345 ASAS Centennial Presentation: Impact of animal science research on U.S. goat production and predictions for the future. T. Sahlu*[1], L. J. Dawson[1,2], T. A. Gipson[1], S. P. Hart[1], R. C. Merkel[1], R. Puchala[1], Z. Wang[1], S. Zeng[1], and A. L. Goetsch[1], [1]*American Institute for Goat Research, Langston University*, *Langston, OK*, [2]*Oklahoma State University*, *Stillwater*.

Goat research in the U.S. has increased but at a rate less than that in production. Research on goat meat includes nutritional quality, packaging, color, sensory characteristics, and preharvest management. Goat skins have value for leather, yet quality of goat leather has not been extensively studied. Research in the production, quality, antibiotic residues, and sensory characteristics of goat milk and its products has aided development of the U.S. dairy goat industry. Limited progress has been made in genetic improvement of milk or meat production. There is need to explore applications of genomics and proteomics and improve consistency in texture and functionality of goat cheeses. New goat meat and milk products are needed to increase demand and meet the diverse tastes of the American public. Despite research progress in control of mohair and cashmere growth, erratic prices and sale of raw materials have contributed to further declines in U.S. production. Innovative and cooperative ventures are needed for profit sharing up to the consumer level. Internal parasites pose the greatest challenge to goat production in humid areas largely because of anthelmintic resistance. Study of alternative controls is needed, including immunity enhancement via nutrition, vaccination, pasture management such as co-grazing with cattle, and genetic resistance. Similarly, the importance of health management is increasing related in part to a lack of effective vaccines for many diseases. Nutrition research should address requirements for vitamins and minerals, efficiencies of protein utilization, adjusting energy requirements for nutritional plane, acclimatization, and grazing conditions, feed intake prediction, and management practices for rapid-growth 'feedlot' production systems. Moreover, efficient technology transfer methods are needed to disseminate current knowledge and that gained in future research.

Key Words: Goats, Research

346 Effects of kidding season on performance of meat goat does in Kentucky. K. M. Andries* and E. Sherrow, *Kentucky State University*, *Frankfort*.

Price for meat goats are showing a seasonal trend with prices generally starting to rise in late fall and winter and peaking in spring with the lowest prices seen during late summer. Because of this many goat producers in Kentucky are moving their kidding season to late fall or winter with little information on the impact this may have on herd performance. A study was designed to evaluate doe performance using two kidding seasons. The objectives of this study were to evaluate doe performance by comparing total birth, 60 day and 90 day kid weight, doe productivity ratio, conception rate, and kid survival to weaning in two alternative kidding seasons. One hundred and twenty commercial meat type does were randomly assigned to either a fall (late October, November, and December) or spring (late March, April, and May) kidding season. Data collected during the first two years included birth weight, birth type, sex, 60 day weight, and 90 day weaning weight on the kids. Sixty day weight was adjusted for age and 90 day weights were adjusted for sex, age, and age of dam. Doe weight and body condition score were taken at weaning (90 days) and the productivity ratio was calculated by dividing the total weight of kids at 90 days by the doe weight taken at weaning. Kidding season had a significant ($p<.01$) effect on doe weight, total weight at 60 days, conception rate, and number of kids born per doe. Season also had a slightly significant effect on total birth weight ($p=0.0487$). Doe weight and total birth weight were higher in fall than spring, however total 60 day weight, conception rate, and number of kids born per doe were higher for spring kidding groups. Interaction between year and kidding season was significant ($p<.01$) for productivity ratio, number born, number at 60 days, and number at 90 days ($p=.022$). This indicates that kidding season does not have a strong influence on kid weight per doe. However, differences in conception rate and kids born per doe may decrease profitability of fall and early winter kidding programs.

Key Words: Meat Goats, Season of Birth, Efficiency

347 Use of electronic rumen boluses for the identification of different goat breeds in the U.S. S. Carné*[1], T. A. Gipson[2], M. Rovai[1,2], R. C. Merkel[2], and G. Caja[1], [1]*Universitat Autònoma de Barcelona*, *Bellaterra, Barcelona, Spain*, [2]*E. (Kika) de la Garza American Institute for Goat Research, Langston University*, *Langston, OK*.

