Pork Quality and Your Profitability

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Starting Points

- Swine production is a business enterprise
- It must be profitable over the long run
- It should be enjoyable over the long run
- The quality of our product will have a major effect on our business and our future
  - On consumer acceptance and repeat business
  - On the price received for our product

Trends in Marketing

- Over the past 10 years, the major emphasis has been on lean percent of the carcass
  - Now the ultra-lean carcasses are being discounted due to loss of value in the belly
- Optimal weight ranges, large lot sizes, regularly scheduled shipments are stressed
- Must be free of residue
- Pricing on meat quality is just starting

Reasons for These Trends

- These factors influence the profitability of the packer and retailer
- Consumers pressure the retailer who pressure the packer who pressure the producer who pressure the seedstock supplier
- Result is a combination of meat quality and lean value pricing

Which Traits Should Producers Focus On?

- Carcass - Easy to change
  - Extreme lean will reduce growth and reproduction
- Growth - Easy to change
  - Fast growth will increase fat
- Reproduction - Harder to change
  - Best reproduction will increase growth and reduce carcass merit
- Quality - ?? Value ??

Commercial Producer Strategy

- Carcass merit must be adequate to ensure a market for your hogs
- Balance reproduction, growth, and carcass merit to maximize profitability on your farm
- How much emphasis should be put on quality?
Muscle Quality Traits
- Must be measurable
- Must be under genetic control
- Must not be genetically related to other traits in a devastating manner
- Must have an economic impact on the commercial producer

Improving Meat Quality
- Genetics set the foundation and the limit for meat quality improvement
- Genetics account for 10 to 50% of the variation in meat quality traits
- Quality means different things to different members of the “value chain”
  - Consumer/retail/processing/production chain

Meat Quality
- Ultimately, meat quality is defined as a wholesome product that tastes good, has good value and generates repeat sales

Pork Quality is Influenced by:
- Genetics
  - Stress gene, Napole gene
- Preslaughter pig management
- Slaughter techniques
- Meat handling
- Cooking methods
- Unknown?

Traditional View of Food System
- Agricultural Inputs
  - Agricultural Production
    - Commodity Handlers
    - Food Processors
    - Wholesalers
    - Retailers
  - Consumers

Current View of Food System
- Consumers
- Retailers
- Wholesalers
- Food Processors
- Commodity Handlers
- Agricultural Production
- Agricultural Inputs
What do Consumers Want?

- Muscle Quality
- Eating Satisfaction
- Visual Appeal
- Increased Shelf-life
- Nutritional Value
- Food Safety
- Foreign Objects
- Animal Welfare
- Other???

“Quality” Indicators

- Color
- Marbling
- Firmness
- Water holding capacity
- pH
- Tenderness
- Taste

Color Scores

Marbling Scores

Trait Characteristics

<table>
<thead>
<tr>
<th>Trait</th>
<th>Measurability</th>
<th>Heritability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Yes (not at line speed)</td>
<td>0.15-0.50</td>
</tr>
<tr>
<td>pH</td>
<td>Yes (maybe at line speed)</td>
<td>0.50</td>
</tr>
<tr>
<td>Marbling</td>
<td>Not at line speed</td>
<td>0.50</td>
</tr>
<tr>
<td>Others</td>
<td>Not at line speed</td>
<td>0.15-0.65</td>
</tr>
</tbody>
</table>
Pork Quality and Profitability

Q1: Do you know what quality of the pork you produce?

Q2: Does the quality of the pork you currently produce influence your profit?
   Profit = Return - cost of production

What Affects Pork Quality

50% producer causes and responsibility
- Genetics
- Nutrition
- Handling on the farm and in transport

50% packer causes and responsibility
- Stunning, sticking, bleeding, and pre-evisceration
- Chilling
- Fabrication

How Does a Pork Producer Find Out the Quality of their Pork?

- Look at the genetics used
  - Choice of breeds or lines
  - Choice of sires within breeds or lines
  - Major genes in your genetics (HAL, RN)
- Do a cut test with an unbiased technician at your packer

Genetic Variability in Meat Quality

- Differences between breeds or genetic lines
  - Can be used in making purchase decisions
- Variation within breeds or genetic lines
  - Should be used in making purchase decisions
- Major gene effects
  - Halothane gene, Napole gene, etc.

