses attributed to *Salmonella* cost \$3.6 billion, STEC (non-O157 and O157) cost nearly \$300 million, and *Listeria* costs \$2.8 billion in the 2013.¹³ These costs resulted from medical costs, lost productivity, and death. There are no acceptable levels for pathogenic organisms in beef products as evidenced by the level of foodborne illnesses in the United States. Because *Salmonella* is a significant source of illnesses, hospitalizations, deaths and related costs, research efforts focused on mitigating this threat in the beef supply will continue to be a key priority.

Another beef industry cost associated with pathogen contamination is the reduced value of products testing positive. When a raw material or finished product tests positive for a pathogen, it cannot enter commerce unless it is thermally processed. If the product has already entered commerce, the product is subject to a recall. In both cases, a substantial reduction in value for the pathogen positive product and significant recall costs are incurred by the packer or processor.

The total costs of safety interventions and processes, medical and missed opportunity claims, recalls and reduced value of contaminated products cannot always be passed on to consumers. Most often these costs are borne by the industry and eventually passed on to beef producers through reduced live cattle values. Accordingly, there is a direct economic incentive for beef producers to invest in beef safety research to further reduce pathogenic contamination levels in raw materials and finished products to increase the value of their cattle and their return on investment.

For the foregoing reasons, foundational, applied research is the focus in this program. Integrated communication and educational initiatives will ensure that the data collected are shared with targeted audiences for application across the processing sectors. Outreach with stakeholder groups will inform and impact collaborative research and communication programs addressing the safety of U.S. beef products.

The beef industry must consistently produce products that are safe and wholesome to maintain and bolster consumer trust and grow demand. International and domestic consumers must have confidence that the U.S. beef items they and their families consume are produced using the best processes available, which are supported by science-based research. The threats in the microbial environment are constantly evolving and posing new risks to the safety of the beef supply. These changes can lead to new regulatory initiatives and require adaptations or scientific support for compliance. Yet, not all research is applicable to all facilities as they vary in size, capacity and types of beef products produced. It is imperative that the beef processing industry have access to the most up-to-date science-based research to mitigate both current and emerging threats. A one size fits all approach does not work when ensuring safe beef. As a result, while there may be a large body of scientific evidence in the literature, post-harvest beef safety research investments must continue to address these differences and emerging challenges. This tactic provides practical, science-based research that can be used by in-plant personnel and others to ensure the safety of the U.S. beef supply.

A standing advisory committee of industry experts and practitioners will establish research priorities and evaluate proposals. As needed, a select group of beef industry members may be identified to develop and evaluate specific research projects in consultation with the standing advisory committee. Based upon their recommendations, contracts are awarded based on merit and priority need. Funding partners are identified, as appropriate. The Foundation, as a contractor to the Beef Checkoff, has a demonstrated history of bringing together funding partners. After the award, the research contracts will be closely monitored to ensure timely and complete research work products are available for distribution to the industry.

Research findings will be disseminated to stakeholders and safety professionals through many means. Investigators will present their research at regional, national and international technical conferences as well as publish work in peer-reviewed materials. Research findings will also be shared with regulatory agencies to ensure they have all the evidence when making decisions impacting beef safety. AR activities and related outcomes will be shared during sponsorship events and exhibits. The dissemination of research findings to the food safety community will aid the safety of, and consumer confidence in, beef products.

1. Sampling Results for FSIS Regulated Products.
http://www.fsis.usda.gov/sites/default/files/media_file/documents/Dataset_QSR_SamplingProjectResultsData.pdf .
Accessed June 13, 2023.
2. Personal Correspondence. KatieRose McCullough, Ph.D., MPH and Paul Kiecker, Administrator, FSIS.
3. Sampling Results for FSIS Regulated Products.
http://www.fsis.usda.gov/sites/default/files/media_file/documents/Dataset_QSR_SamplingProjectResultsData.pdf.
Accessed June 13, 2023.
4. Nationwide Microbiological Baseline Data Collection Program: Beef-Veal Carcass Survey.
<https://www.fsis.usda.gov/node/1968>. Accessed June 16, 2023.
5. FSIS Roadmap to Reducing Salmonella: Driving change through Science Based policy.
<https://www.fsis.usda.gov/wps/wcm/connect/388d5b27-b821-42ba-a717-526f3bc68b4a/FSISRoadmaptoReducingSalmonella.pdf?MOD=AJPERES>. Accessed June 16, 2023.
6. <https://www.federalregister.gov/documents/2020/08/14/2020-17827/salmonella-state-of-the-science>. Accessed June 16, 2023
7. <https://www.federalregister.gov/documents/2023/04/28/2023-09043/salmonella-in-not-ready-to-eat-breaded-stuffed-chicken-products>. Accessed June 16, 2023
8. Sampling Results for FSIS Regulated Products.
http://www.fsis.usda.gov/sites/default/files/media_file/documents/Dataset_QSR_SamplingProjectResultsData.pdf.
Accessed June 13, 2023.
9. Interagency Food Safety Analytics Collaboration. Foodborne illness source attribution estimates for 2020 for Salmonella, Escherichia coli O157, Listeria monocytogenes, and Campylobacter using multi-year outbreak surveillance data, United States. Atlanta, Georgia and Washington, District of Columbia: U.S. Department of Health and Human Services, CDC, FDA, USDA/FSIS. November 2022.