With the aim of assessing the influence of breed on electronic bolus retention, 295 goats from 4 breeds were identified with 3 bolus types containing 32 mm HDX transponders. Ruminal pH was used as an indicator to evaluate feeding conditions. Bolus features were: **B1** (75 g, 68.2 × 21.0 mm, n = 100), **B2** (82 g, 69.1 × 21.2 mm, n = 100) and **B3** (20 g, 56.4 × 11.2 mm, n = 95). Distribution of boluses by breed and bolus type (B1, B2, B3) was: Alpine (25, 24, 25), Boer-cross (26, 24, 23), Angora (25, 26, 24) and Spanish (25, 25, 23). Goats were also identified with a standard flag-button plastic ear tag (4.6 g, 51 × 41 mm). Boluses were administered with a balling gun adapted to each bolus type. Time required for bolus administration was recorded as well as any incident observed. An ISO handheld reader was used to read the boluses. Retention rate (read/applied × 100) of boluses and ear tags was recorded at d 1, 7, 30, 60 and 120. Ruminal pH was measured with a portable pH meter, in random samples of 5 goats from each breed and feeding conditions, after bolus administration and at wk 1, 2, 3 and 4. Ruminal fluid was obtained at 2 h after feeding by using an oro-ruminal probe. Time required for bolus administration varied according to bolus type (B1, 24 ± 2 s; B2, 27 ± 2 s; B3, 14 ± 2 s; $P < 0.05$) and goat breed (Alpine, 34 ± 3 s; Boer-cross, 16 ± 1 s; Angora, 17 ± 2 s; Spanish, 19 ± 2 s; $P < 0.05$). No health or behavior disturbances were observed. Ruminal pH differed according to breed and feeding conditions (lactating Alpine, 6.50 ± 0.07; yearling Alpine, 6.73 ± 0.08; Boer-cross, 6.62 ± 0.04; Angora, 6.34 ± 0.06; Spanish, 6.32 ± 0.08; $P < 0.001$) but showed no influence on bolus retention. Only 1 goat regurgitated a B3 bolus when inverted on an operating table during laparoscopy surgery. At 120 d, bolus retention was greater than ear tag retention (99.7 vs. 97.6%; $P = 0.07$). In conclusion, medium-term bolus retention was not affected by breed and feeding conditions, and remained over the ICAR requirements for official livestock identification (>98%). Long-term bolus and ear tag retention is under study.

Key Words: Transponder, Ruminal Bolus, Goat

348 Comparison of pneumatic, needle-free vaccination to needle vaccination for sheep. M. R. Mousel*[1], T. D. Leeds[1], S. N. White[2], and L. M. Herrmann-Hoesing[2], [1]*USDA-ARS U.S. Sheep Experiment Station*, *Dubois, ID*, [2]*USDA-ARS Animal Disease Research Unit*, *Pullman, WA*.

Administering vaccines using needle-free injection technology as opposed to traditional needles would likely reduce the lateral spread of infectious diseases in sheep flocks. In addition, needle-free technology could reduce the damage to carcasses caused by needle injections (i.e., lesions and broken needle fragments). Therefore, the objectives of this study were to determine whether a pneumatic, needle-free injector could inject s.c. and induce similar antibody responses as traditional needle vaccinations. To determine optimal pressure for s.c. vaccine delivery, 2 8-mo-old wethers received injections of Chinese ink in isotonic, sterile saline at pressures from 207 to 414 kPa in increments of 69 kPa. To evaluate antibody responses, 100 8-mo-old wethers were vaccinated at d 0 with ovalbumin, in an aluminum hydroxide adjuvant and isotonic, sterile saline, using either a needle-free injector or traditional needles. The wethers received a secondary injection of ovalbumin at d 28 using the same type of administration as d 0. Serum samples were collected before vaccination on d 0 and 28, as well as on d 14 and 42. An ELISA was use to determine serum anti ovalbumin antibody titers on d 0, 14, 28, and 42. An optimum pressure of 207 to 276 pKa was determined to deliver a safe and effective s.c. injection using the needle-free method. Serum anti ovalbumin titers at d 14, 28, and 42 were not different ($P > 0.12$) between traditional needle vaccination and pneumatic, needle-free injector. This indicates that needle-free vaccination and traditional needle vaccination produced an equivalent antibody response. Injecting 7 to 9 sheep with the needle-free method (mean 60.6 s) was faster ($P < 0.01$) than changing needles for every animal (mean 155.3 s). In addition, the needle-free injector will reduce biohazard waste, eliminate the possibility of accidental needle sticks for livestock handlers, and will likely reduce iatrogenic infection of sheep.

