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SYMPOSIA AND ORAL SESSIONS
Graduate Student Competition: ASAS Western Section Graduate Student Paper Competition

17 Effect of supplementing activated charcoal on intake of honey mesquite leaves by lambs. P. Mayagoitia*[1], D. Bailey[1], and R. Estell[2], *[1]New Mexico State University, Las Cruces, [2]USDA-ARS Jornada Experimental Range, Las Cruces, NM.*

A study was conducted to determine if intake of honey mesquite (*Prosopis glandulosa* Torr.) leaves by sheep could be increased by supplementing activated charcoal at 0.0, 0.33, 0.67 or 1.00 g / kg of body weight. Twenty wether lambs (36.6 ± 0.6 kg) were randomly assigned to the 4 treatment levels. Lambs were fed low-quality Sudan-grass hay at 2% of BW plus 80 g/d of molasses for 7 d, and Sudan-grass hay at 1.9% of BW plus 80 g/d of molasses mixed with the assigned level of activated charcoal for 16 d (d 8 to 23). On d 8 to 23, lambs were also given ad libitum access to honey mesquite leaves that had been previously harvested, frozen, and thawed immediately before feeding. Repeated measures analyses were used to determine if level of activated charcoal fed to lambs affected daily intake of mesquite leaves. No differences ($P = 0.52$) in intake of mesquite leaves were detected. Mean intake of mesquite leaves was 20.7 ± 3.7, 23.8 ± 3.8, 20.2 ± 3.7, and 27.3 ± 3.7 g/d for 0.0, 0.33, 0.67 and 1.0 treatment levels, respectively. Consumption of mesquite leaves varied greatly among lambs, ranging from 1.4 to 7.4% of their diet during the last 8 d of the study. No differences in hay intake ($P = 0.23$) or lamb weight gain ($P = 0.58$) were detected among supplemental charcoal treatments. Future studies examining the consumption of honey mesquite leaves by sheep should consider the potential variability in intake among individual animals.

Key Words: sheep, rangeland, secondary compounds

18 Pre-breeding β-hydroxybutyrate concentration influences conception date in young postpartum range beef cows. J. T. Mulliniks*[1], M. E. Kemp[1], R. L. Endecott[2], S. H. Cox[1], E. J. Scholljegerdes[1], T. W. Geary[3], and M. K. Petersen[3], *[1]New Mexico State University, Las Cruces, [2]Montana State University, Miles City, [3]USDA-ARS, Fort Keogh Livestock and Range Research Laboratory, Miles City, MT.*

Cows in negative energy balance after calving often have reduced reproductive performance, which is suggested to be mediated by metabolic signals. The objective of this 3-yr study was to determine the association of serum metabolites, resumption of estrus, milk production, cow BW change, BCS, and calf performance on conception date in 2- and 3-yr-old beef cows (n = 131) grazing native range at the Corona Range and Livestock Research Center. Cows were classified by conception date in a 60-d breeding season as early conception (EC; conceived in the first 15 d of breeding) or late conception (LC; conceived during the last 45 d of breeding). Date of conception was calculated from the subsequent calving date. Beginning on d 30 postpartum, blood samples were collected twice/wk for serum metabolite analysis and progesterone analysis to estimate days to resumption of estrous cycles. As a chute-side measure of nutrient status and glucose sufficiency, whole-blood β-hydroxybutyrate (BHB) concentrations were measured 2 wk before breeding. A random subsample of cows from groups was mechanically milked approximately 57 d postpartum. Whole-blood BHB and serum glucose concentrations were lower ($P \leq 0.04$) in EC cows than LC cows. Serum insulin concentrations were greater ($P = 0.03$) in EC cows relative to LC cows. Serum NEFA and urea N concentrations were not different ($P \geq 0.32$) between EC and LC cows. Initial calving date during the year of the study was not different ($P = 0.19$) between EC and LC cows. The postpartum anestrous interval was shorter ($P = 0.04$) in EC cows, indicating that the earlier conception was due partially to an earlier return to cyclicity. Milk production was not different ($P = 0.28$) between EC and LC cows. Cow BW and BCS and were not different ($P \geq 0.12$) at any period between EC and LC cows. Calf weaning (205-d) BW was not different ($P = 0.67$) between EC and LC cows. This study indicates that blood BHB concentrations before breeding may provide a sensitive indicator of energy status for rebreeding success in young beef cows as measured by interval to conception.

Key Words: beef cows, conception date, β-hydroxybutyrate

19 Effects of algal meal supplementation to finishing wethers on performance and carcass characteristics. M. G. Dib,* T. E. Engle, H. Han, I. N. Roman-Muniz, and S. L. Archibeque, *Colorado State University, Fort Collins.*

Crossbred wethers (n = 40; initial BW = 45.3 kg + 3.5) were used in a randomized complete block design to evaluate the effects of titrated concentrations of algal meal as a protein supplement on live performance, live health status and carcass characteristics. Wethers were blocked by time and randomly assigned to one of the 5 treatments. Treatments included (1) soybean meal and rice meal as protein supplementation sources (CON); (2) 5% of algae meal on a DM basis as a protein replacement (5%A); (3) 10% of algae meal on a DM basis as a protein replacement (10%A); (4) 15% of algae meal on a DM basis as a protein replacement (15%A); and (5) 20% of algae meal on a DM as a protein replacement (20%A). All diets were isocaloric and isoproteic. All wethers were fed a high concentrate finishing diet once daily in individual stalls. Wethers were individually weighed on d −1, 0, 21, and 28. On d 21, wethers were transported to metabolic crates for determination of nutrient digestibility and retention. On d 28, animals were transported to a commercial abattoir for harvest. Initial (45.4 kg) and final (44.5 kg) BW, ADG for feedlot period (0.24 kg/d), ADG for metabolism period (−0.84 kg/d), DMI (1.38 kg/d), and G:F (0.187) were similar ($P > 0.05$) across treatments. Furthermore, hot carcass weight, subcutaneous adipose depth, Longissimus muscle area, calculated YG, marbling score, dressing percentage, muscle percentage, body wall thickness, Leg score, Leg circumference, flank streaking, quality grade, carcass conformation and carcass length were also similar ($P > 0.05$) across treatments. Research results suggest that feeding up to 20% of algae co-product meal as a replacement protein source to finishing wethers is feasible with limited impact on performance and carcass characteristics as compared with the standard protein sources that have been used by the industry. Further research may be necessary to determine the response of different levels of supplementation of algal meal for sheep, effects on animals in a different physiological stage or effects on other ruminants in the finishing diet on performance and carcass merit.

Key Words: algae, protein, co-product

20 Influence of the level of dried distillers grains with solubles on feedlot performance, carcass characteristics, serum testosterone concentrations, and semen quality of growing rams. M. L. Van Emon*[1,2], K. A. Vonnahme[2], P. T. Berg[2], R. R. Redden[2], M. M. Thompson[1], J. D. Kirsch[2], and C. S. Schauer[1], *[1]Hettinger Research Extension Center, North Dakota State University, Hettinger, [2]Department of Animal Sciences, North Dakota State University, Fargo.*

The objective of this study was to evaluate the effects of dried distillers grains with solubles (DDGS) on ram lamb feedlot performance, carcass characteristics, serum testosterone concentration, and semen quality. One hundred 20 ram lambs (40.4 ± 9.1 kg; western whiteface × Suffolk) were used in a completely randomized design to determine the effects of DDGS on feedlot performance and carcass characteristics. Rams were allotted into one of 4 dietary treatments (n = 4 pens/treatment; 10 rams/pen): 1) 0DDGS: 85% corn and 15% commercial market lamb pellet; 2) 15DDGS: 15% DDGS substituted for corn on a % DM basis, 70% corn, and 15% commercial market lamb pellet; and 3) 30DDGS: 30% DDGS substituted for corn on a % DM basis, 55% corn, and 15% commercial market lamb pellet. Rams were weighed on consecutive days at the beginning (d 0, 1) and end (d 96, 97 and d 116, 117) of the trial. Scrotal circumference was measured on all rams on d 84, 96, and 116. Semen and blood samples were collected on a subset of 48 rams (4 rams/pen; 16 rams/treatment; n = 4). Blood samples were collected every 14 d throughout the study. Semen samples were collected on d 84, 98, and 112. Rams were fed to market weight, shipped to a commercial abattoir, and harvested for carcass data collection. Initial BW, final BW, change in scrotal circumference, days on feed, carcass characteristics, serum testosterone concentrations, and semen score were not different ($P \geq 0.11$) due to dietary treatment. However, DMI increased linearly ($P < 0.001$) as DDGS increased in the ration, resulting in a linear increase ($P = 0.02$) in ADG. Additionally, sperm count decreased linearly ($P = 0.05$) as DDGS concentration increased in the ration. Increasing DDGS in the diet did not have a negative effect on ram feedlot performance or carcass characteristics; however, in this preliminary study, sperm production may have been negatively affected, necessitating the need for additional research on the effect of distillers grains on ram development.