Genetic System Design

- Terminal cross mating system is most profitable
- Genetic decisions that must be made
  - Breed combination of maternal sow line
  - Breed of terminal sire line
  - Specific animals within sire and dam line for use
  - Status of major meat quality genes (Halothane, RN)
  - Balance production traits with meat quality traits

Differences Between Breeds or Genetic Lines

- Based on producer checkoff-funded NPPC research
  - NBS Sire Progeny Tests
  - Terminal Line Evaluation
  - Quality Lean Growth Modeling
  - Maternal Line Evaluation
### Breed or Line Differences: NGEP Sire Line Results

<table>
<thead>
<tr>
<th>Sire Line</th>
<th>pH</th>
<th>Color</th>
<th>Drip %</th>
<th>IMF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berk</td>
<td>5.91</td>
<td>3.1</td>
<td>2.43</td>
<td>2.41</td>
</tr>
<tr>
<td>Danbred</td>
<td>5.75</td>
<td>3.0</td>
<td>3.34</td>
<td>2.33</td>
</tr>
<tr>
<td>Duroc</td>
<td>5.85</td>
<td>3.0</td>
<td>2.75</td>
<td>3.03</td>
</tr>
<tr>
<td>Newham</td>
<td>5.82</td>
<td>2.7</td>
<td>2.99</td>
<td>2.25</td>
</tr>
<tr>
<td>Hamp</td>
<td>5.70</td>
<td>2.8</td>
<td>3.56</td>
<td>2.57</td>
</tr>
<tr>
<td>York</td>
<td>5.84</td>
<td>2.9</td>
<td>2.85</td>
<td>2.30</td>
</tr>
</tbody>
</table>

### Breed or Line Differences: Lean Growth Modeling Project

<table>
<thead>
<tr>
<th>Breed of Pig</th>
<th>Color Score</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berk cross</td>
<td>3.20</td>
<td>5.78</td>
</tr>
<tr>
<td>Danbred</td>
<td>2.93</td>
<td>5.51</td>
</tr>
<tr>
<td>DeKalb</td>
<td>3.00</td>
<td>5.65</td>
</tr>
<tr>
<td>Duroc cross</td>
<td>3.10</td>
<td>5.65</td>
</tr>
<tr>
<td>Newsham</td>
<td>2.95</td>
<td>5.58</td>
</tr>
<tr>
<td>Hamp cross</td>
<td>2.78</td>
<td>5.42</td>
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</tbody>
</table>

### Breed or Line Differences: Maternal Line Evaluation

<table>
<thead>
<tr>
<th>Breed</th>
<th>pH</th>
<th>Color</th>
<th>IMF%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amer. Diamond</td>
<td>5.63</td>
<td>3.15</td>
<td>2.00</td>
</tr>
<tr>
<td>Danbred</td>
<td>5.63</td>
<td>3.17</td>
<td>1.93</td>
</tr>
<tr>
<td>DeKalb DK44</td>
<td>5.63</td>
<td>3.05</td>
<td>2.09</td>
</tr>
<tr>
<td>DeKalb MXP</td>
<td>5.66</td>
<td>3.12</td>
<td>1.94</td>
</tr>
<tr>
<td>NSR</td>
<td>5.63</td>
<td>3.14</td>
<td>2.08</td>
</tr>
<tr>
<td>Newsham</td>
<td>5.62</td>
<td>3.21</td>
<td>1.90</td>
</tr>
</tbody>
</table>

### Breed or Line Differences: Summary

- Berkshire and Duroc - best pH, color, marbling
- DeKalb - very good pH, good color
- Yorkshire - average on most, low marbling
- Landrace - below average on most traits
- Danbred and Newsham - below average on pH, color, marbling
- Hampshire - poorest on pH, color, drip and cook loss

### Animal Differences Within A Breed

<table>
<thead>
<tr>
<th>Name</th>
<th>Breed</th>
<th>EPD for IMF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Dane</td>
<td>Duroc</td>
<td>0.25</td>
</tr>
<tr>
<td>Changer</td>
<td>Duroc</td>
<td>-0.16</td>
</tr>
<tr>
<td>Cambridge</td>
<td>York</td>
<td>0.11</td>
</tr>
<tr>
<td>Interstate</td>
<td>York</td>
<td>-0.02</td>
</tr>
</tbody>
</table>

