

**78 Hydrodyne-treated beef: aging, proteolysis, and tenderness of strip loins.** B. M. O'Rourke<sup>1</sup>, C. R. Calkins<sup>\*1</sup>, R. T. Rosario<sup>1</sup>, M. B. Solomon<sup>2</sup>, and J. B. Long<sup>3</sup>. <sup>1</sup>University of Nebraska, Lincoln, <sup>2</sup>USDA, ARS, Beltsville, MD, and <sup>3</sup>Hydrodyne, Inc., San Juan, PR.

This study was conducted to determine the benefits of aging and the Hydrodyne process to beef tenderness. The Hydrodyne process involves creation of a shock wave within a water filled tank which enhances meat tenderness through the resulting microstructural damage. Paired loins from 10 USDA Choice and 10 USDA Select beef carcasses were used. One side of each pair was held as a control and the opposite side was treated with Hydrodyne (350 g explosive, 46 cm from the meat, 1060 L tank) 5 d post mortem. Samples for shear force determination and electrophoretic analysis were removed 5, 10, 15 and 20 d post mortem. Steaks were broiled to 70 C. USDA Choice control loins had shear values of 4.96, 4.08, 3.75 and 3.29 kg at 5, 10, 15 and 20 d, respectively, while the corresponding treated strips were 4.04, 3.49, 3.16, and 2.98 kg. For USDA Select loins, the controls had shear values of 5.79, 4.71, 4.33, and 3.81 kg during the aging period and Hydrodyne-treated Select loins were 5.52, 4.81, 4.30, and 3.75, respectively. The main effects of aging ( $p < .01$ ), Hydrodyne treatment ( $p < .05$ ), and quality grade ( $p < .01$ ) were significant, with the most tender being those aged longer, those treated with Hydrodyne, and USDA Choice. Although Hydrodyne-treated loins had lower shear values than controls at all but one aging period, differences were not consistent enough to be significant at individual aging periods, suggesting that the Hydrodyne benefit persists throughout aging. Nevertheless, the largest differences were found for USDA Choice loins at the earlier post mortem aging periods. Electrophoretic gels were inconclusive in establishing differences in proteolysis among the samples. These data emphasize the benefits of aging and Hydrodyne treatment and suggest that both are independently beneficial to beef tenderness.

**Key Words:** Beef Tenderness, Aging, Proteolysis

**79 Beef Customer Satisfaction II.** W. W. Morgan<sup>1</sup>, J. W. Savell<sup>1</sup>, C. L. Lorenzen<sup>1\*</sup>, J. O. Reagan<sup>2</sup>, S. D. Shackelford<sup>3</sup>, T. L. Wheeler<sup>3</sup>, M. Koohmaraie<sup>3</sup>, and J. W. Wise<sup>4</sup>. <sup>1</sup>Texas A&M University, College Station, <sup>2</sup>National Cattlemen's Beef Association, Denver, CO, <sup>3</sup>U.S. Meat Animal Research Center, Clay Center, NE, <sup>4</sup>USDA-AMS, Washington, DC.

Moderate to heavy eaters of beef were chosen to participate in an "in-home" consumer evaluation of three beef cuts (clod, top round, and top sirloin) and several treatment combinations of USDA quality grade and CaCl<sub>2</sub> for sensory traits. Consumer sensory traits (overall like, tenderness, juiciness, flavor like, and flavor amount) were evaluated on a ten point scale. Consumer preparation methods and actual degree of doneness also were used in analysis. One steak from each cut was used for Warner-Bratzler shear force (WBS) determination. Significant interactions involving cooking method and/or degree of doneness were found in all consumer traits for each cut. Clod steaks from four USDA grade categories (Top Choice, Low Choice, High Select, and Low Select) were evaluated by consumers ( $n = 1,241$ ). USDA grade did not affect ( $P > .05$ ) any consumer evaluation traits or WBS in the clod. Two USDA grades, High Select and Top Choice, and CaCl<sub>2</sub> treatment were utilized in the top round. During selection, a top round from one side of each carcass was injected with 200 mM CaCl<sub>2</sub> at 5% of cut weight. Each consumer received a steak from corresponding cuts, one with CaCl<sub>2</sub> and one without. Top Choice steaks rated higher ( $P < .05$ ) for overall like than High Select ( $n = 1,247$ ), 6.9 vs. 6.5, respectively. WBS was not affected ( $P > .05$ ) by USDA grade or CaCl<sub>2</sub> marinade. Top sirloin steaks were evaluated by a different population of consumers. These consumers were divided into two groups. One received cooking suggestions and the other did not. Top sirloins selected for this portion of the study graded High Select. Cuts from one side of each carcass were injected with CaCl<sub>2</sub>. Neither injection with CaCl<sub>2</sub> nor cooking suggestions affected ( $P > .05$ ) consumer ratings ( $n = 399$ ). WBS revealed no CaCl<sub>2</sub> effects ( $P > .05$ ), 2.9 kg vs. 2.7 kg for and control and CaCl<sub>2</sub>, respectively. These data suggest that cooking method and degree of doneness are primary drivers in customer satisfaction ratings.