Key Words: dried distillers grains with solubles, rams, semen quality

21 Effect of weaning method on welfare and performance of beef calves during receiving. E. A. Bailey*[1], J. R. Jaeger[2], J. W. Waggoner[2], L. W. Murray[3], G. W. Preedy[1], L. A. Pacheco[1], D. L. Davis[1], and K. C. Olson[1], *[1]Department of Animal Sciences & Industry, Kansas State University, Manhattan, [2]Western Kansas Agricultural Research Center, Kansas State University, Hays, [3]Department of Statistics, Kansas State University, Manhattan.*

We evaluated receiving performance and welfare of beef calves that had been subject previously to 1 of 3 ranch-of-origin weaning methods 28 d in duration: drylot weaning + dam separation (D), pasture weaning + fence-line contact with dams (PF), and pasture weaning + fence-line contact with dams + supplemental feed delivered in a bunk (P+S). Calves assigned to D were fed a diet designed to promote a 1 kg ADG at a DMI of 2.5% of BW (17.7% CP, 0.92 Mcal NE_g/kg); PF calves had access to native forage only (6.8% CP, 43% ADF); and P+S calves had access to native forage and received a ration of the diet fed to D at a rate of 1% of BW 3 × weekly. Weaning-phase ADG tended ($P = 0.10$) to be greater for D than for PF or P+S; however, incidence of undifferentiated fever during weaning was similar ($P = 0.22$) between treatments. At the end of the weaning phase, all calves were transported 4 h to a feedlot, were penned according to treatment (n = 8 pens/treatment), and were fed a receiving diet (14.9% CP, 0.93 Mcal NE_g/kg) ad libitum. Feed intake, growth, and health were monitored during a 60-d receiving period. Observations of calf behavior were made 3 × daily for the first 7-d of receiving; the proportion of calves in each pen that were eating, resting, or pacing was recorded by 2 trained observers and reported as a pen average. During the first 30 d of receiving, ADG was less ($P < 0.01$) for PF than for D and P+S; however, ADG of D was greater ($P < 0.01$) than that of PF and P+S during the entire 60-d receiving phase. Diet DMI and G:F were greater ($P \leq 0.01$) also for D than for PF or P+S during receiving. Fewer (treatment × day - $P < 0.01$) PF calves were observed at the bunk during the first 4 d of receiving than D or P+S calves; however, the proportions of calves observed at the bunk were similar (treatment × day - $P = 0.64$) between treatments by d 6. Incidence of undifferentiated fever was similar ($P = 0.50$) between treatments during receiving. We interpreted these data to suggest that animal performance and welfare during the receiving period were not improved by pasture weaning + fence-line contact with dams compared with drylot weaning + dam separation. Best-management practices for animal welfare may involve initiating diet transitions from forage to grain at the ranch of origin.

Key Words: animal welfare, preconditioning, weaning

22 Effects of timing of vaccination (day 0 versus day 14 of a receiving period) with a modified-live respiratory viral vaccine on performance, feed intake and febrile response of beef heifers. K. P. Sharon*[1], G. C. Duff[1], M. M. Harbac[1], J. A. Paterson[1], J. A. Carroll[2], and J. W. Dailey[2], *[1]Department of Animal and Range Sciences, Montana State University, Bozeman, [2]USDA-ARS, Livestock Issues Research Unit, Lubbock, TX.*

The objective of this study was to evaluate the effects of timing of administration of a modified-live respiratory viral vaccine (IBR-PI_3-BRSV-BVD) on d 0 or on d 14 of a receiving period on performance, feed intake and febrile response in beef heifers. Our hypothesis was vaccine timing will alter febrile response and feed intake of feeder cattle. Thirty-six heifers (Angus and Angus crosses; initial BW = 265 ± 20 kg) were ranked by BW and assigned to treatment pens (9 pens total) in a completely randomized design. Treatments (3 pens/treatment with 4 heifers/pen) included no vaccine (CON), vaccination on d 0 (DO), and a delayed vaccination on d 14 (D14) of the receiving period. Heifers were fed in 6 × 12 m pens with GrowSafe feeding systems. Daily intakes were recorded and BW measured on d −1, 0, 14, 27, and 28. Temperature probes were attached to controlled intrauterine drug release devices (CIDR; active compound was removed) and vaginal temperatures were recorded every 5 min for the experiment; vaginal temperatures were then averaged for every h before data analysis. All data were analyzed using pen as the experimental unit. No differences ($P > 0.10$) among treatments were observed for initial BW, final BW, ADG for d 0 to end, or overall G:F. A treatment x d interaction ($P < 0.05$) was observed for feed intake. Daily intake was decreased for D14 versus D0 on d 14 ($P < 0.01$) and 15 ($P < 0.10$) and decreased ($P < 0.05$) on d 15 for the average of vaccinated calves versus CON. Eating rate (grams consumed/eating duration) was decreased ($P < 0.05$) on d 14 for D14 versus D0. A treatment x d interaction ($P < 0.01$) was observed for vaginal temperature. Vaginal temperature was increased ($P < 0.10$) on d 1 for D0 versus D14 heifers and increased for D14 versus D0 on d 14 ($P < 0.01$), 15 ($P < 0.05$) and 16 ($P < 0.05$). Our results suggest that time of administration of a modified-live respiratory viral vaccine can alter feed intake and vaginal temperature in feeder heifers.

Key Words: beef heifers, respiratory vaccines, feed intake

23 Assessment of chestnut tannin extract supplementation on animal performance and ruminal fermentation profiles in feedlot finishing diets. J. M. Sieg*[1], J.-S. Eun[1], D. R. ZoBell[1], and B. R. Min[2], *[1]Department of Animal, Dairy, and Veterinary Sciences, Utah State University, Logan, [2]Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL.*

The objective of this study was to assess animal performance and ruminal fermentation when feedlot finishing beef steers were fed with supplementation of chestnut tannin extract (CTE). Eight Charolais-cross steers (average BW = 495 kg) were used in a duplicated 4 × 4 Latin square experiment with a 2 × 2 factorial arrangement of treatments. The 4 animals in one of 2 squares were surgically fitted with a ruminal cannula. Within squares, animals were randomly assigned to a sequence of 4 diets during each of the 4 21-d periods (14 d of treatment adaptation and 7 d of data collection and sampling); CTE supplementation (without vs. with CTE) and ionophore (ION; monensin administered as a Rumensin) supplementation (without vs. with ION). Animals were fed a finishing diet consisting of 8.0% alfalfa hay, 7.0% corn silage, 77.0% rolled barley grain, 3.0% CTE or wheat straw, and 5.0% feedlot supplement without or with ION. Intake of DM/d was not affected by CTE supplementation or ION, whereas DMI/kg BW tended to increase (P = 0.08) by CTE supplementation. Supplementation of CTE increased ADG (P = 0.01), but ION did not influence ADG. Total VFA concentration did not differ in response to supplementing CTE or ION. Additionally, molar proportions of acetate and propionate were similar between dietary treatments. Molar proportion of butyrate tended to increase (P = 0.10) by CTE supplementation, but not by ION. Mean ruminal pH measured for 48 h averaged 6.39 across dietary treatments, but was not influenced by dietary treatments. In contrast, daily episodes with ruminal pH <5.80 tended to increase (P = 0.10) by CTE supplementation, while ION increased the daily episodes only with CTE supplementation, resulting in an interaction between CTE and ION (P = 0.03). Supplementation of CTE had minor impacts on ruminal fermentation, except that CTE affected total buffering capacity of finishing beef steers. Further research is needed to investigate positive effects on animal performance by CTE supplementation in feedlot finishing diets.