### Major Gene Effects

- Halothane gene
  - Gene found primarily in Pietrain breed crosses, with low frequency in most breeds
- Napole gene
  - Gene found primarily in Hampshire breed crosses

Sponsored by the National Pork Producers Council and the American Meat Science Association
### Economic Value of HAL Gene

<table>
<thead>
<tr>
<th>Trait</th>
<th>Normal</th>
<th>Carrier</th>
<th>Diff.</th>
<th>$/pig</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMA</td>
<td>5.94</td>
<td>6.23</td>
<td>0.29</td>
<td>$ 1.65</td>
</tr>
<tr>
<td>Drip %</td>
<td>2.61</td>
<td>3.09</td>
<td>0.48</td>
<td>$ -0.31</td>
</tr>
<tr>
<td>pH</td>
<td>5.85</td>
<td>5.84</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>IMF %</td>
<td>2.60</td>
<td>2.28</td>
<td>-0.32</td>
<td>$ -3.17</td>
</tr>
<tr>
<td>Instron</td>
<td>5.66</td>
<td>6.61</td>
<td>0.50</td>
<td>$ -2.08</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>$ -3.91</td>
</tr>
</tbody>
</table>

### Napole Gene Effects

<table>
<thead>
<tr>
<th>Trait</th>
<th>RN</th>
<th>rn</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield</td>
<td>91.65</td>
<td>95.28</td>
<td>**</td>
</tr>
<tr>
<td>WHC/protein</td>
<td>1.95</td>
<td>2.10</td>
<td>*</td>
</tr>
<tr>
<td>48 hr drip</td>
<td>7.50</td>
<td>4.97</td>
<td>***</td>
</tr>
<tr>
<td>Cook loss</td>
<td>24.09</td>
<td>20.56</td>
<td>***</td>
</tr>
<tr>
<td>Loin purge</td>
<td>4.47</td>
<td>3.55</td>
<td>*</td>
</tr>
<tr>
<td>Ham purge</td>
<td>6.29</td>
<td>4.99</td>
<td>*</td>
</tr>
</tbody>
</table>

### Summary of Major Gene Effects

- Presence of the stress gene will increase loin muscle area; but, it will increase drip losses, decrease marbling and makes the meat tougher resulting in lower value/pig.
- Presence of the Napole gene will increase drip loss, increase cooking loss, increase purge; but, will increase juiciness resulting in lower value of pig.

### Correlation Between Meat Quality and Production Traits

- Increase IMF
  - more BF, less LMA
  - no effect on pH and color
- Better pH
  - no effect on growth and BF
  - usually darker color
- Darker color
  - independent of production traits

### Genetic Improvement of Breeds or Lines in Meat Quality Traits

- The seedstock organization must first measure the meat quality traits that are important in the marketplace.
- These traits must then be included in the selection program with adequate emphasis to result in genetic improvement.

### Cut Test to Assess Meat Quality

- Work with an unbiased program to measure meat quality
  - Such as Iowa Premium Pork Co-op and ISU
- Measure a group of 15-20 pigs from multiple litters from your farm
- Be a part of a test that includes several farms testing at the same time
- Repeat the test on a regular basis
Does Your Meat Quality Influence Your Profit?

- First, look at your market
  - If you market in a value added system (Niman Ranch, Berkshire Gold, etc.), it is a primary factor
  - If you are producing “commodity pork” then the packer exerts an indirect effect
    - Pigs that provide “inferior quality” pork will not be purchased

Summary

- The quality of our product will have major effects on the price producers receive and on repeat purchase decisions by consumers
- Genetics set the foundation and the limit for meat quality
- Traits must be both measurable and heritable to make genetic improvement

Summary

- Differences between the breeds (lines) are large for the meat quality traits, as well as production traits
- Improvement of pH and color appear to offer the most promise for added value without decreased performance
- Major genes identified (Stress gene, Napole gene) result in inferior meat quality and reduced value

Summary

- The meat quality traits of pH, marbling and color have an adequate heritability for genetic improvement to be possible.
- These traits must be measured and included in the seedstock supplier’s selection program in order to make progress.
- High meat quality is essential for our future.