ment indicate that including XP in feedlot diets resulted in a trend for decreased percentage of USDA Select grading carcasses, but may also result in decreased feed efficiency in LS containing diets.

Key Words: feedlot cattle, sulfur, saccharomyces cerevisiae

97 Effects of deleting crystalline amino acids from low-CP, amino acid-fortified diets and dietary valine:lysine ratio for nursery pigs from 6.8 to 11.3 kg. J. E. Nemechek*[1], M. D. Tokach[1], S. S. Dritz[1], R. D. Goodband[1], J. M. DeRouchey[1], and J. L. Nelssen[1], *[1]Kansas State University, Manhattan, [2]Ajinomoto Heartland, LLC, Chicago, IL.*

Two 14-d experiments were used to determine the effect of deleting crystalline amino acids from a low-CP, amino acid-fortified diet and the Val:Lys ratio required for optimal growth of nursery pigs. Diets were corn-soybean meal-based, contained 10% dried whey, and 1.30% SID Lys. For both trials, on d 3 after weaning, pigs were allotted to 1 of 6 dietary treatments. In both trials, 294 nursery pigs (PIC TR4 × 1050, initially 6.9 and 6.8 kg, respectively) were used with 7 pens per treatment and 7 pigs per pen. In Exp. 1 the positive control (PC) diet contained L-lysine HCl, DL-methionine, L-threonine, L-isoleucine, L-tryptophan, L-valine, L-glutamine, and L-glycine. The 6 treatments were (1) PC, (2) PC with L-isoleucine deleted, (3) PC with L-tryptophan deleted, (4) PC with L-valine deleted, (5) PC with L-glutamine and L-glycine deleted, and (6) PC with L-isoleucine, L-tryptophan, L-valine, L-glutamine, and L-glycine deleted from diet (NC). Amino acid:Lys ratios of the positive and negative control diets were: Ile (60 vs 52%), Trp (20 vs 15%), and Val (70 vs 57%). The Lys:CP ratios were 6.8 and 7.5%, respectively. The pigs fed the PC had improved ($P < 0.03$) ADG (303, 256, 246, 244 g) and ADFI (420, 367, 345, 345 g) compared with pigs fed diets with L-tryptophan or L-valine deleted or the NC, respectively. Compared with the PC there was no difference ($P > 0.40$) in ADG (303 vs 320 g), ADFI (420 vs 433 g), and G:F (0.72 vs 0.74) for pigs fed the diet with no L-isoleucine, and a tendency for decreased ($P < 0.19$) ADG (303 vs 277 g) and ADFI (420 vs 345 g) for pigs fed the diet with no L-glutamine and L-glycine. In Exp. 2, SID Val:Lys ratios tested were 57.4, 59.9, 62.3, 64.7, 67.2, and 69.6%. ADG (198, 238, 266, 292, 295, 298 g) and ADFI (316, 359, 418, 427, 440, 434 g) increased (quadratic, $P < 0.01$) and G:F (0.63, 0.67, 0.64, 0.69, 0.67, 0.69) improved (linear, $P < 0.02$) as the Val:Lys ratio increased from 57.4 to 64.7 with little improvement observed thereafter. These experiments demonstrated that L-tryptophan and L-valine were needed in the low-CP, high amino acid-fortified nursery diet, the Lys:CP ratio should be less than 7.5%, and a minimum Val:Lys ratio of 65% was required for optimal growth.

Key Words: amino acid, valine, nursery pig

98 Response by the modern lactating sow and progeny to source and level of supplemental dietary fat. D. S. Rosero*[1], E. van Heugten[1], J. Odle[1], and R. D. Boyd[2], *[1]North Dakota State University, Department of Animal Sciences, Raleigh, [2]Hanor Company, Inc., Franklin, KY.*