Key Words: chestnut tannin extract, beef finishing steers, ruminal fermentation profiles

24 Evaluation of the incidence, causes, and potential solutions for the occurrence of disabled or non-ambulatory cattle within the California beef and dairy industries. M. V. Sis*[1], J. K. Ahola[1], H. A. Foster[2], D. L. VanOverbeke[3], and D. A. Daley[4], *[1]Colorado State University, Fort Collins, [2]California Beef Council, Sacramento, [3]Oklahoma State University, Stillwater, [4]California State University-Chico, Chico.*

A survey was conducted to evaluate how California beef and dairy operations sell market cows and bulls and identify key contributors to these animals becoming disabled or non-ambulatory (NA). Surveys were mailed to 9,778 California beef and dairy producers using the California Beef Council mailing list. Twenty-nine questions were included to evaluate beef and dairy producer demographics, the incidence of NA cattle on-farm or on-ranch, management and marketing practices utilized for market cows and bulls, and reasons animals become NA. Response rate for the mailed portion of the survey was 3.9%. Completed surveys were received from 446 producers (n = 403 beef, n = 43 dairy). The mean age (±SD) for survey respondents was 62 ± 12.3 yr for beef producers and 55 ± 13.1 yr for dairy producers. Survey responses clearly indicated that most beef (77.5%) and dairy producers (62.5%) market their animals at a livestock auction market, which was more (P < 0.05) than any other option. The direct sale of market cows and bulls to a beef packer was (P < 0.05) the next most common outlet among both beef (11.7%) and dairy (22.9%) respondents. Rates of culling, euthanasia, and death loss among cows were 10.8, 1.2, and 1.3%, respectively, for beef respondents, and 33.1, 2.1, and 3.3%, respectively, for dairy respondents. However, 35.6% of beef and 95.2% of dairy respondents indicated they had at least 1 non-ambulatory cow in the previous 12 mo. The majority (P < 0.05) of beef and dairy survey respondents indicated they would consider on-farm euthanasia (92.1 and 88.1%, respectively), and gunshot was identified as the primary method (P < 0.05) of euthanasia among beef (76.2%) and dairy (78.0%) producers. Dystocia was reported to be the primary cause (P < 0.05) of NA status in cows among beef (46.5%) and dairy (79.1%) respondents. These data suggest that management of potential causes of NA status continues to be a challenge among beef and dairy cattle producers and solutions to reduce NA incidence are needed.

Key Words: beef cattle, dairy cattle, non-ambulatory

25 Effect of two, four, and six-hour intervals between two prostaglandin $F_{2\alpha}$ injections administered with five-day CO-Synch + CIDR protocol on pregnancy rate in beef cows. C. J. Berrett*[1], J. L. Seabrook[1], G. E. Seidel Jr[1], J. C. Whittier[1], J. K. Ahola[1], R. K. Peel[1], and A. V. Grove[2], *[1]Colorado State University, Fort Collins, [2]AG Research LLC, White Sulphur Springs, MT.*

At the time this study was conducted, it was recommended when using the 5-d Co-Synch protocol that two 25 mg PG injections at 12-h intervals be given because it was assumed that an immature 5-d CL would not be successfully regressed by a single 25 mg PG injection. Therefore, the objective of this study was to compare fixed-time AI (TAI) pregnancy rates resulting from intervals of 2-, 4-, or 6-h between two 25 mg prostaglandin (PG) $F_{2\alpha}$ injections administered following CIDR removal in the 5-d CO-Synch + controlled internal drug-release device (CIDR) estrous synchronization protocol. Angus and Angus-crossbred cows (n = 901) maintained on native pasture at 3 locations were randomly assigned to one of 3 experimental treatments after blocking for BCS and postpartum interval (PPI). All cows received gonadotropin-releasing hormone (GnRH) and CIDR on d −5, PG with CIDR removal and 25 mg PG on d 0, and GnRH with TAI 72 h after the initial PG injection. Cows also received a second 25 mg injection of PG either 2-, 4- or 6-h after the first injection of PG. Timed AI pregnancy rates were determined by ultrasonography 40 ± 2 d following TAI. Fixed-time AI pregnancy rate was lower ($P \leq 0.05$) in cows receiving 2 PG injections separated by 2- (50.6%) and 4-h (51.4%) intervals, compared with cows receiving 2 PG injections separated by a 6-h (59.7%). Reducing the interval between PG injections from 6 to 2 h resulted in a 9-percentage point (15%) reduction in TAI pregnancy rates for cows synchronized with a 5-d CO-Synch + CIDR protocol. Based on these data the interval between PG injections should be a minimum of 6-h to maintain acceptable pregnancy rates in beef cows when using the 5-d CO Synch + CIDR protocol.

Key Words: beef cow, CIDR, fixed-time AI

26 Effects of pain mitigation and method of castration on behavior and feedlot performance in cull beef bulls. P. E. Repenning*[1], J. K. Ahola[1], R. J. Callan[2], J. T. French[1], R. L. Giles[1], R. K. Peel[1], J. C. Whittier[1], J. T. Fox[3], and T. E. Engle[1], *[1]Department of Animal Sciences, Colorado State University, Fort Collins, [2]Department of Clinical Sciences, Colorado State University, Fort Collins, [3]JBS Five Rivers Cattle Feeding LLC, Greeley, CO.*

The objectives of this study were to evaluate the effects of castration method (band vs. surgical) and use of analgesia on behavior and feedlot

performance in cull bulls. Angus, Hereford, and Angus crossbred bulls (n = 20; initial BW 384 ± 59.3 kg; 336 ± 20.0 d old) were housed in feedlot pens equipped with the ability to measure individual daily feed intake. A balanced randomized block design using a 2 × 2 factorial arrangement of treatments was utilized. Factors included: 1) castration method, and 2) analgesia presence. A multimodal analgesia protocol (MMA) was used and consisted of subcutaneous ketamine-stun containing butorphanol (0.01 mg/kg), xylazine (0.02 mg/kg), ketamine (0.04 mg/kg), and a local 2% lidocaine hydrochloride anesthetic block of the spermatic cords (10 mL per cord) and scrotum (10 mL) on d 0. Flunixin meglumine (1.2 mg/kg) intravenously (iv) on d 0, 1, 2 and 3. Cattle were stratified to treatments based on breed, BW, age and a temperament score. Treatments included: 1) band castration without analgesia (BAND), 2) band castration with analgesia (BAND-MMA), 3) surgical castration without analgesia (SURG), and 4) surgical castration with analgesia (SURG-MMA). Chute exit velocity (EV) and time in chute (TIC) were collected on d −9, 0, 1, 2 and 13. Willingness-to-enter-chute (WTE) score, rectal temperature (TEMP), heart rate (HR), and respiration (RESP) were collected on d 0, 1, 2, 3 and 13. Cattle were weighed on d −9 and 13 while feeding behaviors were collected continuously for 57 d pre-castration and 28 d post-castration. There was a tendency ($P < 0.09$) for ADG to be greater in cattle receiving analgesia. Both SURG treatments exhibited greater ($P < 0.001$) TEMP on d 1 and on d 2 ($P < 0.05$) when compared with BAND treatments. Mean DMI was greater ($P = 0.02$) in MMA treatments when compared with non-medicated treatments. The SURG treatment, when compared with SURG-MMA and BAND, exhibiting greater ($P = 0.04$, $P = 0.04$, respectively) meal size. Results suggest that pain mitigation reduces the impact of castration on ADG and DMI.

