Pork Quality

Dustin Boler
Tenderness, Juiciness, Flavor & Color

1 February, 2017
• Define pork quality
• Discuss how meat scientists evaluate pork quality
• Discuss influencers of pork quality
• Discuss packaging and preservation
• Discuss sensory traits
  – Changes in recommended degree-of-doneness
What is quality?

Being on target with less variation

- In general, different consumers value different things
- Each consumer has their own opinion and each consumer is correct
Pork Quality

- Consumers make purchasing decisions based on color and marbling
- Consumers make *repeat* purchases based on tenderness, juiciness, and flavor
  - Flavor
  - Price
  - Appeal
What Influences Pork Quality

Management practices

- Genetic Selection
- Pig’s Diet
- Pre-Slaughter Handling
- Numerous other factors
Fat Quality & Bacon
Fat Quality & Bacon

![Graph showing frequency distribution of fat quality in different groups: IC Barrow, PC Barrow, Entire male, and Gilts.](image1)

![Images of bacon cuts labeled with letters A to I.](image2)
Normal Pork Quality

- **Color**
  - Reddish-pink
- **Drip Loss**
  - < 0.5%
- **Ultimate pH**
  - 5.6 - 6.2
- **Marbling**
  - Equivalent to 2.5-4% intramuscular fat
Color Evaluations

• Evaluated on the ventral side or cut surface of the loin
• Subjective evaluation/dependent on skill
• Will influence purchase intent and export potential
• May/may not affect flavor and juiciness
<table>
<thead>
<tr>
<th>Color Description</th>
<th>Minolta L* Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Pale pinkish gray to white</td>
<td>61*</td>
</tr>
<tr>
<td>2.0 Grayish pink</td>
<td>55*</td>
</tr>
<tr>
<td>3.0 Reddish pink</td>
<td>49*</td>
</tr>
<tr>
<td>4.0 Dark reddish pink</td>
<td>43*</td>
</tr>
<tr>
<td>5.0 Purplish red</td>
<td>37*</td>
</tr>
<tr>
<td>6.0 Dark purplish red</td>
<td>31*</td>
</tr>
</tbody>
</table>

Minolta L* values use D65 daylight light source.
Instrumental Color Evaluation
Myoglobin

“Visual, Practical” - Fresh Meat Color Triangle

Deoxymyoglobin $\text{Fe}^{2+}$

1. Oxygenation “Bloom”

2a. Oxymyoglobin $\text{Fe}^{2+}$

2b. Metmyoglobin Oxidized – $\text{Fe}^{3+}$

3. Aerobic/anaerobic conditions

4. $\pm CO$

Carboxymyoglobin $\text{Fe}^{2+}$

$OC = \text{oxygen consumption}$

All conversions affected by $pH$ and temperature

Sourced from AMSA 2012 Meat Color Measurement Guidelines, Originally sourced from Dr. Melvin Hunt, Kansas State University
Shelf-life of Fresh Pork
Marbling Evaluation

- Evaluated on the cut surface of the loin eye
- Subjective score of the amount of visible fat in the loin eye
- May/may not affect flavor and juiciness
Marbling scores correspond to intramuscular lipid content.
Sensory Characteristics

• Taste
  – Tenderness
  – Juiciness
  – Flavor
  – Texture

• Aroma

Images from: porkbeinspired.com
Degree-of-Doneness

RARE

MEDIUM

VERY WELL DONE

60°C 140°F

71°C 160°F

82°C 180°F
Degree-of-Doneness

• Historically, pork was cooked to 160° F internal temperature

• New USDA guidelines for cooked pork internal temperature
  – Internal temperature of 145° F for pork is safe to eat
  – A three-minute rest time is suggested before consumption
  – 145° F has a pinker color than what consumers are accustomed to from the fully white color from a internal temperature of 160° F
## Degree-of-Doneness

<table>
<thead>
<tr>
<th>Final internal temperature, °F</th>
<th>144 °F</th>
<th>160 °F</th>
<th>176 °F</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenderness</td>
<td>8.56&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.76&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.81&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.11</td>
</tr>
<tr>
<td>Juiciness</td>
<td>9.85&lt;sup&gt;a&lt;/sup&gt;</td>
<td>8.51&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.29&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.08</td>
</tr>
<tr>
<td>Flavor</td>
<td>4.66</td>
<td>4.75</td>
<td>4.56</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Means within a row with different superscripts differ (P < 0.05)

Sensory items were evaluated with a 15 cm line scale where 0 = extremely tough, dry, and no flavor; 15 = extremely tender, juicy, and intense flavor

Panelists rated chops cooked to a lesser degree-of-doneness as more tender and juicy than chops cooked to a greater degree-of-doneness

Let's Eat Some Pork!
Sensory Evaluation

Sensory Panel Score Card

Name__________________
Date__________________

Session__________________
Sample #__________________

TENDERNESS

Tough

Very Tender

JUICINESS

Dry

Juicy

POPK FLAVOR

None

Extremely Intense

Off Flavor Comments:
Sensory Panel Score Card

Session __________________
Sample # __________________

TENDERNESS

10

Tough Very Tender

PORK FLAVOR

None Extremely Intense

Off Flavor Comments:

IPPE – Pork Quality

Sensory Panel Score Card

Session __________________
Sample # __________________
Degree-of-Doneness

Tenderness

- Rare (140°F)
- Medium (160°F)
- Well Done (180°F)
Warner-Bratzler Shear Force
Degree-of-Doneness

WBSF, kg

- Rare (140°F)
- Medium (160°F)
- Well Done (180°F)
Degree-of-Doneness

Juiciness

- Rare (140°F)
- Medium (160°F)
- Well Done (180°F)
Degree-of-Doneness

Cook loss, %

- Rare (140°F)
- Medium (160°F)
- Well Done (180°F)
Conclusion

• Fresh loin quality can be variable and difficult to characterize

• Final internal temperature will influence tenderness and juiciness of fresh pork chops
Thank You. Questions?

D.D. Boler
dboler2@Illinois.edu
(217) 300-4847