Title: Relationship of Fat Quality to Meat and Eating Quality Traits of Pork - NPB# 12-055

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Date Submitted: June 2, 2014

Scientific Abstract: Fat (adipose tissue) quality is an important component of meat quality as perceived by the consumer. One measurement of fat quality is iodine value. Iodine values are an indicator of the degree of unsaturation of the fatty acids of fat samples, with higher iodine values indicating a higher concentration of unsaturated fatty acids. Higher concentrations of unsaturated fatty acids result in pork fat that is softer in texture, which is undesirable to the meat processor as well as to the consumer. Prior to this research, little was known about the relationship between genetic differences (i.e., breed) and pork fat quality (e.g., iodine value). Additionally, little was known about the relationship between fat quality and meat quality characteristics such as pH, color, and tenderness. Finally, little is known about adipocyte cellularity (size and number of adipocytes per weight of tissue) variation between breeds of pigs or how cellularity varies amongst anatomical sites (e.g., back, belly, and jowl fat). The objectives of this research were, therefore, to investigate the relationship of pork fat quality to meat quality, the effect of genetic differences on fat quality, how fat quality and adipocyte cellularity varies amongst anatomical sites, and finally how the seven breeds performed (e.g., ADG and percentage of lean tissue at the time of harvest) when compared with one another. Our hypothesis was that measures of pork fat and meat quality vary with different breeds of pigs and there is a significant relationship between fat and pork quality measures. Barrows and gilts (n=352) of six purebred lines (Berkshire, Chester White, Duroc, Landrace, Yorkshire, Hampshire) and one commercial crossbred line were all fed commercial swine diets with dried distillers grains with solubles (DDGS) inclusion at 30% of dietary dry matter. Pigs began the performance test when the pen average pig weight was 70.1 lbs, and they were removed from the test for harvest at a minimal weight of 245 lbs. At harvest, carcass characteristics were measured, adipose tissue was collected from the back, belly, and jowl, and meat samples were taken from the longissimus muscle for evaluation of fat and meat quality characteristics. Crossbred, Duroc, and Yorkshire pigs performed equally well (ADG = 1.89, 1.92, and 1.91 lbs/day with 53.34, 52.51, and 52.39 percent fat-free lean tissue, respectively) in this experiment. Iodine values varied amongst breed within anatomical site as well as between anatomical sites within each breed suggesting the anatomical site of adipose tissue sampling may be of importance when evaluating iodine values of pork fat. Jowl fat iodine values are highly significant (P < 0.0001) predictors of back and belly fat iodine values (R = 0.5406 and 0.6001, respectively). Backfat iodine values were not correlated with ultimate pork chop muscle pH (P = 0.0680) but were negatively correlated with visual color (P = 0.0002), visual marbling (P < 0.0001), and visual firmness (P = 0.0346), indicating that an increase in iodine value of pork fat (decreased fat quality) is related to a decrease in pork quality as perceived by consumers. Additionally, Minolta Y and Hunter L values were positively correlated (P = 0.0003 and P=0.0023, respectively), again indicating that an increase in iodine value of pork fat is related to a decrease in pork quality as perceived by consumers. Finally, adipocyte cellularity was significantly affected by breed when compared within anatomical location across breeds (back P = 0.0012, belly P = 0.0001, jowl P = 0.0059), but significant differences between breeds, within anatomical location, of mean cell size of adipocytes were only found for belly adipose tissues (P = 0.0013). Overall, these experimental results support our hypothesis that there is a significant relationship between pork fat and pork quality, and that pork fat quality and meat quality vary by breed. Finally, these experimental results show that iodine values are not only a valuable measure of pork quality, but that iodine values of jowl fat can be used to predict iodine values of both back and belly fat, providing a powerful tool to meat packers for fat quality estimation.

These research results were submitted in fulfillment of checkoff-funded research projects. This report is published directly as submitted by the project’s principal investigator. This report has not been peer-reviewed.

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