Key Words: bulls, castration, ketamine-stun

27 Fetal and maternal induction of angiogenic factors during early pregnancy. K. E. Quinn*[1], J. D. Lindsey[1], S. M. Stanbrough[1], A. K. Ashley[2], and R. L. Ashley[1], *[1]Department of Animal and Range Sciences, New Mexico State University, Las Cruces, [2]Center for Animal Health, Food Safety, and Bio-Security, New Mexico State University, Las Cruces.*

Early pregnancy, when most embryonic losses occur, is a critical period in which vital placental vascularization is established. Adequate vascular development supports embryonic survival and subsequent fetal growth. Vascular endothelial growth factor (VEGF) is the most potent inducer of angiogenesis, and factors regulating VEGF may ultimately affect vascularization. Activation of chemokine receptor 4 (CXCR4) by CXCL12 increases VEGF synthesis and secretion, which in turn stimulates CXCL12 and CXCR4 production. This synergistic regulation may drive placental vascularization. Our laboratory reported elevated CXCR4 in endometrium during early pregnancy in sheep, but the relationship between the CXCL12/CXCR4 signaling pathway and angiogenic factors such as VEGF, Fibroblast growth factor (FGF2), and Angiopoietin 1 (ANG1) is lacking in ruminants. We hypothesized CXCL12, CXCR4, and select angiogenic factors and their receptors would increase in placental tissue during early pregnancy. To test this hypothesis, caruncle and fetal extraembryonic membrane tissues were collected on d 20, 25 and 30 of pregnancy, with d10 of the estrous cycle as a control. Real time PCR was used to assess relative mRNA levels. Expression levels were normalized by standard methods, and subjected to ANOVA with Newman-Keuls post hoc test to determine significant differences ($P < 0.05$). In caruncles, CXCL12 and CXCR4 increased on d20 in pregnant ewes. FGF2 increased during early to mid-placentation in caruncle tissue. In fetal extraembryonic membranes, CXCL12, CXCR4, ANG1 and VEGF were induced with advancing pregnancy, whereas FGF2 and VEGFR2 peaked on d25. The increase of angiogenic factors in fetal placenta during implantation and placentation highlights the concept that the fetus regulates its vascularization in synergy with the maternal placenta. The relationship between VEGF and CXCL12/CXCR4 underscores the potential role for this chemokine system in placentation. These results provide strong support for enhanced signaling between chemokines and angiogenic factors within the fetal-maternal interface.

Key Words: chemokine, vascularization, pregnancy

28 Effect of swath grazing on forage intake and wastage by ewes. E. E. Nix,* D. L. Ragen, J. G. P. Bowman, R. W. Kott, and P. G. Hatfield, *Montana State University, Bozeman.*

Sixty non-pregnant and nonlactating mature white faced ewes (Targhee 65.4 ± 5.84 kg BW in 2010 and Rambouillet 61.9 ± 6.28 kg BW in 2011) were used in a 2 yr study to evaluate intake, wastage, and nutrient composition of a pea/barley forage fed either as baled hay in confinement (CONFINEMENT) or swathed and left to graze (GRAZE). Forage intake was estimated using IVDMD and chromic oxide as a marker for estimating fecal output. Forage wastage was estimated by sampling and weighing the initial swath, standing, and baled forage, and weighing the forage again after a 7-d collection period, and subtracting the estimated forage DMI. Baled, swathed, and any standing forage was sampled once per month from the date the forage was swathed (early August) until October. Samples were analyzed for DM, OM, CP, NDF, ADF, and in situ dry matter digestibility (ISDMD). There was no main effect of treatment or year ($P \geq 0.23$) for DMI ($kg \cdot ewe^{-1} \cdot d^{-1}$); however, there was a treatment x year interaction ($P < 0.04$). In 2010, DMI ($kg \cdot ewe^{-1} \cdot d^{-1}$) was greater ($P < 0.10$) by CONFINEMENT compared with GRAZE (2.4 vs 1.7 kg/d). Forage wasted as a percent of beginning available forage did not differ ($P \geq 0.28$) between GRAZE and CONFINEMENT within both years. In 2010, OM was greatest ($P < 0.10$) in baled forage, intermediate in standing forage, and lowest in swathed forage. In 2011, OM did not differ ($P = 0.99$) for baled and swathed forage, but both were greater ($P < 0.10$) compared with standing forage. In 2010, CP was greatest ($P < 0.10$) in swathed forage (12.0%), intermediate in baled forage (10.3%), and lowest in standing forage (8.2%). In 2011, CP was greater ($P \leq 0.05$) in baled forage compared with swathed and standing forage. In both years, NDF and ADF were lower ($P < 0.10$) in baled forage compared with swathed and standing forage. In 2010, ISDMD was greater ($P < 0.10$) for swathed forage compared with baled forage. In 2011, percent ISDMD was greater ($P < 0.10$) in baled forage compared with swathed or standing forage. Forage intake and percent wastage were not affected by treatment, but forage quality was lower in the GRAZE treatment compared with the CONFINEMENT treatment.

Key Words: confinement, ewes, swath

29 Maternal diet restriction in beef cows alters fetal cardiovascular hemodynamics and fetal and placental development during early pregnancy. L. E. Camacho,* C. O. Lemley, K. C. Swanson, and K. A. Vonnahme, *Department of Animal Sciences, North Dakota State University, Fargo.*

Objectives were to examine the effects of maternal nutrient restriction on fetal cardiovascular hemodynamics, and fetal and placental development during early gestation. On d 30 of pregnancy, multiparous beef cows were randomly assigned to dietary treatments of 100% (CON; n = 6) or 60% of NRC recomendations (RES; n = 6). Cows were individually-fed once daily using Calan gates at 1000 h. On d 85 of

gestation, fetal blood flow was determined via Doppler ultrasonography followed by cow slaughter. Ultrasound measurements included fetal heart rate (HR), umbilical blood flow (uBF), pulsatility index (PI), and resistance index (RI). Fetal PI and RI were not affected ($P \geq 0.19$) by maternal restriction, while fetal HR was decreased ($P = 0.006$) in RES vs. CON fetuses. Umbilical BF, uBF relative to placental weight, and uBF relative to cotyledon weight were not affected by maternal nutrient restriction, while uBF relative to fetal weight was decreased ($P = 0.03$) in RES vs. CON. Fetal weight tended to be greater ($P = 0.07$) in RES vs. CON fetuses. Total placentome weight was greater ($P = 0.002$) in RES vs. CON cows; however, cotyledon weight, caruncle weight, fetal membranes, and chorioallantoic/amniotic fluid volume were not different ($P > 0.27$) between treatments. Placental efficiency (fetal weight: placentome weight ratio) tended to be greater ($P = 0.10$) in CON vs. RES cows. Heart girth and ponderal index were increased ($P = 0.004$) in RES vs. CON fetuses, while biparietal distance and crown rump length were not different ($P \geq 0.28$) between treatments. Maternal nutrient restriction during early gestation increased fetal growth and placentome weight, while uBF was decreased relative to fetal weight. Therefore, it would appear that maternal nutrient restriction leads to compensatory fetal and placental development during early gestation.

Key Words: maternal restriction, pregnancy, umbilical blood flow

30 Serum exosome profile as related to early pregnancy status in the mare. J. R. Hergenreder,* J. C. da Silveira, A. D. Belk, D. N. R. Veeramachaneni, J. G. Bouma, and J. E. Bruemmer, *Colorado State University, Fort Collins.*

During early pregnancy the conceptus and mare must communicate to establish and maintain pregnancy. This is most pronounced between d 12 and 16 post-ovulation. The mechanism behind successful establishment of pregnancy in the mare is unknown. Recently, cell-secreted vesicles, called exosomes, were detected in high amounts in serum of pregnant women. Exosomes are 50–100 nm vesicles containing bioactive materials such as mRNA, miRNA, and protein that can mediate immune-responses through membrane protein interaction and delivery of products into cells. Exosomes have been described in body fluids, including urine, milk, and serum. We hypothesized that exosomes are present in mare serum and that their amount differs with pregnancy status. To test this, we determined the presence and relative amount of exosomes in serum of pregnant and non-pregnant mares. Serum samples were obtained from mares in a crossover design, with each mare serving as a pregnant treatment and non-mated control (n = 3/d). Blood samples were obtained on d 12, 14, 16, and 18 post-ovulation. Serum was removed and stored at −80°C. Exosome isolation, for flow-cytometry and transmission electron microscopy (TEM), was performed using ExoQuick (System Biosciences, Inc.), a precipitation solution designed to isolate exosomes. Samples were analyzed using flow cytometry with 100 nm sized beads as a size control and a counting bead standard for relative amount determination. Flow cytometry analysis revealed exosomes in both pregnant and non-pregnant mares and the presence of 2 distinct size populations, one of exosomes smaller (<100 nm) than previously described, which were more abundant in mare serum from d 12 of pregnancy, and the second of the expected 100 nm size at each day examined. TEM analysis validated the results from the flow cytometry as each population was characterized visually. Along with the 100 nm and slightly smaller sized vesicles, TEM also revealed the presence of vesicles slightly larger than 100 nm, with small amounts of vesicles ~200 nm in size, indicating the presence of microvesicles as well. We conclude that exosomes are present in mare serum and further characterization of such populations can provide clues about the intercellular mode of communication in early pregnancy.

