

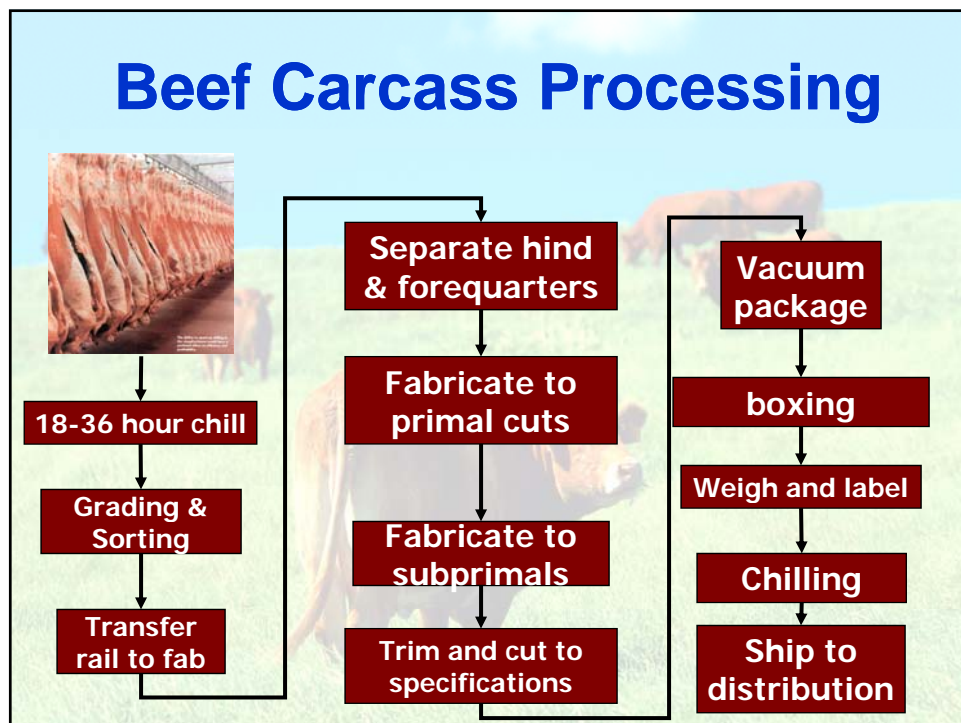
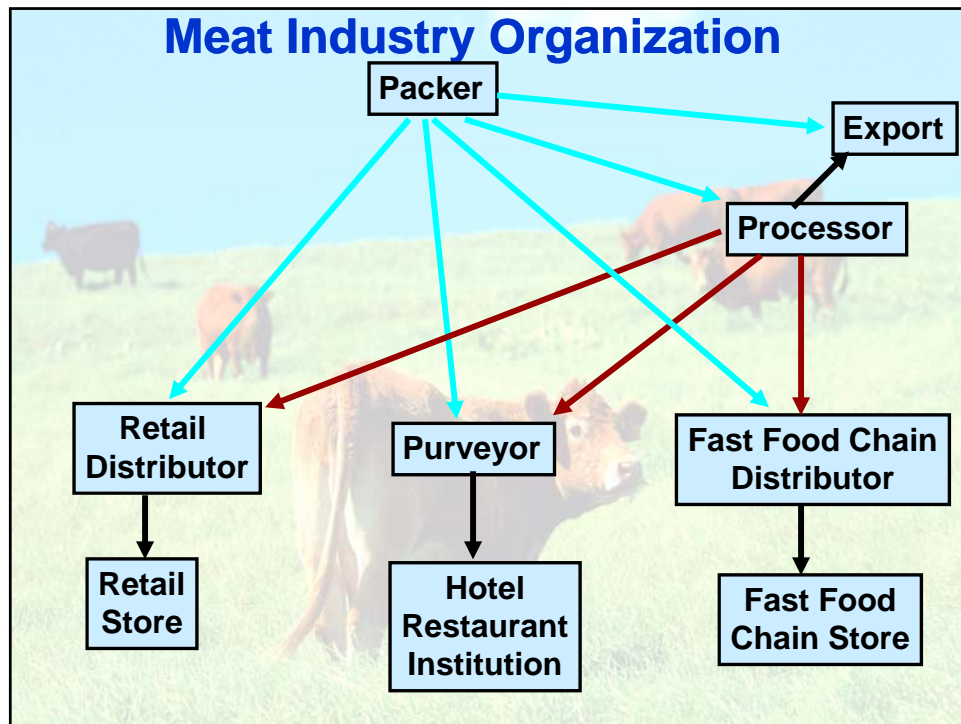
Overview of Meat Life Cycle from Harvest to Consumer

