are dependent on accurate nutrient evaluation of feedstuffs. The extent that different analyses of 4 forages affect predicted milk production was examined. Split samples of low fiber alfalfa hay (LFA),high fiber alfalfa hay(HFA),corn silage (CS), and almond hulls (AH) were sent to two commercial and three research labs for analyses required for the NRC and CPM models. The CP, NDF, lignin, and NSC of both alfalfa samples showed little variation among labs. The percent SP (% of CP) varied from 40 to 6% for HFA and from 40 to 19% for LFA. CP for corn silage was similar from all labs. NDF from CS varied from 53% to 46%; lignin varied from 6 to 3%; NFC varied from 34 to 27%, and SP varied from 70 to 30%. CP, NDF and NFC values from AH were similar from all labs. SP for AH varied from 11 to 5% and lignin varied from 5 to 11%. The CPM model predicted a decrease on ME allowable milk per cow per day of 1.4 lb when NDF of CS increased from 45 to 50%, and lignin increased from 3 to 5 %. The NRC model predicted a decrease of only 0.1 lb milk allowable from NEl from the same change, but an increase of 2.2 lb milk allowable from MP (due to an increase in NFC). The CPM model predicted an increase of 1.4 lb milk allowable from ME when SP of LFA was increased from 20 to 42%, and a decrease of 4.9 lb milk allowable from MP. The ration used for this evaluation contained 10.4% CS, 6.8 alfalfa silage, 21%LFA and 4% AH on a DM basis. The CPM model showed a possible increase of 7 lb ME allowable milk daily and 4.3 lb MP allowable milk by optimizing the original ration which supported 110 lb milk per day. Total milk production, % milk fat and protein, milk fat/protein ratios and MUN can be used by the nutritionist to evaluate the accuracy of model predictions based on feed analyses used.

Key Words: Dairy Ration Formulation, Nutrient Analyses, Evaluating Rations

Breeding and Genetics
Applied Animal Breeding

587 Organ weights and internal fat of Angus or Romosinuano steers finished in the feedlot or with grain-on-pasture. S. W. Coleman*[1], W. A. Phillips[2], C. C. Chase, Jr.[1], D. G. Riley[1], B. Morgan[3], J. Nelson[3], and T. A. Olson[4], [1]*USDA, ARS Sub-Tropical Agricultural Research Station, Brooksville, FL,* [2]*USDA, ARS Grazinglands Research Laboratory, El Reno, OK,* [3]*Oklahoma State University, Stillwater, OK,* [4]*University of Florida, Gainesville, FL.*

Tropical adaptation is a desired trait for cows located in the sub-tropical regions of the U.S.A., including the Gulf Coast and most of the Southeast. Zebu breeds have traditionally been used for this area, but have some limitations such as reproduction and carcass quality. Criollo cattle from South America, such as the Romosinuano, have been reported to have good reproduction under tropical and sub-tropical conditions. A herd of Romosinuano was established at USDA, ARS, STARS in Brooksville, FL for evaluation. The objective of this study was to characterize organ weights and fat depots in Romosinuano steers as compared to Angus. Following weaning and preconditioning, 12 Romosinuano and 12 Angus steers from contemporary STARS herds were shipped to El Reno, OK (2,025 km) and grown for 224 d (November to June). The steers were then finished under two regimens; either 1) conventional total confinement feedlot or 2) by grazing old world bluestem pastures at a stocking rate of 10 hd/ha with ad libitum access to a finishing diet. Romosinuano steers produced heavier ($P < 0.05$) empty body weight than Angus (467 vs 418 kg) when finished with grain on pasture, but breed types were similar when finished in the feedlot (437 kg). When adjusted to a constant empty body weight, there were no differences ($P > 0.10$) due to breed or finishing treatment for weight of heart or kidney. Romosinuano steers had heavier ($P < 0.05$) hide (37 vs 33 kg), spleen (1.2 vs 0.8 kg), and internal fat (23 vs 18 kg) than Angus, but lighter liver (6.8 vs 7.3 kg, $P = 0.06$), and empty rumen tissue (19.3 vs 21.9 kg, $P < 0.05$). Steers finished in the feedlot had more ($P < 0.05$) internal fat (22 vs 18 kg), and lighter ($P < 0.05$) head (15.1 vs 16.1 kg) and lung (6.4 vs 7.1 kg) weights than those finished on pasture. An interaction ($P < 0.05$) was observed for weight of empty GI tract (minus rumen) weight. These data may explain the observation that Romosinuano cattle appear to carry less finish than conventional breeds and may have implications on how tropically adapted cattle adjust to feast or famine conditions of the wet-dry tropics by storing and mobilizing internal fat.