Key Words: Sheep, Methodology, Vaccination

349 Expected rank correlations for varying degrees of ultrasound accuracy. T. D. Leeds*[1], C. A. Moffet[1], D. R. Notter[2], and G. S. Lewis[1], [1]*USDA, ARS, U.S. Sheep Experiment Station*, *Dubois, ID*, [2]*Virginia Polytechnic Institute and State University*, *Blacksburg*.

Live-animal ultrasound backfat thickness (BF) and loin muscle area (LMA) data must be accurate to correctly rank animals. The Beef Improvement Federation and National Swine Improvement Federation have established accuracy criteria for their respective species, but no such criteria have been established for sheep. We used Monte Carlo simulation to derive expected rank correlations for varying degrees of ultrasound accuracy (i.e., SE of prediction; SEP) for BF and LMA in cattle, pigs, and sheep. Normally-distributed carcass BF and LMA data were simulated ($n = 100$ records $\bullet$ trait^{-1} $\bullet$ species^{-1}) using species-specific mean and SD estimates for each of 10,000 replications. Estimates used for cattle, pigs, and sheep, respectively, were: BF mean = 1.14, 1.74, and 0.571 cm; BF SD = 0.510, 0.500, and 0.225 cm; LMA mean = 80.6, 43.3, and 16.7 cm^2; LMA SD = 9.10, 5.64, and 2.67 cm^2. For each replication, unbiased ultrasound data were generated as carcass data + variate ($N(0, \sigma = SEP)$) for a range of ultrasound accuracy. Spearman rank correlations between the carcass and ultrasound data were calculated for each replication. Means and SD of the rank correlation estimates were calculated across all replications within each degree of ultrasound accuracy. Means and SD of the rank correlations were described as a function of SEP using polynomial regression. As expected, rank correlations decreased, and SD of rank correlations increased, as SEP increased. The maximum SEP to achieve an expected rank correlation of 0.85 (arbitrary) between carcass and ultrasound measures for cattle, pigs, and sheep, respectively, were: BF = 0.290, 0.285, and 0.125 cm; LMA = 5.24, 3.25, and 1.53 cm^2. At these SEP, the SD of rank correlation estimates for all traits within all species was approximately 0.031. The SEP values reported here are based on an arbitrary rank correlation value, and are dependent upon trait variation within populations. However, this report describes an objective approach for establishing ultrasound accuracy criteria in sheep.

Key Words: Sheep, Ultrasound, Accuracy

350 Backfat thickness, LM area, and LM depth effects on carcass yield, composition, and value in sheep. T. D. Leeds*[1], M. R. Mousel[1], D. R. Notter[2], H. N. Zerby[3], C. A. Moffet[1], and G. S. Lewis[1], [1]*USDA, ARS, U.S. Sheep Experiment Station*, *Dubois, ID*, [2]*Virginia Polytechnic Institute and State University*, *Blacksburg*, [3]*The Ohio State University*, *Columbus*.

