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PorkBridge 2009
November 5th Session
Packer Perspective
on Quality of Hogs
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Agenda
1. Introduction
   • What is Pork Quality?
2. Factors Influencing Raw Materials
3. Changes in Meat During Storage
4. Summary

What is Pork Quality?
The combination of attributes that make pork desirable
• Freshness
• Economic Value
• Safety
• Nutritional Value
• Processing Characteristics
• Sensory Characteristics

Sensory Characteristics
• Appearance
• Color
• Tenderness
• Aroma
• Juiciness
• Flavor

Focus on Flavor
• The “Eating Experience” is impacted by:
  – Tenderness - effected by pH, aging
  – Flavor - effected by proteins, marbling, pH
  – Juiciness - effected by pH, preparation, marbling
• Influenced by a large number of things:
  – Animal Breed/Genetics, Age, Feeding
  – Plant Processes:
    • Handling, Stunning, Stun to Chill Time, Chilling
    • Cooking Practices
### Pork Chain Influence on Meat Quality & Eating Experience

**Simplistic View**

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<th>Packer</th>
<th>Retailer</th>
<th>Consumer</th>
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**Complete View**

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### Section 2

Factors Influencing Raw Materials

**Key to a Great Product**

- Start with a high quality raw material
  - Low microbial count
  - Temperature control

*Garbage In, Garbage Out*

### Section 2

Factors Influencing Raw Materials

#### Breed and/or Genetics

- Play a role in raw material quality
- **Breed Examples**
  - Angus cattle
  - Duroc or Berkshire pigs
- **Genetic Example**
  - PSS/PSE in pigs
  - Napole gene in pigs

### Section 2

Factors Influencing Raw Materials

#### Nutritional Program

- **Energy Sources**
  - Non-ruminants vs Ruminants
    - Pigs vs Cattle
  - Fat sources
    - Tallow vs Blends
  - Energy by-products
    - DDGS

#### Energy By-Products

- DDGS, corn germ meal, glycerol, bakery feeds, etc…
- **Effects on carcass and pork quality**
  - Belly softness and stability
  - Trim fat stability
  - Performance in dry-cured hams
  - Flavor is primary eating-quality attribute that may cause concerns
Section 2
Impact of Energy By-Products
- Packers implementing or developing procurement programs based on belly or jowl iodine value
- Major bacon manufacturer complaining about soft bellies and slicing yields
- Japanese importers may begin monitoring belly softness because of fresh slicing yields
- Large sausage manufacturer concerned about elevated IV in fat and relationship with rancidity
- Cutting operation concerned about slicing Boston Butts
- Premium ham manufacturer – raw ham specs now include an IV maximum

Section 2
Factors Influencing Raw Materials
Pre-Harvest Handling
- Time Periods Involved
  - Early Pig Processing
  - On-Farm Loading
  - Transportation
  - Plant Unloading and Final Drive
- Rough handling or excessive excitement results in product losses
  - Bruises, cuts & broken bones
  - PSE or DFD

Impact of On Farm Activity:
Short Tail Docking &/or Biting

Impact of On Farm Activity:
Pneumonia ➔ Adhered Lungs

Impact of Marketing Activity:
Frost Bite ➔ Trim Loss

Impact of Marketing Activity:
Non-Ambulatory/Non-Injured Animals NANI
Impact of NANI / Broken Bones: Trim Loss

Impact of Marketing Activity: Boneless Loin Surface Bruises

Impact of Marketing Activity: Boneless Loin Deep Bruise

Section 2
Factors Influencing Raw Materials

Stunning
• Humane Methods of Slaughter Act of 1978
• Types
  – Captive Bolt
  – Electrical
  – Gas
    • Displaces ambient air
    • Mixture of Gases
      – CO₂, CO₂, O₂, CO₂:Ar

Section 2
Factors Influencing Raw Materials

Advantages of Gas Stunning
• Improved Insensitivity Scores
  – Irreversibly stunned
  • Reducing the chance for a “live hang”
  – Improved working conditions

Advantages of Gas Stunning
• Reduction in early postmortem circulatory and skeletal muscle system pressure
  – Cause
    • stimulation of the nervous, hormonal, circulatory and skeletal muscle systems
  – Effect
    • circulatory pressure
      – capillary bursting (blood splash & surface bruising)
    • severe muscle contraction
      – bone breakage (blowouts)
Section 2
Factors Influencing Raw Materials

Advantages of Gas Stunning

• Reduced surface bruises and blood splash

Boneless Loins from Electrical Stunning Process
Boneless Loins from CO₂ Stunning Process

Impact of CO₂ Stunning on pH Decline

Impact of CO₂ Stunning on pH Decline

Section 2
Factors Influencing Raw Materials

Advantages of Gas Stunning

• Alteration of early postmortem muscle pH decline
  – Cause
    • CO₂ acts as a buffer
  – Effect
    • ♦ protein denaturation due to low pH and high carcass temperatures
    • ♦ Color
      – Darker and/or more consistent
    • ♦ Water Holding Capacity
      – ♦ Purge Loss

Section 2
Factors Influencing Raw Materials

Evisceration

• Big potential for Micro Contamination
• Improper Procedures Can Lead to
  – High Micro Counts
  – Off Colors
  – Off Flavors

Section 2
Factors Influencing Raw Materials

Post-Harvest Handling

• Control Microbial Counts
  – Chilling Impact
  – Get below 40˚F ASAP
• Tenderness Issues
  – Cold Shortening

Section 3
Changes in Meat During Storage

• Physical Changes
  – Color Fade
  – Oxidation
  – Package Purge
• Microbial Changes
  – Texture and Color
  – Oxidation Acceleration
  – Purge
Section 3
Changes in Meat During Storage

Physical Changes: Color Fade

- Factors contributing to color fade
  - Temperature
  - pH
  - Lighting conditions
  - Oxidation
  - Microbial load

- Major factor – myoglobin state
  - Oxymyoglobin – fresh meat color
  - Metmyoglobin – gray/brown color

Section 3
Changes in Meat During Storage

Physical Changes: Oxidation

Development of
- Off color
- Off odors
- Off Flavors

- Dependent on two things
  - Composition of fat
    - More unsaturation > more susceptible to oxidation
  - Oxidation Accelerators
    - High storage temperatures
    - Photo-oxidation

Section 3
Changes in Meat During Storage

Physical Changes: Auto-oxidation

- Myoglobin + O₂ ➔ Free Radical Formation

- Free radicals are pro-oxidants
- Continuous cycle

Section 3
Changes in Meat During Storage

Physical Changes: Purge

- Effected by pH of the meat
- Effected by deep chilling/freezing
  - Slow chill
    - Forms large ice crystals which damages more cells, which leads to more purge
  - Fast chill
    - Converse to slow chill

Section 3
Changes in Meat During Storage

Microbial Changes

- Spoilage
  - Color
  - Odor
  - Oxidation Acceleration
  - Purge

- High dollar impact on retailers

Section 3
Changes in Meat During Storage

Factors in Meat Spoilage

1. Type and number of microorganisms
2. Environment to which the meat is exposed
  - Temperature control is critical

“Life begins at 40”
Section 3
Changes in Meat During Storage

Types of Organisms
• Yeasts
  – Surface slime
• Mold
  – Multi-colored, fuzzy appearance
• Bacteria
  – White purge in package
  – Thick purge in package
  – Off odors

Section 3
Changes in Meat During Storage

Microbial Oxidation
• Some organisms can contribute to oxidation
• Produce hydrogen peroxide
• Starts auto-oxidation

Words to Live By …

“The problem is never how to get new, innovative thoughts into your mind, but how to get old ones out.”