RESEARCHABSTRACT

PORK QUALITY

Title: Regulation of Pork Water Holding Capacity, Color, and Tenderness by Protein Phosphorylation – **NPB #99-072**

Investigator: Matthew E. Doumit

Institution: Michigan State University, East Lansing

Co-Investigator: Ronald O. Bates

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Abstract

Rapid glycolysis and pH decline in stress-susceptible pigs has recently been associated with increased activity of pyruvate kinase, an enzyme that regulates glycolysis. Pyruvate kinase was found to be more active due to phosphorylation of the enzyme. Additionally, phosphorylation of specific muscle proteins may also reduce protein degradation and consequently reduce meat tenderization caused by calpain proteases. This study examined relationships between glycolytic enzyme activity and pork color and water-holding capacity. Pork tenderness was measured and the associations between tenderness, degradation of muscle proteins and protein phosphorylation were evaluated. Duroc (n=16) or HAL-1843™ free Pietrain (n=16) sired gilts were harvested over a two-week period. Temperature of the *longissimus* muscle (LM) was logged continuously from 45 min to 22 h postmortem at 5 min intervals and LM pH was measured at 20, 45, 180 min and 22 h postmortem. Temperature of LM at 45 min postmortem was negatively correlated with 45 min pH ($P < .05$). Minolta L* values for LM chops at 24 h postmortem ranged from 49.6 to 60.2. Purge, determined as fluid loss from vacuum packaged loin sections, ranged from .79 to 9.91% in loin sections stored at 4°C from d1 to d6 postmortem. After purge determination, two 2.5 cm thick loin chops were cut and allowed to drip in a simulated retail case at 4°C overnight. Drip loss ranged from .3 to 1.8%. Minolta L* values (d1, d2, d6 and d7) were correlated to all measures of fluid loss ($P < .002$). Pyruvate kinase and phosphofructokinase (rate-limiting enzyme in glycolysis) activities were not correlated with LM pH, purge, drip loss, or color ($r<.2$ or $>-.2$; $P > .31$). Tenderness was measured by Warner-Bratzler shear force on chops aged for 7 days at 4°C and cooked to an internal temperature of 71°C. Desmin degradation, determined qualitatively by Western blot analysis, was consistently greater in tender chops compared to less tender chops. However, differences in desmin phosphorylation were not apparent. Collectively, these data indicate that pork color and water holding capacity are not associated with the capacity of enzymes that catalyze the regulated steps of glycolysis. Pork tenderness is associated with rate and extent of desmin degradation.