**American Society of Animal
Science**

**Annual Meeting,
San Antonio, TX July 9, 2007**

Overview

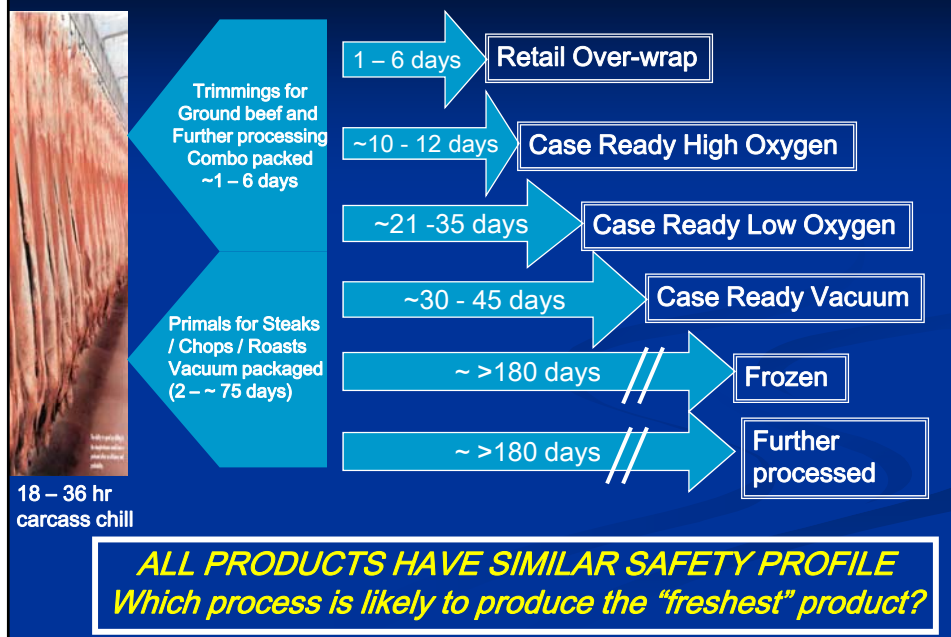
- **Meat processing distribution channels**
- **Preservation techniques**
- **Define and contrast “freshness” and “safety”**
- **Changes in retail meat case - implications for industry**



History of meat preservation

- Salt
- Refrigeration
- Improved sanitation
- Improved packaging (canning, aseptic packaging)
- Preservatives / antimicrobials
- Vacuum packaging (fresh and processed)
- Modified atmosphere packaging

The Conundrum of “Fresh”



Fresh = ???

- Just harvested?
 - Never frozen?
 - Great appearance / taste?
 - Safe to eat?
 - Not spoiled?
- Or....
- Just a marketing buzzword?

Major causes of safety concerns

- Growth / presence of pathogenic bacteria
- Presence of chemical hazards
- Presence of physical hazards

HACCP systems are designed to eliminate, or reduce to an acceptable level, food safety hazards. Shelf life determination of a given product assumes that HACCP and prerequisite programs are functioning to ensure safety.

Major causes of spoilage

- Growth of spoilage bacteria
- Oxidation of lipids
- Enzymatic activity

In contrast, the causes of spoilage are mostly unrelated to factors that influence product safety.

Indicators of safety

- Human observation (*subjective measures*)
 - Implementation of HACCP and prerequisite control programs in the process
 - Visual observation of the process for physical hazards and nodes of potential introduction of microbiological or chemical hazards.
- Instrumental measures (*objective measures*)
 - Pathogen testing of ingredients, raw materials, finished products, etc.
 - Chemical testing of ingredients, raw materials, finished products, etc.
 - Metal detection, x-ray, etc.

Indicators of spoilage

- **Human measures** (*subjective sensorial changes*)
 - Smell -- odors
 - Touch -- visual texture, or feel
 - Sight -- color or texture
- **Instrumental measures** (*objective measures*)
 - Spoilage bacterial enumeration
 - Texture analysis
 - Color analysis

Factors affecting meat shelf life

- Animal production factors
- Genetic differences
- Temperature
- Muscle chemistry
- Muscle pH
- Muscle-to-muscle differences
- Postmortem age
- Ground vs. Whole muscle
- Oxygen & other atmospheres
- Packaging
- Other factors???