The objective of this study was to determine the response to increasing increments of 2 sources of dietary fat on sow and progeny performance during high ambient temperatures. Data were collected from 391 sows (PIC Camborough) from June to September in a 2,600-sow commercial unit in Oklahoma. Sows were assigned randomly to a 2 × 3 factorial arrangement and a control diet without added fat. Factors included: 1) fat sources: animal-vegetable blend (AV; 14.5% FFA, IV = 89, peroxide value: initial = 4.2, 4 h = 102, and 24 h = 140 mep/kg) and choice white grease (CWG; 3.7% FFA, IV = 62, peroxide value: initial = 9.8, 4 h = 34, and 24 h = 228 mep/kg) and 2) fat level (2, 4 and 6%). Diets were corn-soybean meal based with 8.0% dried distillers grains with solubles and 6.0% wheat middlings, and contained 3.56 g standardized ileal digestible lysine/Mcal ME. Sows were balanced by parity, with 192, and 199 sows representing parity 1, and 3 to 5 (P3+), respectively. Feed refusal increased linearly ($P < 0.001$), but feed intake was not affected by additional fat. Caloric intake increased linearly ($P < 0.05$) with increasing fat. Sows fed CWG diets lost less body weight (0.04 kg/d) than either control sows (0.27; $P = 0.08$) or sows fed AV (0.20; $P = 0.10$). Litter growth rate was not affected by AV (1.97, 2.08, 1.99, and 2.07 kg/d; for 0, 2, 4, and 6%, respectively) but increased quadratically ($P < 0.05$) with CWG (1.97, 2.19, 2.04, and 2.00 kg/d). CWG improved G:F (sow and litter gain relative to feed intake; 0.51, 0.45, 0.52 for 2, 4, and 6%, respectively) compared with no fat (0.41; $P = 0.09$) and AV (0.44, 0.39, 0.36; $P < 0.01$). CWG, but not AV increased ($P < 0.05$) total fat content in the milk (subset of 30 sows; 6.30, 6.70, and 7.35% for control, 6% AV, and 6% CWG diets, respectively). Addition of CWG (67.0%) or AV (67.4%) improved ($P < 0.001$) the percentage of sows returning to estrus within 8 d after weaning compared with the control diet (56.0%). In conclusion, caloric intake increased with the addition of fat, but only CWG had a beneficial effect on litter growth rate, milk fat content, and G:F ratio. Return to estrus after weaning was improved by both fat sources.

Key Words: fat, lactation, sows

99 Protease inactivation by thermosonication and impact on milk characteristics. S. Vijayakumar,* D. Grewell, S. Jung, and S. Clark, *Iowa State University, Ames.*

Pasteurized milk shelf life is limited by heat-stable proteases, which cause bitterness and protein gelation. Ultra-high temperature processing inactivates proteases, but detrimentally affects milk quality. An alternative to pasteurization is sought to extend milk shelf life, while maintaining sensory properties. Ultrasonication has been used to inactivate microorganisms and various enzymes associated with food spoilage. In this study we are evaluating the effects of combined heat and ultrasound on the activity of bacterial (Staphylococcus aureus) protease and bovine plasmin, as well as impact on sensory properties and shelf life of milk. Pasteurized skim, reduced-fat and whole milk heated to 60°C and treated with ultrasound of amplitude 160, 170 and 180 µm for 1, 2 and 2.5 min showed significant decreases in the activity of S. aureus protease with increase in sonication amplitude ($P < 0.0001$) and time ($P < 0.0001$). A significant interaction between sonication amplitude and time on the protease activity was found ($P < 0.05$). No significant differences were observed in the rheological properties of milk samples that were thermosonicated at 180 µm for 2.5 min. However, off aromas were observed in reduced-fat and whole milk samples treated with 180 µm for 2.5 min. To investigate the impact of thermosonication on plasmin inactivation, thermosonication was conducted on pasteurized skim milk and heavy whipping cream at 60°C and 160, 180 and 200 µm for 1 to 3 min. The decrease in plasmin activity was not significant in skim milk; it was significant only for increase in amplitude ($P < 0.01$) in whipping cream. A significant interaction between sonication amplitude and time on protease activity was found in whipping cream only ($P < 0.01$). The effects of these treatments on the activity of native plasmin and plasminogen will be evaluated in raw milk and cream in the near future. Sensory panelists are being trained for quantitative descriptive analysis of milk odor attributes. Thermosonicated raw skim milk and raw cream aroma will be evaluated weekly, up to d 28. The outcome of this research will illu-