10. <https://dph.illinois.gov/resource-center/news/2023/june/public-health-officials-warn-about-a-salmonella-outbreak-affecti.html>
11. <https://health.gov/healthypeople/objectives-and-data/browse-objectives/foodborne-illness>. Accessed June 16, 2023.
12. Technomic. NAMI Protein PACT Q1 2022 Report. April 25, 2022.
13. Hoffmann, Sandra, Bryan Maculloch, and Michael Batz. Economic Burden of Major Foodborne Illnesses Acquired in the United States, EIB-140, U.S. Department of Agriculture, Economic Research Service, May 2015. https://www.ers.usda.gov/webdocs/publications/43984/52807_eib140.pdf?v=42136. Accessed June 16, 2023.

▼ Measurable Objectives

Measurable Objective #1

Manage the execution of a minimum of two research projects addressing current knowledge gaps. Topics may include but are not limited to: Evaluating routes of *Salmonella* transmission in and throughout beef establishments; determining the most effective location(s) from harvest to shipping to maximize reduction of microbial contamination in beef processing; and identifying and validating antimicrobial interventions targeting *Salmonella*, *E. coli* O157:H7 and non-O157:H7 STECs in raw ground beef components.

Measurable Objective #2

Assess research impact over time by cataloging citations for research funded by the Beef Checkoff and administered by the Foundation. Initial target is to identify 10 references citing Beef Checkoff funded research used as a foundation for other research projects, to develop regulatory guidelines, standard operating procedures or best practices by the end date of this AR.

Measurable Objective #3

Facilitate the dissemination of research data and knowledge sharing through at least cumulatively four meetings, webinars, documents or other events targeted to safety professionals.

- Reaching at least 1,000 stakeholders through combined activities
- Newsletter distribution will achieve at least 30 percent open rate

Measurable Objective #4:

Conduct a webinar series, at least two per year, to highlight post-harvest safety research funded by the Beef Checkoff. Target cumulative audience of 500 food safety practitioners and interested stakeholders.

LRP Initiatives Addressed by this Tactic

Improve the Business & Political Climate of Beef

- Drive continuous improvement in food safety

Safeguard & Cultivate Investment in Beef Industry Research, Marketing & Innovation

- Encourage the cooperation and collaboration of existing industry advisory committees to identify and prioritize research efforts

▼ Checkoff Program Committee(s) to Score This Tactic

Committee(s) to Score This Tactic:

Safety & Product Innovation

2411-A: Safety Research and Scientific Affairs

Name of Contractor: National Cattlemen's Beef Association

Start Date: 10/1/2023

End Date: 9/30/2026

CBB/BPOC Funding Request for this AR: \$9,643,600

CBB/BPOC Funding Request for this Tactic: \$1,274,700

Tactic A | 2411-R
Safety Research and Scientific Affairs
National Cattlemen's Beef Association

Tactic Description:

NCBA, on behalf of the Beef Checkoff, leads scientific research on pre-harvest beef and directly shares it with key decision makers. This work also builds the scientific foundation for pre-harvest beef safety communications, thought leader education and consumer messages. Historical and active program results demonstrate the industry's commitment to ensuring the safety of beef and addresses improvements that can be made pre-harvest to reduce food safety hazards to the rest of the industry and to consumers.

Results generated through this program are targeted at the scientific community including academia, scientific organization (American Meat Science Association, International Association for Food Protection), beef safety decision makers throughout the industry (feedlot operators, packers, processors, retail, foodservice, corporate food safety scientist) and regulatory sectors. Through collaborations with State Beef Councils, other NCBA Checkoff programs, as well as other Checkoff contractors (e.g., USMEF, FMPRE, etc.), research and education outcomes are further leveraged for broader impact.

Over time, this program has evolved from a single pathogen focus (*E. coli*) to address several potentially harmful bacterial, chemical, or physical threats to beef safety. As the beef supply and microbial environment evolves, other pathogens such as *Salmonella* challenge beef's safety. Today, consumers expect beef to be safe from all safety threats, but also expect the beef industry to take steps to evolve and improve the safety of the beef they purchase. Research in this program advances the industry's commitment and progress towards addressing these consumer/influencer concerns.

The current research roadmap developed and maintained with an industry expert advisory group, builds a foundation of research that addresses challenges and opportunities related to pre-harvest beef safety focusing on pathogen mitigation strategies, pathogen harbors, and microbial physiology. Scientific reviews of emerging beef safety topics will also be commissioned. Research outcomes will be shared with advisory groups developing safety guidance, and scientific and regulatory communities through public forums/symposia (i.e., Beef Industry Safety Summit and other scientific forums), through written materials, visual tools or in-person meetings/briefings.

Strategic planning sessions will be conducted as needed to identify research gaps and collaborative research opportunities with third-party experts. This tactic directly addresses the demand drivers of eating experience and how food is raised/grown that influence consumption and preference.

