688 ASAS Centennial Presentation: A century of pioneers and progress in meat science leads to new frontiers. D. H. Beermann*, *University of Nebraska*, *Lincoln*.

Discoveries, understanding and innovations in meat science led to revolutionary changes during the last century in meat and poultry production, processing, marketing and consumption. American Society of Animal Science members made key contributions in most, if not all, categories of advancement. The first U.S. university meat science program started in Minnesota in 1905. Use of mechanical refrigeration in the "meat packing industry", improved transportation and packaging, and home refrigeration provided more flexibility, variety and consistency of meat and meat products in the early 1900s. Cooperative meat research was started by 27 universities in 1925, with focus on observational characterization of carcass traits and composition, meat quality attributes, and understanding the causes of wide variation in these variables. Scientific study of the genetic, nutritional, and environmental influences on growth, physiology and postmortem biochemistry of muscle often employed muscle-comparative investigations. Rigor mortis, cold shortening and thaw rigor, postmortem muscle metabolism, post mortem tenderization and tenderness variation, and postmortem myoglobin and lipid oxidation were vigorously studied in the 1960s and beyond, defining the biochemical bases for associated outcomes in fresh and processed products. Value-added benefits result from implementation of electrical stimulation, "boxed beef" and modified atmosphere packaging, restructuring technologies, collagen recovery and muscle profiling work. Isolation, purification and defining the primary structure and biophysical properties of the myofribillar and cytoskeletal proteins in muscle aided understanding of contraction and postmortem changes. The role of calcium-dependent proteases in meat tenderness and muscle growth is being clarified. The chemistry of meat curing, meat emulsion formation, fermentation, and other processing methods led to new technologies, new meat products, and new benchmarks in product shelf-life and quality. Meat safety assurance and our ability to manage the microbiological causes of food-borne illness and spoilage are imminently important now and in the future.

689 Mapping quality attributes within the pork loin. R. M. Smith*[1], M. J. Anderson[1], J. Viguera[2], E. Huff-Lonergan[1], and S. M. Lonergan[1], [1]*Iowa State University*, *Ames*, [2]*Company Imasde Agroalimentaria, S.L.*, *Madrid, Spain*.

Muscle location has the potential to be a significant source of variation in fresh pork quality. The objective of this study was to investigate how location affects quality attributes within the longissimus dorsi. Forty pork loins aged 10-12 days postmortem were cut into chops from the blade end, center, and sirloin end. Quality attributes were measured on the longissimus dorsi at each location. Hunter L, a, and b values as well as drip loss were measured in duplicate. Intact desmin and pH were also measured in each location. Two instrumental methods used to determine texture were Warner-Bratzler shear (WBS) and star probe (SP). Measurements of SP of the blade were significantly lower ($P<0.01$) than both the center and the sirloin. WBS values of the center were significantly higher ($P<0.01$) than both the blade and the sirloin ($P<0.01$). pH of the sirloin tended to be higher ($P<0.06$) than the blade and was significantly higher ($P<0.01$) than the center. Hunter L and b values both exhibited location differences between the blade and center and between the blade and sirloin end. There was significantly more intact desmin in blade ($P<0.05$) than in the center and sirloin. Location did not significantly affect drip loss values or Hunter a values. The differences observed between locations for some quality attributes reiterate the importance of sampling from the same location when examining pork quality.

	Blade	Center	Sirloin	Standard error	P-value
Star Probe (kg)	4.27[b]	5.87[a]	5.72[a]	1.49	<0.01
Warner-Bratzler Shear (kg)	2.58[b]	3.25[a]	2.82[b]	1.15	<0.01
pH	5.65[b]	5.63[b]	5.71[a]	0.02	<0.05
Drip (%)	1.05	1.16	1.13	0.06	0.39
Hunter L	57.15[a]	54.94[b]	55.03[b]	0.41	<0.01
Hunter a	7.03	6.94	7.15	0.28	0.88
Hunter b	12.57[a]	11.75[b]	11.82[b]	0.15	<0.01
Intact Desmin	1.53[a]	1.27[b]	1.14[b]	0.09	<0.01

Key Words: Pork Quality, Star Probe, Warner-Bratzler Shear Force

690 Nitrosylation affects the autolysis of μ-calpain. W. Zhang*, S. Lonergan, and E. Huff-Lonergan, *Iowa State University*, *Ames*.