Backfat thickness, LM area, and LM depth were measured on 172 wethers to determine relationships between these measures and carcass yield, composition, and value. Wethers were F_1 progeny from the mating of 4 terminal sire breeds to Rambouillet ewes and were finished on a concentrate diet to a mean BW of 62.9 kg (SD = 9.5 kg). Before transport to harvest, LM area, LM depth, and backfat thickness were measured from transverse ultrasound images taken between the 12th and 13th ribs. After harvest, these measures were taken on the carcasses. The SE of prediction, a measure of ultrasound accuracy, for the technician were 0.140 cm, 1.55 cm^2, and 0.263 cm for backfat thickness, LM area, and LM depth, respectively. Carcasses were fabricated into subprimal items, and weights were recorded. Carcass yield, composition, and value were described using linear models that included fixed effects of BW (or carcass weight), breed of sire, backfat thickness, and LM area (or LM depth). At a standardized BW and backfat thickness, wethers with larger LM area and LM depth yielded larger and more valuable carcasses, and these relationships were detectable with ultrasound. For each SD increase in carcass LM area, dressing percentage increased 1.57 percentage points, gross carcass value increased US$5.12, and boxed carcass value increased US$6.84 ($P < 0.001$). For each SD increase in ultrasound LM area, dressing percentage increased 0.95 percentage points, gross carcass value increased US$3.15, and boxed carcass value increased US$3.86 ($P < 0.001$). The response in boxed carcass value attributed to disproportionate increases in high-value subprimal item weights was small. Responses in dressing percentage and carcass value were significant ($P < 0.01$) for ultrasound and carcass LM depth, but were smaller in magnitude when compared with LM area. These data indicate biological and economical incentives for increasing LM area in wethers, and live-animal ultrasound can provide reliable estimates of carcass measures. These results are applicable to terminal sire breeders and producers who market sheep using carcass-merit pricing systems.

Key Words: Sheep, Ultrasound, Carcass yield

351 Phenotypic correlations among growth and carcass traits of Polypay and White Dorper × Polypay crossbred lambs. D. K. Aaron*, D. G. Ely, E. Fink, B. T. Burden, M. M. Simpson, and A. K. Lunsford, *University of Kentucky*, *Lexington*.

Wether lambs from two genetic types, Polypay (PP; n = 32) and White Dorper (WD) x PP crosses (WDX: 1/2 WD x 1/2 PP, n = 36; 3/4 WD x 1/4 PP, n = 34; 7/8 WD x 1/8 PP, n = 18; 15/16 WD x 1/16 PP, n = 12), were used to estimate phenotypic correlations among growth and carcass traits. Wethers were weaned at an average of 70 d of age and 26 kg, were managed postweaning on pasture and supplemented with grain at 2 to 3% BW, and were harvested at an average of 208 d of age and 55 kg. Partial correlations among growth and carcass traits, pooled within model fixed effects, were obtained separately for PP and WDX using multivariate procedures. Homogeneity of genetic type correlations were tested using Chi-square criteria. In general, correlations were homogenous between PP and WDX; thus, data were combined and pooled within genetic type correlations calculated. When heterogeneous correlations ($P < 0.05$) were observed, they involved associations with live and carcass weights. Overall, weaning weight was positively correlated ($P < 0.05$) with final weight (0.48), hot carcass weight (0.40), leg (0.40), rack (0.20), and shoulder (0.20) weights but was negatively correlated with postweaning ADG (-0.50) and harvest age (-0.30). Postweaning ADG was positively associated with final weight (0.22; $P < 0.05$) but negatively associated with harvest age (-0.45; $P < 0.05$). Dressing percentage was positively correlated ($P < 0.05$) with hot carcass weight (0.57), rib fat (0.36), body wall thickness (0.37), yield grade (0.36) and leg, rack, and shoulder weights (0.36, 0.21, and 0.43). Positive correlations ($P < 0.05$) between longissimus muscle area and harvest weight, body wall thickness, and wholesale cut weights indicated moderate to strong relationships. Generally, correlations indicated weak to moderately strong relationships among all growth and carcass traits. Where heterogeneous correlations existed between PP and WDX, they indicated stronger associations among traits measured on WDX lambs.

Key Words: Growth, Carcass, Lambs