Summary of "Pork Marbling Initiative – first steps"

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The Challenge and Approach

Pork Marketing Canada took the initiative to see the development of a carcass grading system based specifically on marbling, and to investigate the relationship between pork marbling levels and consumer acceptance of pork. The longer term goal is to provide pork marketers and retailers something equivalent to the "Canada AAA" grade in the beef industry. The technical challenge of evaluating pork marbling in a commercial setting is yet to be overcome, and in the absence of a technology that is both accurate and suited to in-line applications the initial uptake of marbling-based grading is expected to be by smaller packers and for niche marketing applications. In a smaller scale situation it is likely that interested packer(s) could be persuaded to prepare pork loins so as to provide an appropriate cross-sectional surface of the longissimus muscle to facilitate subjective or objective assessments of marbling.

Consumer product testing (Consumer Product Testing Centre, Alberta Agriculture and Rural Development) and meat quality analyses (Lacombe Research Centre, Agriculture and Agri-Food Canada) were used to catalogue and evaluate pork quality attributes along the marbling continuum (NPPC marbling levels 1 through 6) such that "premium pork" with an expected level of performance could be identified for appropriate marketing. At the outset, what constituted "premium pork" was unknown; however, consumer feedback provided some interesting insights.

In the winter of 2007/8, 380 boneless pork loins from blast-chilled carcasses were selected from the cutting line of a large federally inspected plant 24 h postmortem. Marbling at the tenderloin end was used to select meat spanning a range of marbling from 1-6+%. Loins were then broken at the grade site (3/4th last rib), and classified on the basis of mid-loin marbling into six marbling levels. Chops at several sites along the loin were kept for image and consumer sensory analyses, and the chop at the grade site underwent determination of % IMF (intramuscular fat).

Marbling Level Determination

Selection for marbling based on the exposed *longissimus dorsi* at the 5th lumbar of the tenderloin end was most often correct for mid-loin marbling scores < 2 (i.e. < 2% IMF). Variation in the marbling at this site increased with increased marbling at the grade site. Subjective marbling scores based on meat images were found to be similar to objectively-determined (IMF) content up to approximately 4%. However, as IMF increased above 4%, the relationship with image-based scores became progressively poorer, although direct assessment of marbling was acceptable. The region from the grade site to the last rib was the area of lowest loin marbling for all marbling categories. There was, however, some indication that at <4% IMF the least marbling was to be found at the grade site, whereas at > 4% the site of lowest marbling moved towards the last rib. More work is required to be certain of this.

Consumer Product Testing

Five product testing days were conducted with a total of 177 consumer panellists who were regular pork users, but who were not told the purpose of the test. Each panellist evaluated six levels of marbling from randomly presented samples of cooked and then raw pork chops derived from the same loin. Panellists were first asked to rate tenderness, juiciness, and overall acceptability of cooked pork chops, and to indicate their willingness to purchase intent each sample. Each panellist then evaluated colour, marbling level, and overall acceptability of the matching raw samples, and to again indicate willingness to purchase. Finally, all panellists were shown the same series of marbling standard photo cards and were asked which one of the photographed pork chops they would buy, and why.

As marbling level increased, both the acceptability of eating quality-related characteristics of cooked chops and intent to purchase increased, whereas both the acceptability of characteristics assessed visually in raw chops and purchase intent decreased. Correlation co-efficients indicated a virtual lack of relationship between overall acceptability of cooked pork chops and either overall acceptability of raw pork chops or acceptability of the amount of fat visible in raw pork chops. Marbling level 6 received the highest mean acceptability scores for characteristics assessed during consumption of cooked pork chops. An upper limit of acceptability of cooked pork chops was not apparent across the array of marbling levels assessed in this project. Marbling level 2 received the highest mean acceptability scores for characteristics assessed by the visual inspection of raw pork chops. A large proportion of consumer panellists considered marbling levels 3-6 "too fatty" while marbling level 1 was "too lean". When asked to select a single product type for

hypothetical purchase, 80% of consumer panellists chose marbling standards 1-3 and many either directly cited or implied that lower fat products are healthier. Numerous of these consumers also recognized that lower fat content could compromise the eating quality of a pork chop. Amongst panellists who selected marbling standards 4-6, none implicated health concerns as a factor in their choice, and many expressed their perception that enhanced eating quality is related to higher fat content.

The Practical Implications

Given the results of the current study, loins could be sorted in two stages. In the first stage, an automated image-based sorting system could be used to remove entire loins with marbling ≤ 2% IMF. For the second stage, loins could be broken at a commercially acceptable site located in the region of the grade site to last rib for direct selection-by-eye of meat with marbling > 4% IMF. The loins remaining following this selection will be of moderate marbling.

When typical pork consumers assess raw pork chops by visual examination AND in the absence of any additional information about product performance (e.g. educational, marketing, promotional materials), there is a strong bias against pork chops in marbling levels greater than 2. At the same time, the highest marbling category (6) received the highest mean acceptance scores for eating quality. Together, these observations indicate that if highly marbled pork is considered "premium" based on its eating quality performance, it must be put in the hands of the "right" consumers – perhaps through a niche marketing channel. Highly marbled pork will not garner appreciation or command a premium price if it is marketed to the masses through conventional commodity channels.

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