Key Words: mare, pregnancy, exosome

31 Effects of natural service and artificial insemination breeding systems on pregnancy rates and days to conception. P. L. Steichen*[1], S. I. Klein[1], Q. P. Larson[1], K. M. Bischoff[2], V. G. R. Mercadante[2], G. C. Lamb[2], C. S. Schauer[3], B. W. Neville[4], and C. R. Dahlen[1], *[1]Department of Animal Sciences, North Dakota State University, Fargo, [2]North Florida Research and Education Center, University of Florida, Marianna, [3]Hettinger Research Extension Center, North Dakota State University, Hettinger, [4]Central Grasslands Research Extension Center, Streeter, ND.*

Four hundred 80 crossbred beef cows and 86 crossbred beef heifers were used to compare the effects of 2 breeding systems on pregnancy rates and days to conception. Cattle were stratified by age and BCS, and assigned randomly to 1 of 2 treatments: 1) Females exposed to natural service bulls for the duration of the breeding season (NS; n = 284), or 2) females exposed to estrous synchronization and a fixed-timed AI (d 0; 7-d Co-Synch + CIDR), followed by exposure to natural service bulls for the duration of the breeding season (AI, n = 282). Bulls were introduced on d 1 and both treatments were managed as a cohort in the same pastures. Blood samples were collected on d −20 and −10 to determine cyclic status. On d 49 and again at least 40 d after bull removal from pastures, transrectal ultrasonography was used to determine pregnancy status and fetal age. Overall, 42.8% of cattle were cyclic at the beginning of the breeding season. Treatment × cyclic status interactions ($P < 0.01$) were present for the proportion of cows detected pregnant on d 49, the proportion of cows pregnant at the end of the breeding season, and days from the beginning of the breeding season to conception. A greater proportion ($P < 0.05$) of cyclic cattle in the AI treatment (88%, 104 of 118) had a viable fetus detected on d 49 of the breeding season compared with cyclic cattle in the NS treatment (74%, 88 of 119) and non-cyclic cattle in the AI (75%, 122 of 163) and NS treatments (77%, 120 of 156). A greater percentage ($P < 0.05$) of cyclic cattle in the AI treatment (94%, 111 of 118) were pregnant at the end of the breeding season compared with non-cyclic cattle in the AI treatment (84%, 136 of 162) whereas cyclic (88%, 105 of 119) and non-cyclic (89%, 140 of 157) cattle in the NS treatment were intermediate. Both cyclic (11.6 ± 1.4 d) and non-cyclic (14.5 ± 1.4 d) cattle in the AI treatment became pregnant earlier in the breeding season ($P < 0.05$) compared with cyclic (19.9 ± 1.4 d) and non-cyclic (17.9 ± 1.4 d) cattle in the NS treatment. Breeding systems for beef cattle that incorporated AI altered pregnancy rates and days to conception compared with natural service breeding systems.

Key Words: artificial insemination, estrous synchronization, natural service

32 Evaluation of the ability of grain distillers dried yeast to replace fish meal in the diets of juvenile rainbow trout *Oncorhynchus mykiss*. B. S. Hauptman*[1], F. T. Barrows[3], S. Block[4], T. G. Gaylord[2], W. M. Sealey[2], and J. A. Paterson[1], *[1]Montana State University, Bozeman, [2]USFWS, Bozeman Fish Technology Center, Bozeman, MT, [3]USDA, Agriculture Research Service, Bozeman, MT, [4]Archer Daniels Midland Company, Decatur, IL.*

Grain distillers dried yeast (GDDY) is a single-cell protein obtained as a co-product during the production of fuel ethanol and may have potential as an alternative protein source for rainbow trout. The objective of the current study was to determine if GDDY could replace fish meal (FM)

without negatively affecting growth performance and proximate composition of juvenile rainbow trout. A 2-phase approach was employed where a digestibility trial was first conducted to determine GDDY apparent digestibility coefficients (ADCs) for protein, lipid, energy, DM, and apparent availability coefficients (AACs) for P and amino acids. The second phase was to conduct a feeding trial where a control diet (42% digestible protein and 20% crude lipid with 25% FM) was compared with diets where FM digestible protein was replaced by GDDY at 7 different levels (25, 37.5, 50, 62.5, 75, 87.5, and 100%). All diets were formulated to provide equal amounts of available lysine, methionine, threonine and total P. Diets were fed twice daily to rainbow trout (initial weight 22.1g + 0.26) to apparent satiation in a 15°C recirculating system. There were 4 replicate tanks per diet (30 fish/tank) and diets were fed for 9 weeks. Bulk tank weights and feed intake (FI) were determined every 3 weeks. At conclusion of the feeding trial, 3 fish per tank were sampled for condition indices and proximate composition analyses. Grain distillers dried yeast ADCs for protein, DM, lipid, energy and AAC for P were quantified at 98, 65, 100, 70 and 81%, respectively. Feeding trial results showed that fish performance was not significantly different from the control diet at the 25% and 37.5% replacement levels. However, reduced growth ($P < 0.001$) and poorer feed conversion ($P < 0.001$) were observed when GDDY replaced more than 37.5% of dietary FM (11.2% GDDY inclusion). Feed intake, proximate composition and protein retention efficiency were not significantly affected by GDDY inclusion level. Apparent digestibility coefficients suggested that GDDY nutrients were highly digestible and FI measurements suggest no palatability issues; however, growth was reduced after extended feeding at higher inclusion levels.

Key Words: grain distillers dried yeast, alternative protein, rainbow trout

33 Differences in allele frequency distribution of bovine high-density genotyping platforms in Holsteins and Jerseys. K. L. Weber*[1], G. Rincon[1], A. L. Van Eenennaam[1], B. L. Golden[2], and J. F. Medrano[1], *[1]Department of Animal Science, University of California, Davis, [2]Dairy Science Department, California Polytechnic State University, San Luis Obispo.*

Two single nucleotide polymorphism (SNP) genotyping arrays, the Illumina High-Density Bovine BeadChip Array (BovineHD; 777,962 SNP) and the Affymetrix Axiom Genome-Wide BOS 1 Array (BOS1; 648,874 SNP), are available for bovine genomics analyses, such as quantitative trait loci (QTL) fine mapping and genomic selection. These genotyping arrays are of interest to researchers for their high marker density relative to other genotyping platforms. Differences in allele frequency distribution between arrays contributes to their efficacy for association studies as QTL may have rare alleles (low minor allele frequency, MAF), limiting the extent of linkage disequilibrium (LD) possible with intermediate MAF SNP. To evaluate MAF distribution differences between arrays in Holstein (HO) and Jersey (JE) breeds, we genotyped 16 DNA samples (10 HO, 6 JE) from UC Davis cows and their sires with both BovineHD and BOS1, and MAF distribution was determined within breed. A greater proportion of SNP had MAF equal to zero in BOS1 relative to BovineHD (HO: BOS1 45% vs. BovineHD 28%; JE: BOS1 55% vs. BovineHD 39%), which given the fewer number of total SNP in BOS1 resulted in fewer BOS1 SNP for all MAF. However, of polymorphic SNP, low to intermediate MAF SNP (MAF ≤ 0.20) were proportionally more highly represented in BOS1 (HO 45%; JE 42%) relative to BovineHD (HO 38%; JE 39%). An important issue in genotyping arrays is marker redundancy. SNP in complete LD have collinear effects, reducing the accuracy and stability of marker effect estimates when jointly analyzed. To evaluate if removal of redundant SNP altered the MAF distribution in BovineHD and BOS1, LD pruning was performed using SVS7. Using the LD threshold $r^2 \geq 0.99$, a greater proportion of polymorphic SNP were removed from BovineHD relative to BOS1 (HO: BovineHD 75% vs. BOS1 57%; JE: BovineHD 86% vs. BOS1 79%), yielding more informative SNP at nearly all MAF in BOS1 for HO (+18,775 SNP). The proportion of low MAF SNP in BOS1 (HO 37%; JE 32%) became similar to BovineHD (HO 34%; JE 31%), and the correlation between BovineHD and BOS1 MAF distributions rose in HO (0.58 to 0.95) but did not change in JE.

