Food Safety Research Prospects for The Meat Science & Animal Biologics Discovery Program

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Current and Future Prospects for Meat Science and Animal Biologics Discovery Program
Food Animal Microbial Ecology

Post-harvest Packaging Temperature

Pre-harvest Antimicrobials, Vaccines, Pre/Probiotics, etc.

Processing Antimicrobials, Temperature

Consumer Education
Strategy for Pre-Harvest Food Safety and Gut Health

**Pathogen Screen**

**Pathogen**
Pathogen challenge studies *in vitro/in vivo*

**Microbiome**
16S rRNA gene-targeted sequencing of entire microbial communities

**Gut Ecology**

**Taxa**: Identification of representative gut microbes = core microbiome for a feed additive

**Diversity**: Identification of differences in gut microbe populations among feed additives

- Host gut response: Metabolomics, transcriptomics, immunology, proteomics
- **Longitudinal studies**: Meat microbiology and meat quality post harvest

**Animal performance**
Potential Outcomes for Preharvest Food Safety Research

- **Standardization of Feed Additives Evaluation**
  - Gut microbiome composition and metabolome
  - Pathogen reduction and animal performance
  - Farm to fork: Longitudinal studies

- **Prebiotic Mechanisms and Discovery**
  - Complex prebiotic = complex gut microbe response
  - Gut microbiome to identify active grain bran components
  - Pathogen transposon mutagenesis

- **Commercialization/discovery opportunities:**
  - Probiotic and prebiotic candidates
Strategy for Meat Processing
Microbial Ecology/Food Safety

Sequencing

- NGS
  - Next Generation Sequencing

Microbiome
- 16S rRNA gene-targeted sequencing of entire microbial communities

Applications
- Conventional plating; Microbiome mapping of meat processing steps
  - Pathogen Quantitation
- Taxa identification of representative indicator microbes; Signature microbial populations for interventions
- Screening of culture nonselective and selective plating methods; Validation of plating methods by NGS
Potential Outcomes for Meat Processing and Food Safety Research

- **Rapid quantitative methods** for pathogens: Molecular typing for *Salmonella* identification, CRISPR typing; DNA barcoding for tracking

- **Quantitative microbiome mapping:** Designing protocols for quantifying general microbial populations on red meat and poultry

- **Postharvest microbial indicators:** Identifying indicator microbial profiles for optimal intervention performance and shelf life prediction = evaluation of commercial antimicrobials; sanitizers

- **Data analytics:** WGS, microbiome mapping; risk assessment = Need collaboration for advanced computer programming

- **Commercialization:** Rapid pathogen ID quantitation kits, Assays for precise spoilage prediction
Current and Future Trends in Food Safety

• **Organic, natural** and the removal of antibiotic growth promoters

• **Alternative** meats, animal welfare, sustainability

• Labor shortage = **Automation** in processing

• Big vs. small animal agriculture: **Retail** vertical integration

• “**Big data**” revolution: Block chain, traceability, cyber security, and sequencing
Food Safety Opportunities for MSABD

• Science-based identification of novel feed additives and mechanisms

• Defining concept of “meat microbial ecology”

• Animal biologics: Maximize use of animal = Search for unique biologicals and microbes

• Collaborate with computer engineers to develop more advanced sequencing bioinformatics

• Generate groundbreaking/innovative peer reviewed research
Thank You

Questions