Origin of Pork Quality Measurements

Measuring pork quality at Hormel has its origins in the results of a survey conducted by the National Pork Producers Council (NPPC) in the mid-1990’s. In this survey, several thousand consumers were questioned about how satisfied they were with the eating qualities of fresh pork. They were also asked to describe the doneness level to which they cooked pork.

The results clearly showed that consumers were “underwhelmed” with the pork eating experience:
• 23% were “very satisfied”.
• 51% were “somewhat satisfied”.
• 26% were “not very” or “not at all satisfied”.

Combine the mediocre level of satisfaction (at that time) with the fact that 91% said they cooked pork “medium-well” and/or “well-done” and it became clear to us that a radical conversion to value-added enhanced fresh pork products was necessary.

Fresh Pork Product Transformation

Since our “conversion experience” of several years ago, we’ve moved rapidly from regular to enhanced fresh pork (both flavored and non-flavored). Enhanced pork fulfills the three most important desires consumers have for fresh pork:

• Pork must deliver a great eating experience!
• Pork must become easier to prepare and/or the resulting eating experience must be worth the time required for preparation.
• There must be a greater variety of pork products to satisfy the diversity of flavors, eating occasions, and serving sizes demanded by consumers from their protein choices.

Pork products to satisfy (and even exceed) these consumer desires can only be produced from high quality raw material. In this instance, pork quality is defined by the attributes of pH, water holding capacity (WHC), and color. Specifically—we must increase pH, improve WHC and darken the color of our current supply of fresh pork raw material to satisfy consumer desires.

Measurement is Essential

Our knowledge of the quality improvement process tells us that no attribute can be understood until it is measured. No product attribute can be improved until we understand the process and no process can be improved without measurement. Which brings us to today’s topic—“Measuring Quality in the Pork Industry.”

My goal is to answer the following questions:

• What instrumentation is currently being used to measure pork quality?
• How is the pork quality data being used?
• What does the pork quality data tell us?
• What is the future of on-line pork quality measurement?

Everyone in the industry is measuring pork quality attributes but methods of measurement vary. The attributes being measured include:

A. pH

• Most commonly measured at 24 hours; some are measuring 45-minute and 3-hour pH to determine rate of pH decline.
• The primal most often measured is the loin.
• A variety of pH meters are available; the pH-STAR from SKF is the most common unit in use.
• pH is useful because it’s fast, relatively accurate, relatively low cost, less invasive and a good predictor of product attributes (color, WHC).

B. Color

• Both subjective and objective measurements are currently being collected by packers and/or processors.
• A variety of objective color measurement equipment is being utilized. This can lead to some confusion when interpreting and comparing data. Hormel uses a Minolta spectrophotometer (D65 daylight light source). Color measurement is useful because it directly measures an important product attribute.
C. WHC

- Several methods are commonly used in industry (filter paper, drip loss, and percent purge in a vacuum package; tray purge may also be used).
- Percent purge can be an excellent measurement because it directly measures product performance; however, results take time (generally 2–3 weeks), and it is a more invasive method (more costly because product is sacrificed).
- While other WHC tests produce results in less time, they are not as directly related to actual product performance.

Why Are We Measuring Pork Quality?

Pork quality is being measured because all current and future pork products do/will require superior quality raw material to successfully satisfy consumers. More specifically, pork quality measurements are being used for three basic purposes:

- Identify genetic lines with superior pork quality. This information is being communicated to pork producers and genetic suppliers. At this time, I’m not aware of any payment program (premiums/discounts) based on a measure of pork quality.
- Sort carcasses/primals for optimal end-use utilization. These uses could include: (a) case ready production; (b) enhanced primal programs; (c) export; and (d) specific customer requirements.
- Process control. Pork quality measurements are being used to monitor variation in the process (handling, rest time, stunning, chilling, etc.).

What Does the Pork Quality Data Tell Us?

Our work with measuring pork quality at Hormel has primarily focused on 24-hour pH. We currently measure it online at all three slaughter plants. It has proven to be an effective tool for the three activities listed above. Highlights from this data include:

- The evaluation of 25 different genetic lines/crosses from hundreds of different producers showed that the genetic line with the highest average 24-hour pH was 0.10 pH unit above the entire group average while the genetic cross with the lowest average pH was about 0.10 below the average for the entire population.
- In practical terms, the value of being 0.10 pH unit above or below the average pH is approximately 2–4 L* units. However, when the 0.10 pH unit change occurs well below the average pH (e.g., 5.40 to 5.30) for a given population, the L* change is larger (4 units). Conversely, when the 0.10 pH unit change occurs well above the average pH (e.g., 5.90 to 6.00), the L* change is smaller (2 units).
- A comparison of pork producers across all genetic lines revealed that the top 25 producers had an average 24-hour pH 0.30 pH units higher than the worst 25 producers.
- A difference of 0.30 pH units is equivalent to 6–10 units on the L* scale and a 100% difference in percent purge within the vacuum package.
- A recent genetic line study (all lines are free of the RN gene) shows the value of 24-hour pH:

<table>
<thead>
<tr>
<th>Genetic Lines (free of RN-gene)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-hour pH</td>
<td>5.55</td>
<td>5.67</td>
<td>5.63</td>
<td>5.70</td>
</tr>
<tr>
<td>24-hour L*</td>
<td>45.3</td>
<td>42.5</td>
<td>43.1</td>
<td>41.6</td>
</tr>
<tr>
<td>L* if pH &gt; avg. pH</td>
<td>42.6</td>
<td>40.4</td>
<td>41.4</td>
<td>40.2</td>
</tr>
<tr>
<td>pH if L* &gt; 48</td>
<td>5.46</td>
<td>NA</td>
<td>5.50</td>
<td>5.34</td>
</tr>
</tbody>
</table>

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- A difference of 0.30 pH units is equivalent to 6–10 units on the L* scale and a 100% difference in percent purge within the vacuum package.
- A recent genetic line study (all lines are free of the RN gene) shows the value of 24-hour pH:

What is the Future of On-Line Pork Quality Measurement?

Because of continued sales growth in fresh pork products (both domestic and export) that require high quality raw material, on-line measurement of pork quality will expand beyond its current level of use. One drawback of on-line pork quality measurement is the relative inability of equipment to withstand operating under plant conditions for more than just a few hours a day—this is especially true for pH meters. Unless new equipment and processes are developed, the long-term success of on-line pork quality measurement rests squarely on improving the reliability of current equipment.

On-line pork quality measurements will continue to be a critical factor in the drive to improve the pork quality for the entire US hog population. To produce innovative pork products that consistently satisfy consumer demands, we need the following pork quality changes to take place:

- 24-hour pH must increase by 0.10–0.15 pH units.
- pH decline [45-minute pH (−) 3-hour pH] must be slowed to a minimal level.
- L* color scores must be reduced by 2–4 units.
- Standard deviations for these pork quality attributes must be reduced by 50%.

It is quite apparent that fresh pork with excellent pork quality attributes is absolutely necessary for us to develop and
market the kinds of products which will satisfy the demands of domestic and international consumers.

And, pork products produced from high quality raw material will do more than just satisfy, they will “delight” our consumers! These delighted consumers:

• understand the benefits of our products.
• through experience, trust our products to deliver these benefits.
• are willing to reward us for a great eating experience.
• keep coming back for MORE!

As an industry our vision must be to delight the consumer. In fact, delighting the consumer must be the law that governs our research and product development efforts. If we don’t share that vision and submit ourselves to the authority of that law, the result will be like that described in Proverbs 29:18, “Where there is no vision, the people perish; but he that keepeth the law, happy is he.”