RESEARCH ABSTRACT

PORK QUALITY

Title: **Influence of commercial deep chilling processes on early postmortem events in muscle that affect ultimate fresh pork tenderness and processing quality – NPB #12-086**

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Scientific Abstract:

The objective of the project was to determine the extent to which deep chilling of pork carcasses affects the quality of fresh pork. Specifically the aims of the study were to evaluate the impact of rapid chilling on sensory quality, processing quality, and biochemical properties of pork. On four different days (November 2nd, 2012, slaughter two on February 8, 2013, slaughter three on May 29, 2013) ten carcasses were selected for the experiment. . Carcasses selected were required to be in the range of 86 to 91 kg hot carcass weight and 54 to 57% fat free lean. Carcasses were split immediately after processing and 1 side was deep chilled and the other chilled at 4°C. Deep chilling protocol resulted in a significantly more rapid chilling. Temperature in the loin at 3 hours postmortem was 15°C colder in deep chilled sides compared to those chilled at 4°C (4°C vs. 20°C). Additional manual pH and temperature measurements were taken at 0, 4 and 24 hours postmortem. Samples were taken 24 hours *post-mortem* from the *Psoas Major* (PM), *Longissimus Dorsi* (LD), *Semimembranosus* (SM), and *Triceps Brachii* (TB). Muscles were then packed on ice and transported to Iowa State University. Samples were weighed before vacuum packaging and held for sensory analysis by trained panel. Aged cut pH, color, purge, marbling score, and Minolta L, a and b values were measured. Tenderloin roasts and shoulder cushion roasts were cooked in a convection oven to 68°C. Loin chops and top ham chops were cooked to 68°C. Cooked cuts were used to measure Warner Bratzler Shear force (WBS), Star Probe, and trained Sensory panel evaluation. Bottom hams (biceps femoris and semitendinosus) will be processed within 5 days of slaughter. Hams were pumped to 25 percent of green weight with a brine containing sodium chloride (11%), sugar (6.6%), sodium tripolyphosphate (2.2%), sodium erythorbate (0.295%) and sodium nitrite (0.08%). After tumbling, and maceration, hams will be cooked and then chilled. Ham yield, (pre and post chilling), slicing yield, color and color stability were documented. Samples from every muscle were evaluated for degradation of desmin. At 1 d postmortem calpain autolysis and calpastatin activity were determined in LD samples. Four hour loin pH was significantly greater in deep chilled carcasses (6.34 vs. 6.09). Loin chops (aged 10 days) from deep chilled carcasses had higher WBS values, indicating less tender product. Few other differences in fresh pork loin were noted. Tenderloin cuts (aged 7 days) had greater purge loss in the deep chilled cuts, but the deep chilled tenderloin was determined to be more juicy, more tender, less chewy, and had lower WBS values than the tenderloin from the same carcass that were conventionally chilled. No meaningful or consistent differences in fresh pork quality were noted in comparison of deep chilled and conventionally chilled triceps brachii and semimembranosus. Deep chilling clearly slowed down the rate of inactivation of calpastatin as 24 h calpastatin activity was 10 % greater in loins from deep chilled carcasses compared to their conventionally chilled counterparts. Interestingly, a 40% greater abundance of glycogen phosphorylase was detected in the deep chilled loin cuts at 1 d postmortem. This indicates a greater propensity for glycolysis after 1 d postmortem. This was observed as pH continued to decline in those cuts. Deep chilling did not affect the processing yield or color of cured and cooked hams. deep chilling of pork carcasses does result in less tender center loin chops, but few consistent or meaningful differences in quality or processing parameters of other cuts in the pork carcass. The consistent decrease in loin tenderness may be related to slower metabolism and protein degradation in early postmortem muscle.