Key Words: genotyping, SNP, cattle

34 Comparing the lifetime productivity of beef females initially conceiving to, or sired by, artificial insemination or natural service. B. J. Bigler,* J. T. French, J. K. Ahola, J. C. Whittier, W. M. Frasier, G. E. Seidel, R. M. Enns, and R. K. Peel, *Colorado State University, Fort Collins.*

Artificial insemination and estrous synchronization can be valuable tools for the beef cattle industry due to the ability to increase productivity and reproductive efficiency. Therefore, the objectives of this study were to: 1) compare lifetime productivity between heifers that conceived to AI with those that conceived to natural service (NS) as a yearling, and 2) compare lifetime productivity between females that were the result of an AI mating with those that were the result of an NS mating. Calving and breeding records (n = 6,693) were utilized from 1,173 Angus females collected at 1 location from 1991 to 2010. The first objective classified heifers into 2 groups: conceived by AI or NS. The second objective categorized females into 4 dam groups, depending on whether they were conceived by an AI bred heifer (H-AI), an NS bred heifer (H-NS), an AI bred cow (C-AI), or an NS bred cow (C-NS). Cutoff dates were formulated to distinguish between AI and NS born calves by documenting the AI date and summing a 290-d gestation length. Economic significance was analyzed using weaning weights from all calves produced by each female while in the herd, along with price data collected from the nearest marketing center. Yearling heifers that conceived to AI were older and heavier ($P = 0.02$) at breeding than heifers that conceived by NS. When compared with heifers that were conceived by NS, females that conceived through AI had a greater ($P < 0.001$) average weaning weight, weaned more ($P < 0.001$) weight, and produced more ($P < 0.001$) total calves. Consequently, females that conceived to AI as yearlings yielded greater ($P < 0.001$) revenue throughout their lifetime in the cow herd than heifers that conceived to NS. There was a positive correlation between heifer age at breeding and lifetime productivity. These data suggest that if the majority of a beef cow herd calves within the first 30 d of the breeding season, producers can maximize the productivity and efficiency of each female, and as a result, increase total revenue per cow.

Key Words: artificial insemination, lifetime productivity, natural service

35 Identification of single nucleotide polymorphisms associated with feed efficiency in rams. R. R. Cockrum*[1], N. K. Pickering[2], R. M. Anderson[2], D. L. Hyndman[2], M. J. Bixley[2], K. G. Dodds[2], R. H. Stobart[1], J. C. McEwan[2], and K. M. Cammack[1], *[1]University of Wyoming, Laramie, [2]AgResearch Limited, Mosgiel, New Zealand.*

Residual feed intake (RFI) is a measure of efficiency that is time consuming, expensive, and labor intensive to obtain, making it an ideal trait for marker-assisted selection. The objectives of this research were to 1) identify single nucleotide polymorphisms (SNPs) and heritability

associated with feed efficiency in sheep and 2) trace identified SNPs to the corresponding gene or genomic region. We hypothesized that regions of the genome corresponding to feed efficiency could be identified using the Ovine SNP50 BeadChip. Individual intake measurements were collected on rams from 2 separate ram tests (Dual Purpose Ram Test and Blackface Ram Test) at the University of Wyoming Ram Test (n = 328) from 2009 to 2011 using the GrowSafe System. Individual RFI (actual feed intake – predicted feed intake) values were generated. Blood was collected via the jugular and DNA was isolated. Single nucleotide polymorphisms in ram DNA were genotyped using the Ovine SNP50 BeadChip on the Illumina Infinium HD BeadChip Assay. Percentage loci scored per animal and locus, Hardy Weinberg deviations, animal information comparison, replicate sample reproducibility, and unusual allelic ratio analyses were conducted through Genome Studio and R for quality control analysis resulting in 50,896 SNPs used in the analysis. A genome wide association study (GWAS) analysis was conducted in R using the GenABEL package to identify SNPs using a polygenic model, $Y = \mu + G + e$, where μ is the intercept, G is the polygene, and e is the random residual, and estimate heritability. The SNP associated with *RXFP2* was used to confirm the accuracy of the polygenic model resulting in a high association ($P = 9.283^{-04}$) with the horn phenotype. Heritability for RFI was estimated as 0.14, which is similar to reports in cattle. Genome wide threshold ($P \leq 0.00025$) was obtained for 4 SNPs. Corresponding genes to identified SNPs were determined using the UCSC Genome Browser. Corresponding genes included zinc finger 1 (*Glis1*), interleukin 1 receptor accessory protein-like 1 (*IL1RAPL1*), and sex-determining region y – box 5 and 6 (*SOX5* and *SOX6*). Though 4 potential markers for RFI were identified, sample size must increase and markers must be validated for marker-assisted selection use.

Key Words: residual feed intake, sheep, single nucleotide polymorphism

36 Out-of-season reproductive performance of ewes synchronized to estrus with various 5-d protocols. C. G. Jackson*[1], T. L. Neville[1], V. R. G. Mercadante[2], K. M. Bischoff[2], G. C. Lamb[2], C. R. Dahlen[1], and R. R. Redden[1], *[1]North Dakota State University, Fargo, [2]North Florida Research and Education Center, University of Florida, Marianna.*

The objective of this experiment was to evaluate the reproductive performance of ewes after synchronization to estrus with progesterone (P_4) impregnated controlled internal drug release (CIDR) inserts in combination with GnRH and PG. Dorset and Katahdin ewes (n = 61 and 17; respectively) were assigned randomly during the anestrous period (April) to 1 of 4 treatments: 1) Untreated (U; n = 16); 2) CIDR (0.3 g P_4) inserts for 5 d (C; n = 21); 3) CIDR insert for 5 d and PG (dinoprost, 10 mg i.m.) at CIDR removal (P; n = 20); and 4) GnRH (gonadorelin, 0.02 mg i.m.) at CIDR insertion and PG at CIDR removal (G; n = 21). Rams equipped with marking harnesses were introduced at CIDR removal (d 0) and ewes were checked at 0800 h and 1700 h daily for breeding marks. Blood samples were collected via jugular venipuncture on d −12, −5, 0, 1, 2, 3, 4, 5, 8, 11, 14, 17, and 20 relative to CIDR removal and analyzed for serum concentrations of P_4 via RIA. Reproductive performance data were collected which included: days to estrus, days to lambing, percentage of ewes exhibiting estrus, pregnancy rate, lambing rate, and prolificacy. There was a treatment × time interaction ($P \leq 0.05$) for concentrations of P_4. Concentrations of P_4 were decreased ($P \leq 0.04$) in G compared with U on d 2. On d 14, C and P had greater ($P \leq 0.03$) concentrations of P_4 and G tended ($P = 0.06$) to have greater P_4 concentrations compared with U. In contrast, concentrations of P_4 on d 20 were greater ($P \leq 0.03$) in U compared with C. Days to estrus after CIDR removal, as indicated by breeding marks, were greater ($P \leq 0.02$) in U (6.5 ± 1.05) and P (5.90 ± 0.88) compared with G (2.98 ± 0.88). Pregnancy rate within 7 d post CIDR removal were similar ($P = 0.57$) for U, C, P, and G (30 ± 12.27, 30 ± 11.12, 35 ± 10.96, and 51 ± 10.78%; respectively). Similarly, no differences ($P \geq 0.32$) were detected for all remaining reproductive performance data. It appeared the 5 d CIDR coupled with GnRH and PG improved estrus synchronization; however, reproductive performance was not clearly improved by either of the 5 d CIDR protocols. These results warrant further research to determine the efficacy of industry-wide application of the 5 d CIDR in anestrous ewes.