Nitric oxide is a signaling compound that can interact with cysteine residues and induce protein nitrosylation to regulate protein function and enzyme activities. This study was designed to examine the hypothesis that S-nitrosoglutathione (GSNO) can induce the nitrosylation of the cysteine protease μ-calpain and regulate its autolysis. GSNO is a natural compound which releases nitric oxide (NO) under physiological conditions and is widely used as a NO donor. SDS-PAGE, western blotting and a nitrosylation assay were used to detect autolysis and nitrosylation of μ-calpain that was exposed to GSNO. The five treatments for autolysis were (in order of addition): 1) control: μ-calpain only; 2) μ-calpain+GSNO; 3): μ-calpain+CaCl2; 4) μ-calpain+CaCl2+GSNO; 5) μ-calpain+GSNO+CaCl2. A sixth treatment in which purified μ-calpain was incubated with 10 volumes of 5 mM dithiothreitol (DTT) for 12 hours was also included in the nitrosylation assay. The final calcium concentrations for autolysis and nitrosylation were 0.5 and 1.0 mM respectively. μ-Calpain was purified from porcine skeletal muscle and 0.83 μg μ-calpain was used for each treatment. GSNO was added at a ratio of 2:1 (w:w) GSNO to μ-calpain. All treatments were incubated with pH 6.5 HEPES on ice for 60 minutes. μ-Calpain autolysis of the 80 kDa subunit was slowed by GSNO especially when it was first exposed to GSNO before calcium. The calpain was less autolyzed in GSNO+calcium treatment after 5 and 10 minute incubations on ice compared with control treatment. Of particular interest was that native μ-calpain was shown to be nitrosylated. Less nitrosylation was detected in the DTT treated group compared with control group showing calpain may be endogenously nitrosylated. More μ-calpain was nitrosylated in both GSNO, calcium+GSNO and GSNO+calcium groups than control group, although the difference was less remarkable in the absence of calcium. These results indicate that μ-calpain could be further nitrosylated by GSNO. The nitrosylation may be involved in regulating the autolysis of μ-calpain.

Key Words: S-Nitrosoglutathione, μ-Calpain, Nitric Oxide

691 Myostatin is associated with marbling in beef cattle. K. R. Underwood*, J. Tong, M. J. Zhu, W. J. Means, and M. Du, *University of Wyoming*, *Laramie*.

Marbling, or intramuscular fat, is an important factor in beef quality. Myostatin is a member of the Transforming Growth Factor-β family which functions as a negative regulator of muscle growth. Myostatin mutation leads to double muscling cattle. Though the role of myostatin as a negative regulator of skeletal muscle development has been well-established, its role in adipose tissue deposition and adipogenesis is not well defined. Myostatin′s role in marbling deposition of beef cattle is unclear. HYPOTHESIS: Myostatin is positively associated with marbling in beef cattle. OBJECTIVE: To evaluate the role of myostatin in marbling deposition in beef cattle through both *in vivo* study and *in vitro* 3T3-L1 cell culture study. 3T3-L1 cells are commonly used for studying adipogenesis *in vitro*.
Five steers with high intramuscular fat (High IMF, 5.71 ± 0.36%) and five steers with low intramuscular fat (Low IMF, 2.09 ± 0.19%) were selected from a highly uniform group to measure myostatin mRNA expression using RT-PCR and myostatin protein expression using immunoblotting. In addition, 3T3-L1 cells were incubated in DMEM medium with 10% fetal bovine serum. Adipogenesis in 3T3-L1 cells was induced using a standard adipogenic medium composed of DMEM with 10% Fetal bovine serum supplemented with insulin (20 mIU/ml), dexamethazone (0.1 μM), 3-isobutyl-1-methylxanthine (0.5 mM), and troglitazone (10 μM) for 10 days with 0, 2.5, 5.0, 10.0, and 20.0 μM myostatin. Adipogenesis was then assessed by Oil-Red-O staining (n = 3).
Myostatin mRNA expression and active myostatin content tended to be higher ($P < 0.10$) in the High IMF steers compared to Low IMF steers. Oil-Red-O staining showed that myostatin levels of 2.5, 5.0, and 10.0 μM increased ($P < 0.05$) adipocytes differentiated into mature 3T3 cells, but 20.0 μM myostatin did not. These data indicate that myostatin is associated with marbling in beef cattle. Therefore, myostatin may be a target that could control muscle growth and marbling deposition in beef cattle.

Key Words: Myostatin, Marbling, Beef

692 ASAS Centennial Presentation: Current and future meat science research needs. T. H. Powell*[1] and R. D. Huffman[2], [1]*American Meat Science Association*, *Savoy, IL*, [2]*American Meat Institute*, *Washington, DC*.

Meat science research continues to evolve and adapt to the ever changing needs and resources of the agricultural research community and the livestock and meat processing industries. Recently, meat scientist from academia, government and industry convened to develop a comprehensive set of current research needs and relative priorities in meat science. The initial forum was convened by the American Meat Science Association and the American Meat Institute Foundation during a 1 day research priority symposium at the 2006 Meat Industry Research Conference. Sixty-five scientists from academia, industry and government heard presentations from key thought leaders in four broad research areas:
1. Product Quality
2. Food Safety
3. Processing, Packaging and Ingredients
4. Consumer Needs

Conference participants then worked in break-out groups for each research area. For each area, they brainstormed current research needs, assigned a relative priority score and identified the most urgent needs. Reports from each breakout group were presented at the conference and will be summarized in this presentation. The document was reviewed and updated during a reciprocation session at the 2007 Reciprocal Meat Conference. This presentation will also take a forward look at what challenges lay ahead for meat science research in the future given the changing dynamics of livestock production, meat consumption patterns, and ever increasing limits on available resources for research.