Valued traits for meat processing and packaging

- Fresh raw materials
- Sanitation, Sanitation, Sanitation
- Low spoilage bacteria loads
- Normal meat pH
- Temperature control
- Minimize exposure to O₂

Control of these factors is critical to preserving product and extending shelf life

Current state of fresh meat packaging

- National Meat Case Study
 - Conducted twice, 2002 and 2004
 - 104 retail stores
 - 43 metro markets in 29 states
 - 29,000 linear feet of display case
 - Over 117,000 packages sampled

Sponsored by: Cryovac Sealed Air Corporation, National Cattlemen' Beef Association and National Pork Board

National Meat Case Study

■ 2002

- 69% of linear feet devoted to fresh
- Styrofoam tray, PVC overwrap, 51%
- 49% of fresh meat packages were case ready
- 9% MAP

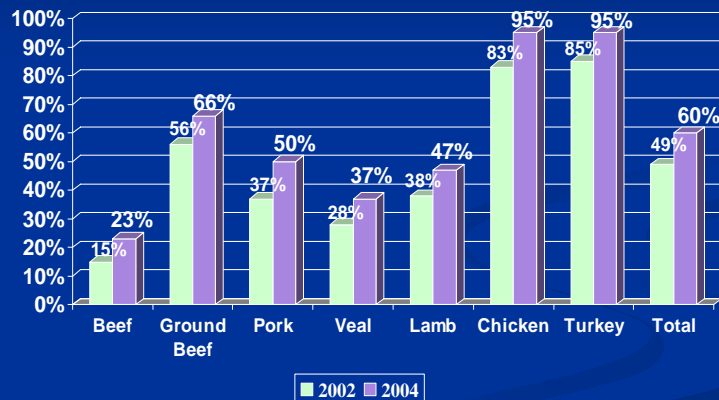
■ 2004

- 63% of linear feet devoted to fresh
- Styrofoam tray, PVC overwrap, 47%
- 60% of fresh meat packages were case ready
- 13% MAP

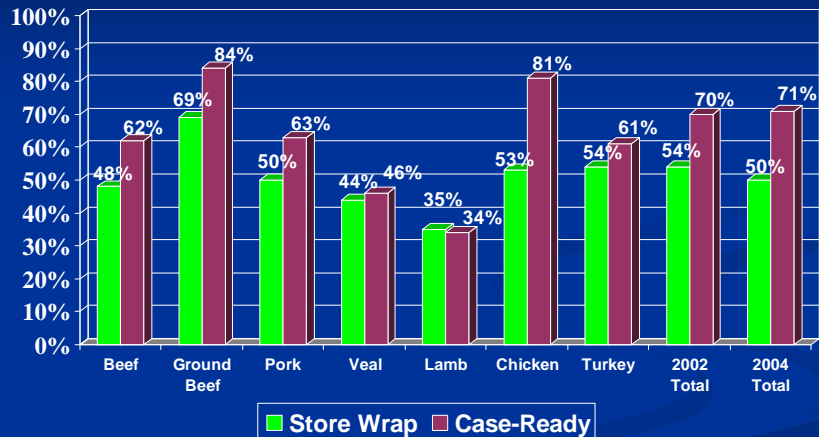


Case Ready Penetration Increased for Each Major Specie

Based on Package Counts



In-Stock Position Was Better in Case-Ready than Store-Wrap Packaging



In-Stock is 5 or more packages per SKU displayed. Sausage was excluded.

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Current State: Fresh meat retail packaging

- Evolution to case ready continues at a measured pace
 - Driven largely by economic influence
- “Fresh Meat” case continues to shrink
 - Driven largely by need for consumer convenience



Progression of MAP Innovations

- **High Oxygen as an industry standard**
 - Has worked well for a number of years
 - Some retailers successful in implementation of this format; others find limited shelf life to be a challenge
 - Downside is the rapid development of oxidation
- **The ultimate in low oxygen packaging: Vacuum packaging**
 - Consumer acceptance is still an issue due to appearance and color

Low Oxygen-CO Innovations

- **Consumer benefits of low-oxygen packaging with carbon monoxide**
 - Major benefit is control of oxidation
 - Superior flavor over oxygenated product
 - Removing oxygen prevents pre-mature discoloration



Summary

- Meat processing and distribution systems are complex, and are designed to meet the needs of a demanding and increasingly global marketplace.
- Product safety and product freshness (or spoilage) are measured by different factors and should be treated independently.
- Management of meat shelf life requires a balance between science, sanitation and packaging.
- Innovative packaging and processing technologies will continue to evolve and change the way the industry delivers “fresh” product to consumers.



Acknowledgements

- Dr. Darren Cornforth -- Utah State University
- Dr. Melvin Hunt – Kansas State University
- Scott Eilert, Tim Freier, Brad Down, Anne Rojas -- Cargill Meat Solutions
- Phil Minerich, Kevin Meyers -- Hormel Foods
- Brian McFarlane, Dean Danilson -- Tyson Foods
- Mark Franzreb, Charles Barmore, Jerry Kelly, Jim Belcher – Cryovac-Sealed Air Corporation

Thank you.