Foundation for Meat and Poultry Research and Education

AR# 2410-R
AR Title: Post-Harvest Safety Research

AR Purpose and Description:

The strategies and tactics described in this Authorization Request (AR) support the Checkoff program category for Research. Detailed descriptions for post-harvest beef safety research and education and outreach are included in the following section. Around the world, consumers of U.S. beef demand high quality, safe and nutritious products. Beef safety research plays a key role in the dialogue with domestic and foreign consumers of U.S. beef as their access to protein choices expands and the demand for product information continuously increases. Effective communications must be based in science. Disseminating science-based information and data to diverse audiences is a fundamental role that will be filled through the programs outlined in this AR. Collaborative efforts will be utilized to ensure broad distribution and effective engagement with all stakeholders.

CBB Budget Category: Research

Name of Subcontractor: N/A

Start Date: 10/1/2023

End Date: 9/30/2026

FY24 CBB/BPOC Funding Request		
Direct Costs	**Implementation**	**Total**
$350,000.00	$150,000.00	$500,000.00

Beef Industry Long Range Plan (LRP) Core Strategies Addressed by this AR:

- Improve the Business and Political Climate of Beef, Safeguard and Cultivate
- Investment in Beef Industry Research, Marketing and Innovation

AR Tactic(s)

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 August 1, 2023, there are two ongoing foodborne illness investigations of *Salmonella* 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* Typhimurium infections causing 26 illnesses has been linked to ground beef.[10] In late July, the Centers for Disease Control and Prevention announced a multistate outbreak attributed to *Salmonella* Saintpaul in ground beef. Of the 16 illnesses, there have been six hospitalizations.[11] 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.[12] 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.[13]

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.

Citations:

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. *Salmonella* Outbreak Linked to Ground Beef. https://www.cdc.gov/salmonella/saintpaul-07-23/index.html. Accessed August 1, 2023.

12. https://health.gov/healthypeople/objectives-and-data/browse-objectives/foodborne-illness. Accessed June 16, 2023.

13. Technomic. NAMI Protein PACT Q1 2022 Report. April 25, 2022.

14. 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 three 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

Supplemental Information for This AR

1. **Please explain changes from the FY23 approved AR:**
   Potential research topics have been updated in Tactic A.

2. **List any proposed vendors/agencies that will be used to complete the work in this AR.**
   None

3. **Will all work with vendors/agencies be competitively bid?**
   Work will be awarded through an RFP process and evaluation of research proposals by a standing committee comprised of industry and academic food safety experts.

4. **Please list any relationships between this AR and projects previously funded by the Beef Promotion Operating Committee (BPOC).**
   The Foundation for Meat and Poultry Research and Education and the North American Meat Association previously administered post- harvest beef safety research through ARs # 1405, 1504, 1603, 1705, 1811, 1910 and 2010. FMPRE also administered processed beef nutrition research under ARs # 1910, 2010 and 2110. FMPRE currently administers post- harvest beef safety research through AR # 2110, 2210, and 2310.

5. **If applicable, explain how this AR can be extended by State Beef Councils or other contractors.**
   Outcomes and results will be shared with State Beef Councils and contractors for further dissemination and use. Efforts on topics of common interest among contractors will be shared to maximize Checkoff reach

Potential Partnerships

Please list all potential partners/collaborators for this AR, and include any partnership and/or collaborations with a third party by identifying the third party, the nature of the collaboration, and extent of the collaboration.

Potential Partnership List:

North American Meat Institute – Collaborations could include in-kind staff support, research co-funding, dissemination of research, outreach and education opportunities.

Foundation for Meat and Poultry Research and Education – Collaboration could include research co-funding with non-Checkoff funds, dissemination of research, outreach and education opportunities.

National Pork Board - Collaborations could include co-funding research, dissemination of research, outreach and education opportunities.

U.S. Poultry and Egg Association - Collaborations could include co-funding research, dissemination of research, outreach and education opportunities.

American Meat Science Association – Collaborations could include dissemination of research, outreach and education opportunities.

American Association of Meat Processors - Collaborations could include dissemination of research, outreach and education opportunities.

Eastern Meat Packers Association - Collaborations could include dissemination of research, outreach and education opportunities.

Southwest Meat Association - Collaborations could include dissemination of research, outreach and education opportunities.

FMI – The Food Industry Association – Collaborations could include dissemination of research, outreach and education opportunities.

National Grocers Association – Collaborations could include dissemination of research, outreach and education opportunities.

International Association for Food Protection - Collaborations could include dissemination of research, outreach and education opportunities.

Institute of Food Technologists - Collaborations could include dissemination of research, outreach and education opportunities.

International Food Information Council - Collaborations could include dissemination of research, outreach and education opportunities.

