Livestock Processing

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Why is muscle so important?

“By 2050 the world’s population will reach 9.1 billion, 34 percent higher than today. Nearly all of this population increase will occur in developing countries. Urbanization will continue at an accelerated pace, and about 70 percent of the world’s population will be urban (compared to 49 percent today). **Annual meat production will need to rise by over 200 million tons to reach 470 million tons.**” FAO Report: How to Feed the World in 2050

“There is a strong positive relationship between the level of income and the consumption of animal protein, with the consumption of meat, milk and eggs increasing at the expense of staple foods. As diets become richer and more diverse, the high-value protein that the livestock sector offers improves the nutrition of the vast majority of the world.” WHO: Availability and changes in consumption of animal products
Why animals for food?

• Meat is a highly nutritious source of protein, B-vitamins, and minerals

• Livestock convert poor quality feedstuffs from land not suitable for crops into nutritious valuable products

• Food animal hunting and production allowed for settlement of temperate regions of the world

• Meat production and consumption is directly correlated to socio-economic development
Pre-Harvest (ante-mortem)

1. Animals should be fasted 12-18 hours before slaughter.
2. Water should always be available.
3. Animals should be handled with care to minimize stress.
4. Ante-mortem inspection looks for any signs of illness or injury that would make animal unfit for consumption.
Harvest Regulations

• The Humane Slaughter Act of 1958 requires that all livestock be rendered unconscious before exsanguination
  – Cattle, sheep, and goats use captive bolt
  – Hogs and poultry use electricity or CO₂
  – Sheep can also use electricity

• Exceptions are religious harvests such as Kosher and Hallal

• Poultry, fish and rabbits do not require stunning
Harvest Process*

1. Restraint (box, chute, suspended alley)
2. Immobilization (stunning)
3. Exsanguination (bleeding)
   - Only ~50% of blood removed from body
4. Integument removal (outer dirty parts)
   - Hair removed from swine
   - Feathers removed from poultry
   - Hide/pelt removed from beef, lamb, goat
   - Head and feet removed

*All steps under state or federal inspection
De-hairing

- De-hairing of hogs
  - Immerse in hot water
    - Approx 140-145°F until hair begins to slip
    - Converts collagen to gelatin around follicle
    - Removed by scraping or with tumbler
  - Hard vs. soft hair season
    - Soft in Spring
    - Hard in Fall
  - Overscalding
    - Cooks skin
    - Defaced carcass

- Alkaline products
  - Old baldy
  - Remove scruff from skin
Feather Removal

- Scalding
  - Hard scald: 160-180°F, 30-60 sec
  - Sub scald: 138-140°F, 30-75 sec
  - Semi scald: 123-130°F, 30-75 sec

- 4 parts boiling water to 3 parts cold water gives about 135°F
5. Evisceration (remove internal organs)
   - Tie off rectum and esophagus to contain digesta
   - Viscera is the digestive system, liver, bladder, reproductive organs, etc
   - Pluck is the heart, lungs, trachea

6. Inspection of organs, glands, head for disease

7. Washing, splitting, chilling

8. Inspection stamp
Poultry Processing
In the cooler...

- Meat animals will go through rigor mortis
  - Lack of oxygen causes muscles to use glycolysis to contract → produces lactic acid and heat
  - pH decreases due to lactic acid build up
  - Muscles contract until all energy is depleted and cannot relax (2-8 hrs post-mortem)
  - Resolution of rigor occurs 24-48 hours post-mortem due to degradation of sarcomeres (muscle now considered meat, is pliable)
  - Can now be cut into smaller parts for food
Rigor Onset and Resolution

![Graph showing isometric tension development during phases of rigor mortis.](image)

**Table 5.1 Delay Time Before Onset of Rigor Mortis**

<table>
<thead>
<tr>
<th>Species</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>6–12</td>
</tr>
<tr>
<td>Lamb</td>
<td>6–12</td>
</tr>
<tr>
<td>Pork</td>
<td>1/4–3</td>
</tr>
<tr>
<td>Turkey</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Chicken</td>
<td>&lt; 1/2</td>
</tr>
<tr>
<td>Fish</td>
<td>&lt; 1</td>
</tr>
</tbody>
</table>

*Figure 5.3* Isometric tension development in muscle during phases of rigor mortis.
pH decline

**Figure 5.1** Postmortem pH decline curves. Modified from Briskey, E. J., “Etiological Status and Associated Studies of Pale, Soft, Exudative Porcine Musculature,” *Adv. Food Research* 13, 89 (1964) Academic Press, Inc.
Now it’s meat!

- Resolution of rigor occurs 24-48 hours post-mortem due to degradation of muscle fibrils (muscle now considered meat, is pliable)
- Larger carcasses should be left intact and aged longer to improve tenderness
- Can now be cut into smaller parts for food
Once Stamped...

- Once the carcass is stamped, it is legally considered food
- You can further process inspected meat without an inspector present
- To maintain the inspection on the package, your label must be approved by inspection agency
- Can also obtain a retail exempt license for non-approved labels
  - Must start with inspected product
  - Cannot wholesale
What about the offal?

• Per state and federal regulations, offal (inedible parts) must be disposed of via:
  – Burying
  – Incinerating
  – Composting
  – Rendering

• Keep in mind that many parts can be food:
  – Pigs feet, chicken feet, liver, kidney, heart, tripe,...
SALES STRATEGIES
Labels

Inspected

Retail Exempt

Custom Exempt
Inspected or Custom Harvest?

**Inspection**
- Inspected meat can be sold to anyone*
- More flexibility with small sales (individual packages)
- Plants can charge more for inspection time slots (cannot charge for inspection itself)
- Can take longer to get in the queue on inspected days
- Confidence of safety

**Custom Harvest**
- Custom harvest sales must happen with live animal (owner assumes risk of non-inspection)
- Need whole animal sold before harvest
- Recommend a trusted processor
- Processing can be cheaper, or at the expense of customer
- Confidence of source

*If state inspected, must stay in the state. If retail exempt, must be in a retail setting.*
What about chickens?

• In the state of Indiana, you can process your own birds for sale at farmer’s markets
  – Up to 1000 birds per calendar year
  – Must be frozen at point of sale
  – Cannot wholesale to restaurants, etc
  – No inspection required, but must be labeled well
  – Visit our session at 1:30 today to learn more
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