▼ Measurable Objectives

Measurable Objective #1

Conduct a minimum of four original pre-harvest safety scientific research projects or technical assessments focused on the research roadmap pillars (mitigation strategies, harbors and physiology) as published on Beefresearch.org that leads to discoveries about pre-harvest beef safety and strengthens the scientific foundation and/or balances the body of evidence to reinforce beef safety within the scientific community.

Measurable Objective #2

To build broader scientific understanding in beef safety, conduct science briefings with targeted safety thought leaders with varied expertise in areas of the research roadmap pillars (minimum of 40). Target at least five new thought leaders (ex. emerging investigators) to expand support for research discovery/scientific interest in beef.

Measurable Objective #3

Secure placement of pre-harvest beef safety research results (minimum of 40) internally (in other tactics/ARs or State Beef Council partners) or externally (conferences, industry meetings, supply chain partners, communication/educational outlets, etc.) to provide the science-based information about pre-harvest beef safety research discoveries and what it means for overall beef safety.

LRP Initiatives Addressed by this Tactic

Improve the Business & Political Climate of Beef

- Drive continuous improvement in food safety

▼ Checkoff Program Committee(s) to Score This Tactic

Committee(s) to Score This Tactic:

Safety & Product Innovation

2411-C: Product Quality Research and Technical Expertise

Name of Contractor: National Cattlemen's Beef Association

Start Date: 10/1/2023

End Date: 9/30/2026

CBB/BPOC Funding Request for this AR: \$9,643,600

CBB/BPOC Funding Request for this Tactic: \$1,188,300

Tactic C | 2411-R

Product Quality Research and Technical Expertise

National Cattlemen's Beef Association

Tactic Description:

NCBA, on behalf of the Beef Checkoff, leads the primary product quality focused research initiative in the U.S. and shares findings with the scientific community and industry stakeholders. This program also builds the scientific foundation and generates unique research insights to reduce product inconsistencies, optimize product utilization, and improve beef eating satisfaction. This is essential for the beef industry as it is the only research funded on beef quality that is not proprietary or for competitive advantage.

Results generated through this program are targeted at the scientific community including academia, product quality decision makers, industry partners, and science associations (American Meat Science Association, American Association of Meat Processors, etc.).

Through collaborations with State Beef Councils, other NCBA Checkoff programs, as well as other Checkoff contractors (e.g., USMEF, FMPRE, etc.) research and education outcomes are further leveraged for broader impact.

Over time, this program has evolved from a focus on beef tenderness challenges to address several factors of overall eating experience including aging, cooking, and beef flavor as well product storage and processing evolutions post-pandemic. As the beef industry evolves, the program addresses inconsistency from production, product management, end user decisions, and supply challenges. Today, consumers expect beef to provide a quality and repeatable eating experience. Research in this program advances the industry's commitment and progress towards addressing these consumer/influencer concerns.

The current research roadmap developed and maintained with an industry expert advisory group builds a foundation of research that addresses challenges and opportunities focusing on beef palatability and product yield. Scientific reviews of emerging beef relevant topics will also be commissioned. Strategic planning sessions will be conducted as needed to identify research gaps and collaborative research opportunities with third-party experts. Through scientific affairs activities, such as public conferences (i.e., the annual Reciprocal Meats Conference), written materials, visual tools and/or in-person meetings/briefings, this program will aim to drive product consistency. Taste is beef's top demand driver and the top reason consumers chose beef. To protect the most important product attribute - taste, this tactic directly addresses the demand drivers of eating experience, convenience/versatility and price.

▼ Measurable Objectives

Measurable Objective #1

Conduct a minimum of eight original product quality scientific research projects or technical assessments focused on the research roadmap pillars (applied research, basic research and technical services) as published on beefresearch.org that leads to discoveries about beef quality and strengthens the scientific foundation and/or balances the body of evidence to reinforce beef's quality attributes within the scientific community.

Measurable Objective #2

To build broader scientific understanding in beef quality, conduct science briefings with targeted product quality thought leaders with varied expertise in areas of the research roadmap pillars (minimum of 40). Target at least five new thought leaders (ex. emerging investigators) to expand support for research discovery/scientific interest in beef.

Measurable Objective #3

Secure placement of product quality research results (minimum of 40) internally (other tactics/ARs or State Beef Council partners) or externally (conferences, industry meetings, supply chain partners, communication/education outlets, etc.) to provide the science-based information about beef quality research discoveries and what it means for overall beef quality.

LRP Initiatives Addressed by this Tactic

Develop and Implement Better Business Models to Improve Price Discovery and Value Distribution Across All Segments

- Use innovative methods and technologies to value carcasses based on eating satisfaction and red meat yield

Promote & Capitalize on the Multiple Advantages of Beef

- Implement a marketing campaign that communicates beef's advantage compared to competing proteins
- Engage consumers in a memorable beef eating experience
- Promote underutilized beef cuts and new variety meat products

▼ Checkoff Program Committee(s) to Score This Tactic

Committee(s) to Score This Tactic:

Safety & Product Innovation