Niche Meat Processors Assistance Network - Collaborations could include dissemination of research, outreach and education opportunities

Detailed Budget Summary

The tables in the following three sections report program budget information from the following funding sources:

1. Cattlemen's Beef Board/Beef Promotion Operating Committee (CBB/BPOC) Funding
2. "Other Funding" sources such as:
    - Federation of State Beef Councils (FSBC) Funds
    - Individual Qualified State Beef Council (QSBC) Funds
    - Government Funds (e.g., Market Access Program,
    - Foreign Market Development) Grain/Oilseed Funds (e.g., National Corn Growers Association, American Soybean Association)
    - Corporate Funds (e.g., tech and pharma companies)
    - Other

Section 1 - Funding Requested by Tactic

CBB/BPOC Funding Requested by Tactic
The following table outlines the amount of CBB/BPOC funding that is being requested for each tactic within this AR, and the committee(s) that has been selected to score each tactic.

CBB/BPOC Funding Requested by Tactic					
Committee Name	**Tactic**	**Tactic Name**	**Direct Costs**	**Implementation**	**Total**
Safety & Product Innovation	Tactic A	Post-Harvest Beef Safety Research	$350,000.00	$150,000.00	**$500,000.00**
		Total	**$350,000.00**	**$150,000.00**	**$500,000.00**

Other Funding Sources Requested by Tactic
The following table reports the amount of proposed and/or anticipated "Other Funding" sources that would be applied to this AR's tactics. The funding information in this table is for informational purposes only and demonstrates external collaboration as delineated in the 2021-2025 Beef Industry Long Range Plan.

Other Funding Sources Requested by Tactic *(Informational Only)*			
Funding Source	**Tactic**	**Tactic Name**	**Total**
Other: N/A	Tactic A	Post-Harvest Beef Safety Research	
		Other Funding Total	

Use the space below if you wish to provide additional comments/information on the FY24 CBB/BPOC or Other Funding amounts that are being requested for this AR's tactic(s).

N/A

Section 2 - Summary of FY23 AR Budgets and Expenses

Classification:	This AR is a continuation of, or builds upon, program work from last year. CBB will report information in the "FY23 CBB/BPOC Funding" table and we will provide information for the "FY23 Other Funding Sources" table.

FY23 CBB/BPOC Funding
This table reports the amount of awarded and expended CBB/BPOC funding for this Authorization Request in FY23.

FY23 CBB/BPOC Funding *Note: The Cattlemen's Beef Board will complete the fields in this table.*			
	AR# 2310-R		
	Direct Costs	**Implementation**	**Total**
Funds Awarded	$300,000.00	$150,000.00	$450,000.00
Actual Expenses *(October 1, 2022 - June 30, 2023)*	$12,433.00	$51,726.00	$64,159.00

FY23 Other Funding Sources
The following table reports the amount of committed and expended "Other Funding" sources for this AR in FY23. The funding information in this table is for informational purposes only and demonstrates external collaboration as delineated in the 2021-2025 Beef Industry Long Range Plan.

FY23 Other Funding Sources *(Informational Only)*			
	AR# 2310-R		
	Other Funding Source	**Funds Committed**	**Funds Expended** *(October 1, 2022 – June 30, 2023)*
A	Other: N/A		

Use the space below if you wish to provide additional comments/information on the FY23 CBB/BPOC or Other Funding budget and expense summaries.
N/A

Section 3 - Historical Summary of AR Budgets and Expenses

Classification:	This AR is proposing new program initiatives that are not related to previous program work from two years ago (or longer). Therefore, we do not have any historical budget information to report

CBB/BPOC Funding – Historical Summary
The following table reports the amount of awarded and expended CBB/BPOC funding for this AR in FY20, FY21, and FY22.

CBB/BPOC Funding - Historical Summary
Note: The Cattlemen's Beef Board will complete the fields in this table.

		FY22 AR# 2210-R	FY21 AR# 2110-R	FY20 AR# 2010-R
AR Period[1]	*Start Date:*	*Oct. 1, 2021*	*Oct. 1, 2020*	*Oct. 1, 2019*
	End Date:	*Sep. 30, 2024*	*Sep. 30, 2024*	*Sep. 30. 2023*
Funds Awarded		$500,000.00	$646,144.00	$798,057.00
Actual Expenses[2]		$195,359.00	$304,015.00	$795,425.00

[1]For multiyear ARs, the "End Date" reflects the date that the AR is scheduled to be completed.
[2]If the AR "End Date" has not year occurred, actual expenses will be reflective of the following time period:
AR Start Date - June 30, 2023

Other Funding - Historical Summary
The following table reports the amount of "Other Funding" source expenditures for this AR in FY20, FY21, and FY22. The funding information in this table is for informational purposes only and demonstrates external collaboration as delineated in the 2021-2025 Beef Industry Long Range Plan.

Other Funding Sources – Historical Summary *(Informational Only)*

	FY22 AR# 2210-R		FY21 AR# 2110-R		FY20 AR# 2010-R	
	Other Funding Source	**Total Expenditures**	**Other Funding Source**	**Total Expenditures**	**Other Funding Source**	**Total Expenditures**
A	Other: N/A		Other: N/A		Other: N/A	