Key Words: Romosinuano cattle, Organ weights, Internal fat depots

588 Winter and spring performance of steer calves reared in temperate or sub-tropic environments and used as stockers on winter wheat pasture in Oklahoma. W. A. Phillips*[1], E. E. Grings[2], S. W. Coleman[3], R. E. Short[2], D.G. Riley[3], C. C. Chase[3], H. S. Mayeux[1], and R. K. Heitschmidt[2], [1]*USDA-ARS Grazinglands Research Laboratory, El Reno,OK,* [2]*USDA-ARS Fort Keogh Livestock and Range Research Laboratory, Miles City, MT,* [3]*USDA-ARS Subtropical Agricultural Research Station, Brooksville, FL.*

Each fall millions of beef calves are imported into the Southern Great Plains region of the U.S. to graze winter wheat pastures before entering a feedlot for finishing. Rather than owning the calves, winter wheat pasture producers may decide to act as subcontractors, who are paid according to the gain accumulated by each calf. The objective of this experiment was to compare the weight gains of steers from temperate and sub-humid environments as stockers for grazing winter wheat pastures. On October 23, 2000, Angus (N=34) and Romosinuano (N=36) steers born and reared at Brooksville, FL were transported 2,025 km to El Reno, OK. On November 14, 2000, crossbred steers of temperate breeds born in February (N=24), April (N=11) or June (N=18) and reared at Miles City, MT were transported 1,710 km to El Reno, OK. All calves had been weaned for at least 21 d prior to shipment. Individual BW was taken at arrival and used as the initial BW. Because winter wheat pasture was limited due to drought conditions, all steers were combined into a single group, placed on a 28-ha dormant warm season grass pasture, and given ad libitum access to a mixed diet formulated to support an ADG of 0.8 kg for the winter period (October or November to April). In April, steers were moved to winter wheat pasture for a 63-d spring grazing period. Angus steers were 26 kg heavier (433 vs 407 kg; $P = 0.11$) upon arrival and gained more weight ($P < 0.01$) during the winter (297.5 vs 221.6 kg) than Romosinuano steers. During the spring when temperatures were warmer, Romosinuano steers gained more weight ($P < 0.01$) than Angus steers (36.9 vs 26.0 kg). Crossbred calves born in February were heavier ($P < 0.01$) than calves born in April or June (244 > 197 and 175 kg) and gained more ($P < 0.02$) weight during the winter than calves born in June (139 vs 123 kg). Overall gain (winter + spring) was similar among the three age groups (151 kg). In general, calves from temperate breeds performed better as winter stocker calves than calves from a tropically adapted breed.

Key Words: Tropical breed, Stocker calves, Winter wheat

589 Scrotal circumference in yearling bulls may be related to number of facial hair whorls within a breeding program . M Meola*, T Grandin, P Burns, and M Enns, *Colorado State University, Fort Collins, Colorado, USA.*

The objective of this study was to determine the relationship between number of facial hair whorls and scrotal circumference in yearling bulls. Scrotal circumference measurements were taken on 129 yearling bulls (mean = 371 ± 1.7 d of age) from the Eastern Colorado Research Center (ECRC) Bull Test Station in Akron, CO and 63 Angus yearling bulls (mean = 350 ± 1.3 d of age) from the John E. Rouse CSU Beef Improvement Center (BIC) in Saratoga, WY. The breeding program at BIC focuses on purebred Black Angus cattle with specific selection criteria for fertility, calving ease and pulmonary artery pressure, while the population of bulls at ECRC comes from various breeds and breeding programs. Scrotal circumference was measured to the nearest 0.5 cm using a scrotal tape and the number of facial hair whorls (0, 1 or 2) was recorded. At ECRC, there was no relationship between breed category (British vs Continental) and number of hair whorls ($P = 0.38$). No relationship was found between scrotal circumference and number of hair whorls ($P = 0.40$) or breed category ($P = 0.39$). Bulls from ECRC with two facial hair whorls had a mean scrotal circumference of 36.3 cm, compared to bulls with one whorl (35.9 cm; $P = 0.25$), and no facial whorls (35.9 cm; $P = 0.69$). However, bulls from BIC with two facial hair whorls had smaller scrotal circumference measurements (33.8 cm) than bulls with one facial hair whorl (35.5 cm) or bulls with no facial hair whorls (36.1 cm; $P = 0.03$). There was no relationship

between age of bull and scrotal circumference at either ECRC (P = 0.30) or BIC (P = 0.74). Because hair whorl numbers are consistent from birth, within a particular breeding program, the absence and/or number of facial hair whorls may provide a visual estimate of current or future scrotal circumference in yearling bulls.