Key Words: CIDR, ewe, synchronization

37 Effects of maternal fluoxetine dosage on lamb serum hormone concentrations and reproductive traits. P. L. Black,* D. M. Hallford, and T. T. Ross, *New Mexico State University, Las Cruces.*

Fluoxetine (human anti-depressant; selective serotonin reuptake inhibitor; FLX) depresses lactation in women and research has been conducted to evaluate sheep as a human lactation model. Fluoxetine has been shown to appear in the milk, yet little is known on how this drug will influence progeny. Our objective was to evaluate the effect of maternal FLX exposure on lamb growth and development. We utilized a completely randomized design with 18 mature Suffolk ewes (BW = 91 ± 12 kg; BCS = 2.0 ± 0.5). Treatments consisted of 0 (control) and 80 mg FLX; ewes were individually fed FLX using ground corn as the carrier at 0700 beginning on approximately d 126 of gestation and continued until 3 wk postpartum. The resulting 31 Suffolk-cross lambs were weighed at birth (birth weight = 4.6 ± 1.0 kg) and weaning (BW = 24.0 ± 3.2 kg; approximately 9 wk of age) and ADG was calculated. Blood samples were taken from lambs on d 1, 3, 5, 7, 14, 21, 28, 42, 56, and 66 and serum was analyzed for serum prolactin (PRL), IGF-I, and triiodothyronine (T_3) concentrations. Following weaning, ewe lambs were kept for subsequent evaluation. A total of 21 Suffolk-cross ewe lambs (BW = 44.7 ± 4.3 kg) were evaluated for age at puberty and pregnancy rate. No additional treatment was administered, as we only wanted to evaluate the effect of maternal FLX. Average daily gain from birth to weaning was similar ($P = 0.42$) between control and FLX-exposed lambs. Lambs exposed to maternal FLX had depressed PRL ($P = 0.01$), IGF-I ($P < 0.0001$), and T3 ($P = 0.04$) compared with controls. Age at first cycle was similar ($P = 0.53$) between FLX-exposed and control ewe lambs. Similarly, pregnancy rates were comparable ($P = 0.37$) between both control and FLX-exposed ewe lambs. Maternal supplementation of FLX reduced PRL, IGF-I, and T_3 serum concentrations in lambs, however this did not appear to have a negative effect on growth or reproductive performance.

Key Words: fluoxetine, growth, sheep

38 Digestibility of algal biofuel co-product in a forage diet. M. K. Beckman,* L. N. Tracey, N. Miller, K. Norman, K. Marchetti, E. J. Scholljegerdes, S. A. Soto-Navarro, C. L. Löest, and S. L. Lodge-Ivey, *New Mexico State University, Las Cruces.*

Co-product produced from extraction of oil from microalgae grown for biofuel production represents a novel feedstuff for ruminants. The objective of this study was to determine the influence of lipid extracted algae (LEA) on feed intake and diet digestibility when included in a forage diet. We hypothesized that an isonitrogenous addition of LEA to a forage diet would yield results similar to soybean meal (SBM). Fifteen crossbred wethers (43 ± 1.4 kg BW) fitted with ruminal and duodenal cannulas were used in a completely randomized design. Lambs were

fed twice per day at 110% of previous 3 d DMI. Experimental diets included: 1) sorghum-sudan hay (CP 8.3%; NDF 52.79%, DM basis; HAY), 2) sorghum-sudan hay plus LEA (CP 13.6%; NDF 44.19% DM basis; ALGAE), and 3) sorghum-sudan hay plus SBM (CP 10.6%; NDF 51.24%, DM basis; SOY). Animals were adapted to treatments for 10 d followed by 5 d sample collection. Treatment did not influence OM intake ($P = 0.99$) or total tract OM and NDF digestibility ($P > 0.10$). Total tract CP digestibility was lowest for ALGAE while SOY and HAY did not differ (75.86 vs 84.88 and 82.12 ± 1.177%, respectively; $P < 0.01$). Ruminal pH, liquid dilution rate, and volume did not differ ($P > 0.10$) by treatment. Soybean meal increased ($P < 0.01$) ruminal ammonia by 57.4% and 56.0% compared with ALGAE and HAY, respectively. Total VFA production and molar proportion of butyrate did not differ ($P > 0.14$) by treatment. Acetate was highest for HAY, lowest for SOY, and ALGAE did not differ from HAY and SOY (74.11, 71.57, and 69.07 ± 1.245 mol/100 mol for HAY, ALGAE, and SOY, respectively; $P = 0.04$). Propionate was greatest for ALGAE which differed from HAY, while SOY was similar to ALGAE and HAY (14.80, 19.89, and 17.85 ± 1.233 mol/100 mol HAY, ALGAE, and SOY, respectively; $P = 0.04$). Acetate:propionate ratio was lowest ($P = 0.03$) for ALGAE. Adding ALGAE to a forage diet resulted in increases in propionate production while OM and NDF digestibility was comparable to SOY. However, ALGAE resulted in the lowest ruminal ammonia and total tract CP digestibility. These data imply that CP in LEA may not be as soluble as CP in SBM, therefore we reject our hypothesis.

Key Words: biofuels, sheep, digestibility

39 Effects of preovulatory estradiol concentration on embryo survival and pregnancy establishment in beef cows. C. A. Roberts*[1,3], G. A. Perry[3], M. D. MacNeil[1], M. A. Minten[2], and T. W. Geary[1], *[1]USDA-ARS Fort Keogh, Miles City, MT, [2]Washington State University, Pullman, [3]South Dakota State University, Brookings.*

The role of estradiol during the preovulatory period on embryo survival and pregnancy establishment has not been characterized in beef cows. We hypothesized that preovulatory estradiol is important for embryo survival and pregnancy establishment. To establish the importance of estradiol during the preovulatory period on embryo survival, ovariectomized multiparous cows (n = 26) received estradiol cypionate (ECP), estradiol benzoate (EB) or no treatment (CON) to mimic a preovulatory period. Prior to treatment, all cows received a progesterone-releasing device (CIDR) for 7 d, 25 mg injection of prostaglandin-F2α (PGF) at CIDR removal (d −2), and an injection of GnRH (100 μg; d 0) 2 d later to mimic the follicular phase. Utilizing a 3 × 3 Latin Square design, cows received either ECP 36 h before GnRH injection, EB 12 h before GnRH injection, or no estradiol (CON). Luteal phase progesterone was mimicked with 2× daily increasing progesterone injections from d 3 to 6 and use of CIDRs from d 7 to 29. On d 7 after GnRH injection, each cow received one embryo and a CIDR. Another CIDR was added 24 h following embryo transfer and every 6 d, the older of the 2 CIDRs was replaced with a new CIDR. Blood was collected every 4 h between d −2 and d 0 for characterization of serum estradiol profiles. Blood was collected on d −2, −1, 0, 3 to 7, 13, and 17 to 29 to characterize progesterone profiles. Serum estradiol profiles were different ($P < 0.001$) between treatments. Mean serum progesterone concentrations were decreased ($P = 0.05$) for EB and ECP treated cows compared with CON. Transrectal ultrasonography on d 29 indicated that 4% of CON, 29% of EB, and 21% of ECP treated cows were pregnant. Expression of interferon stimulated genes ISG15, Mx2, and Oas1 on d 19 indicated 66.0% of CON, 69.3% of EB, and 71.0% of ECP treated cows were pregnant. Thus, 62, 39.7, and 50% of pregnancies in CON, EB, and ECP treated cows, respectively were lost from d 19 to 29. Overall, results indicate greater embryonic survival and pregnancy establishment in cows exposed to estradiol in the preovulatory period.