**Key Words:** Consumer Survey, Beef Quality, Calcium Chloride

## NONRUMINANT NUTRITION

**80 Effects of increasing the apparent digestible tryptophan:lysine ratio on the growth performance of the 5 to 10 kg pig.** J. A. Loughmiller<sup>\*</sup>, J. L. Nelssen, R. D. Goodband, M. D. Tokach, K. Hongtrakul, P. R. O'Quinn, S. Moser, and J. W. Smith II, Kansas State University, Manhattan.

A 16 d growth assay was conducted to determine the appropriate apparent digestible tryptophan:lysine ratio for 5 to 10 kg pigs. Three hundred and sixty segregated early-weaned pigs (Newsham Hybrids) were blocked by weight (initially 4.3 kg and 14 d of age) and allotted to one of 12 treatments. Treatments were arranged in a 2 x 6 factorial with two levels of dietary lysine (1.15% and 1.50% apparent digestible) and six apparent digestible tryptophan levels (12.5, 15, 17.5, 20, 22.5, and 25% of lysine). All diets were corn-soybean meal based with 10% dried whey, 15% crystalline lactose, 6% soybean oil, 6% spray-dried animal plasma, and 3% select menhaden fishmeal. Crystalline amino acids were added to maintain all amino acids, except tryptophan, on an ideal amino acid basis relative to lysine. Increasing apparent digestible lysine from 1.15% to 1.50% decreased ADFI and increased G/F ( $P < .05$ ). A lysine x tryptophan interaction was observed for G/F ( $P < .05$ ). Increasing the tryptophan:lysine ratio had no influence on performance for pigs fed the diets containing 1.50% apparent digestible lysine. Conversely, increasing the apparent digestible tryptophan:lysine improved ADG (quadratic,  $P < .10$ ) and G/F (quadratic,  $P < .05$ ) with pigs fed 1.15% apparent digestible lysine (see Table). The greatest improvement in performance was observed as the apparent digestible tryptophan:lysine ratio was increased from 12.5% to 15%. Under these experimental conditions, the apparent digestible tryptophan:lysine ratio to maximize growth performance of the 5 to 10 kg pig is approximately 15%.

	1.15% apparent digestible lysine						SEM
	Trp:Lys	12.5	15	17.5	20	22.5	
ADG, g	176	206	220	218	222	216	11.4
ADFI, g	254	272	295	276	286	285	14.1
G/F	.70	.77	.75	.79	.78	.76	.024

**Key Words:** Tryptophan, Lysine, Pigs

**81 Effects of dietary threonine on the growth performance of entire male, female, and castrated male pigs between 6 and 14 kg live weight.** D. J. Cadogan<sup>1\*</sup>, T. K. Chung<sup>2</sup>, R. G. Campbell<sup>1</sup>, S. Kershaw<sup>1</sup>, and D. Harrison<sup>1</sup>. <sup>1</sup>Bunge Meat Industries, Corowa, Australia, <sup>2</sup>ADM, Singapore.

One Hundred and fifty pigs (Bunge genotype), comprising equal numbers of entire males, females, and castrated males were blocked by weight (6.5 + 0.9 kg) and allocated to 5 treatments. Pigs were housed in individual pens and offered ad libitum feed and water throughout the 21 d study. Experimental wheat based diets were formulated to contain 15.5 MJ DE/kg (3,700 kcal DE/kg), 1.55% total lysine (0.92 g/MJ DE available lysine) and crystalline amino acids were used to ensure all other essential amino acids were in excess (120% of Auspig prediction). L-threonine was used to provide five total threonine levels (0.78, 0.89, 1.00, 1.11 and 1.22%). A similar growth performance was measured between the three sexes during the 21 d period. ADG and feed efficiency were improved ( $P < 0.001$ ) by increasing dietary threonine, with 1.00% total threonine (0.57 g/MJ DE available threonine) supporting maximum growth for the combined sexes. The higher levels of threonine reduced ADFI (linear,  $P < 0.001$ ; quadratic,  $P < 0.001$ ), although this effect was more pronounced in entire males and females compared to castrates. The results suggest that between 6 and 14 kg, entire male, female and castrated male pigs of improved genotype, have a similar threonine requirement of approximately 1.00% or 3.85 g/d to support maximum growth performance. The corresponding values expressed as percent of lysine and g per MJ DE were 65% and 0.67 respectively.

	Threonine content of diet.					SEM	Effect <sup>1</sup>	
	0.78%	0.89%	1.00%	1.11%	1.22%		L	Q
Wt in (kg)	6.53	6.41	6.46	6.56	6.59	0.193	NS	NS
ADG (kg)	0.303	0.307	0.348	0.317	0.310	0.028	NS	**
F:G	1.342	1.300	1.106	1.112	1.051	0.057	NS	*
ADI (kg)	0.397	0.385	0.383	0.350	0.329	0.033	***	***
Threonine intake (g/d)	3.07	3.42	3.85	3.88	3.95	0.332	***	***
Wt out (kg)	14.19	14.09	15.15	14.49	14.33	0.759	***	***

<sup>1</sup>Linear and Quadratic effect: NS, non significant,  $P > 0.05$ ,  $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

**Key Words:** Pigs, Threonine, Amino Acids

Individual feed 3700 kcal ME  
X  
Total  
Thr:Lys = 63% True basis