Key Words: Hair whorls, Scrotal circumference, Bulls

590 Correlated responses in carcass and meat quality traits in a line of Landrace pigs selected for increased ultrasound loin eye area. D.L. Kuhlers*[1], K. Nadarajah[1], S.B. Jungst[2], and B.L. Anderson[1], [1]*Auburn University, AL,* [2]*PIC, Franklin, KY.*

Selection for increased ultrasound loin eye area (ULEA) in pigs might cause changes in carcass and meat quality traits. Five generations of single trait selection conducted in a line of Landrace pigs for increased ultrasound loin eye area (ULEA) showed a difference of 10.6 cm^2 in average EBVs between select (SL) and control (CL) lines for ULEA. The objective of this study was to examine the impact of increased ULEA on changes in carcass and meat quality traits. Real-time ULEA data at 10th rib of 1406 pigs at 168 d of age, and of those 192 barrows that had carcass measurements for carcass length (CLGT), backfat thickness at 10th rib (CFAT), *longissimus* muscle area (CLMA) between 10th and 11th ribs, percent lean cuts (PCNL), color (COLR) and marbling (MARB) scores (1-5 scale) were used for this study. Heritabilities and genetic correlations were estimated by the multivariate REML procedure using MTDFREML. For ULEA, the model considered the fixed effects of generation, sex, covariate of 168 d weight, and random effects of animal, litter and error. For carcass traits, fixed effect of generation, covariate of hot carcass weight and random effects of animal and error were considered. Estimates of heritabilities for ULEA, CLGT, CFAT, CLMA, PCNL, COLR and MARB were .47, .74, .71, .41, .27, .35 and .43, respectively. Genetic correlations of ULEA with CLGT, CFAT, COLR and MARB were negative and the correlation with CLMA was very high (.99). Estimates of genetic correlations of CLGT with CFAT and CLMA were -.26 and -.67, respectively. Average EBVs of SL pigs in the fifth generation were 4.35 cm less for CLGT and 0.57 cm less for CFAT than those of CL pigs. Compared to CL pigs, the average EBVs of SL pigs showed differences of 11.2 cm^2 for CLMA and 3.28% for PCNL, and a reduction of a point in scores for COLR and MARB, respectively. Selection for increased ULEA resulted in improvement in CLMA and CFAT with concomitant reduction in CLGT, COLR and MARB.

Key Words: Selection, Ultrasound Loin Eye Area, Carcass and Meat Quality

591 Between-breed variation in response to *Haemonchus contortus* infection in sheep. H. B. Vanimisetti*, S. P. Greiner, A. M. Zajac, and D. R. Notter, *Virginia Polytechnic Institute and State University, Blacksburg.*

The objective of this study was to compare breed differences in resistance to *H. contortus* in sheep. A total of 131 ewe lambs representing Dorset (**DO**) and Dorper (**DP**) crossbreds (out of 1/2-Dorset, 1/4-Rambouillet, 1/4-Finnsheep ewes) and straightbred Katahdins (**KT**) were evaluated in 2000 and 2001. In addition, 82 DO, DP, KT and Barbados Blackbelly X St. Croix (**HH**) wethers were evaluated in 2001. After deworming at 4 mo of age, ewes were dosed with infective larvae and evaluated in drylot, whereas wethers were evaluated on pasture with natural infection. Parasite eggs per gram of feces (**FEC**), log transformed FEC (**LFEC**), packed cell volume (**PCV**; %), and body weight (**BW**; kg) were measured 3, 4, 5 and 6 wk after deworming and reinfection. A repeated-measures analysis of variance included breed, year (for ewes), week and their interactions. Least square means and SE (in parenthesis) for ewes (**E**) and wethers (**W**) across sampling times are shown below. Breed and week influenced all traits (P<0.05) except BW in ewes. The DP had highest FEC at all times followed by DO and KT. Breed x week interaction affected (P<0.05) LFEC in both sexes, BW in wethers and FEC in ewes. The DP had higher PCV (P<0.05) than DO despite their higher FEC. The HH wethers had lowest FEC at all times and smallest drop in PCV 6 wk after deworming. All breeds grew throughout the study, but DP wethers grew least rapidly. The DP were clearly not more resistant to parasites than DO, whereas the KT and HH were most resistant. Mean BW was negatively correlated to FEC and LFEC and positively correlated to mean PCV. Mean PCV was negatively correlated to FEC and LFEC. Clear breed differences in resistance to *H. contortus* thus exist.

Trait	DO-E	DP-E	KT-E	DO-W	DP-W	KT-W	HH-W
BW	41.5	42.8	41.2	32.4	29.8	26.0	24.5
	(0.8)	(1.1)	(0.9)	(0.9)	(0.9)	(1.2)	(1.2)
PCV	26.4	27.9	29.8	24.3	24.5	26.7	27.4
	(0.3)	(0.5)	(0.4)	(0.8)	(0.9)	(1.1)	(1.1)
FEC	2043	3007	1460	1931	2269	1469	673
	(183)	(261)	(227)	(196)	(208)	(264)	(257)
LFEC	7.3	7.6	6.4	7.2	7.4	6.7	5.8
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.2)	(0.2)

Key Words: *H. contortus*, Parasite resistance, Sheep

Dairy Foods
Sensory

592 Trace thiol compounds in aged cheddar cheese. J.P. Kleinhenz[1], W.J. Harper*[1], and M. A. Drake[2], [1]*The Ohio State University Columbus, Ohio,USA,* [2]*North Carolina State University, Raleigh, North Carolina, USA.*

Sulfur compounds are known to be important in the flavor of Cheddar cheese and also have sensory thresholds in very small concentrations, ranging from parts per billion to parts per trillion, depending on the individual compound. A method was developed to detect very low (ppt) concentrations of thiol compounds in Cheddar cheese. Two pounds of Cheddar cheese was warmed to 37^{o}C and centrifuged to recover about 200 g of cheese fat. This was then diluted with an equal volume of redistilled hexane, and extracted with a basic 25% ethanol solution containing Tris carboxyethyl phosphine, a disulfide reducing reagent, and p-hydroxymercuribenzoic acid, a thiol trapping salt, to capture the thiol compounds in a reduced state. The pH of the 25% ethanol solution was then lowered to 6.5, and the p-hydroxymercuribenzoic acid-thiol complex was concentrated on an ion exchange resin. The thiol compounds were eluted with aqueous cysteine, and then recovered by extracting the aqueous cysteine solution with a 2:1 solution of pentane and diethyl ether, dried over anhydrous sodium sulfate, concentrated by evaporation under nitrogen, and analyzed by GC with a Sulfur Chemiluminescence detector. The method was shown to be specific for thiol compounds. The internal standard was 3-methoxythiophenol. The method was applied to 8 commercial Cheddar cheeses more that 6 months old, which had been shown to differ in 4 sulfur descriptors (total sulfur, cat like, match like and egg like). Multiple thiol compounds were seperated from all cheeses. The extracts from the different cheeses showed both quantitative and qualitative differences. Up to 30 compounds were shown to be present in any given cheese. Identification of the compounds has been complicated by lack of available standard compounds. One polyfunctional thiol compound shown to be present in different concentrations in most of the cheeses was 4-mercapto-4-methylpentan-2-one, which has been responsible for a catty flavor taint in Gouda cheese. Based on kovats retention indices, other polyfunctional thiols are also present.

Key Words: Cheddar, thiols, flavor

593 Comparison of descriptive sensory analysis with electronic nose differentiation of commercial Swiss cheese. W. J. Harper*[1], J. Kuo[1], and M. A. Drake[2], [1]*The Ohio State University, Columbus, Ohio, USA,* [2]*North Carolina State University, Raleigh, NC, USA.*

There is need for methods that differentiate and monitor flavor quality of cheese. This includes rapid screening analytical methods, such as electronic noses. We have shown previously that similar differentiation can be obtained for Cheddar cheese using descriptive sensory analysis and an Electronic Nose with a Mass Spectrometer detector in a Negative Chemical Ionization mode for aged Cheddar cheeses. This approach