Key Words: estradiol, embryo survival, pregnancy establishment

40 Individual mineral supplement intake by ewes swath grazing or confinement fed pea-barley forage. D. L. Ragen*[1], E. E. Nix[1], P. G. Hatfield[1], R. L. Endecott[2], and J. G. P. Bowman[1], *[1]Montana State University, Bozeman, [2]Montana State University, Miles City.*

Sixty mature ewes (non-pregnant, nonlactating) were used in a completely randomized design to determine if feeding method of pea-barley forage (swath grazing or hay in confinement) had an effect on individual ewe mineral consumption. Thirty ewes were randomly allocated to 3 confinement pens and 30 ewes were randomly allocated to 3 grazing plots. Targhee ewes (65.4 ± 5.84 kg BW) were used in 2010. Rambouillet ewes (61.9 ± 6.28 kg BW) were used in 2011. The study was conducted during September 25-October 15, 2010 and September 6–19, 2011. Ewes had ad libitum access to food, water, and a mineral supplement containing 11–12.5% salt with 2% TiO_2 added as an external marker to estimate individual mineral intake. On d 1 of the data collection period, mineral/TiO_2 was weighed and placed in feeders in confinement pens and grazing plots. At the end of the collection period, remaining mineral was weighed and consumed mineral was recorded to provide an estimate of total mineral intake via disappearance. Forage intake was calculated using estimates of fecal output obtained by dosing gelatin capsules containing 2 g Cr_2O_3 every day for 14 d, and in vitro 48 h DM digestibility. Fecal grab samples were collected from each individual ewe for a period of 7 d and composited. Forage and mineral intakes were analyzed using individual ewe as the experimental unit. A year x treatment interaction ($P < 0.001$) existed for forage DMI and mineral DMI. Ewes in confinement consumed more forage than grazing ewes in 2010 (2.60 vs. 1.86 kg/d, respectively), but less than grazing ewes in 2011 (1.99 vs. 2.49 kg/d, respectively). Mean mineral intake was highest ($P < 0.001$) by grazing ewes in 2011 and 2010 (average 69 g/d), intermediate by ewes in confinement in 2010 (57 g/d), and lowest by ewes in confinement in 2011 (31 g/d). In this study, swath grazing ewes consumed more mineral than ewes in confinement, indicating that producers may want to provide a larger quantity of mineral to ewes swath grazing.

Key Words: mineral, confinement, swath

41 Effects of weaning age and winter development environment on heifer grazing distribution. N. L. Hojer*[1], M. B. Hubert[2], P. S. Johnson[2], M. H. Price[3], and K. C. Olson[2], *[1]South Dakota State University, Brookings, [2]South Dakota State University, Rapid City, [3]South Dakota School of Mines & Technology, Rapid City.*

The objective of this experiment was to determine if early weaning (approximately 125 d) vs. normal weaning (approximately 250 d) and wintering replacement heifers in drylot vs. rangeland affected heifer grazing distribution during the subsequent summer. Heifer calves from the 2009 and 2010 calf crop (n = 104 and 73, respectively) were allocated to the 2 weaning treatments and then stratified by age into the 2 winter development treatments. During the summer of yr 1 heifers were allocated to 2 pastures by winter treatment, and in yr 2 all 4 treatment combinations were allocated to separate pastures. A subset of heifers from each group were selected to wear global positioning system (GPS) collars (n = 2 and 5 in yr 1 and 2, respectively). Readings were taken from the GPS every 15 min in yr 1 and every 65 s in yr 2. The GPS coordinates were then analyzed relative to ecological sites,

water locations, fence locations, and temperature using Arc GIS (Esri, Redlands, CA). Winter treatment affected ($P < 0.05$) mean distance from fence lines, preference index (PI) for claypan and loamy sites in 2010, and distance from water in 2011. Day of sampling affected ($P < 0.05$) claypan and loamy site PI in 2010 and thin claypan site PI in 2011. Day of sampling interacted with winter treatment ($P < 0.05$) for distance from water in 2010, sand and thin claypan site PI in 2010 and thin claypan site PI in 2011, while day of sampling interacted with weaning treatment for distance from water in 2011. A winter by weaning treatment interaction affected ($P < 0.05$) thin claypan site PI in 2011. There was a 3-way interaction ($P < 0.05$) between weaning treatment, winter treatment and ambient temperate on the distance from water in both years and between weaning treatment, winter treatment and day of sampling on claypan and sand site PI in 2011. In conclusion, winter development influenced patterns of range utilization. Day-of-sampling interactions indicated that range heifers did not adjust preferences and thus were already adapted to the range environment, whereas drylot heifers adjusted preferences over time suggesting they re-learned how to utilize the range environment.

Key Words: heifer development, grazing distribution, weaning

42 Effects of distillers dried grains with solubles supplementation on grazing and subsequent feedlot performance of heifers grazing northern Great Plains rangelands. Q. P. Larson*[1], R. J. Maddock[1], P. L. Steichen[1], K. K. Karges[2], and B. W. Neville[3], *[1]Department of Animal Sciences, North Dakota State University, Fargo, [2]Dakota Gold Research Association, Sioux Falls, SD, [3]Central Grassland Research Extension Center, Streeter, ND.*

The objectives of this study were to evaluate the effects of distillers dried grains with solubles (DDGS) supplementation on animal performance while grazing northern Great Plains rangeland, as well as the effects of supplementation on subsequent feedlot performance and carcass characteristics. Eighty-two yearling heifers (319.5 ± 4.0 kg) were utilized in a completely random design to examine the outlined objectives. Heifers were stratified by BW and randomly assigned to 1 of 6 groups, with each group randomly assigned to 1 of 2 treatments: 1) no supplement and 2) DDGS supplemented at 0.6% BW. Stocking rates were 1AU/1.6 ha. Distillers dried grains with solubles were delivered daily and placed in plastic lined feed bunks. This study consisted of 2 portions a 74 d grazing phase and a 109 d finishing phase. Feedlot pens coincided with grazing pastures. All heifers received a common corn-based finishing ration for the duration of the 109 d finishing study. At the start of the grazing portion, initial BW was not different ($P > 0.09$). Final BW and ADG were greater for heifers supplemented DDGS ($P \leq 0.03$) during the grazing portion of this project. Heifers supplemented DDGS gained an additional 0.21 kg/d and came off pasture 11.21 kg heavier than heifers not receiving DDGS. No differences in animal performance were observed ($P \geq 0.13$) during the finishing phase. No differences in carcass characteristics were observed ($P \geq 0.23$). Although not statistically different, heifers receiving DDGS had greater marbling scores (Modest-514) compared with unsupplemented heifers (Small-470). Producers could benefit from this small increase in marbling scores; allowing the carcasses to qualify for certified programs possibly resulting in premium returns. Distillers dried grains with solubles improved average daily gain of yearling heifers grazing northern Great Plains rangeland with no adverse effects on feedlot performance or carcass characteristics.

Key Words: distillers dried grains with solubles, feedlot performance, yearling cattle

43 Effects of post-AI nutrition on reproductive and growth performance of yearling beef heifers. R. P. Arias*[1], P. J. Gunn[2], R. P. Lemenager[2], G. A. Bridges[3], and S. L. Lake[1], *[1]University of Wyoming, Laramie, [2]Purdue University, West Lafayette, IN, [3]University of Minnesota, St. Paul.*

The objective of this study was to determine the effects of a change in nutritional plane during the 21 d immediately following artificial insemination, on growth performance and conception rates of yearling Angus heifers. This experiment was conducted at the University of Wyoming (Loc. 1) and Purdue University, IN (Loc. 2) using a total of 151 animals (n = 98 and 53 respectively). Prior to initiation, heifers were fed 0.68 kg/d between weaning (~7 mo of age) and breeding (~14 mo of age) to obtain a BW of approximately 65% of their mature weight by the beginning of the breeding season. Immediately following routine estrous synchronization and AI, heifers (BW = 931 ± 643.7 kg) were randomly assigned to 1 of 3 nutritional treatments for a 21 d nutritional study: 1) formulated to meet NRC (2000) requirements for heifers to gain approximately 0.68 kg/d (GAIN); 2) formulated to meet NRC (2000) nutrient requirements for maintenance only (MAINTAIN), and 3) formulated to provide 80% of the NRC, 2000 energy requirement for maintenance (LOSS). Two linear pre-planned orthogonal contrasts (Proc GLM; SAS Inst. Inc., Cary, NC) were used to compare effects of GAIN vs. others and MAINTAIN vs. LOSS. No treatment*location interaction ($P = 0.73$) was detected. Heifers fed the GAIN treatment had greater ($P = 0.04$) first-service conception rates (76.5%) when compared with the other 2 treatments (58.5%) overall. No differences were detected between MAINTAIN (56.2%) and LOSS (60.8%). As expected, ADG were greater ($P < 0.01$) for heifers fed the GAIN diet (0.78 kg/d) and greater ($P < 0.01$) for heifers on the MAINTAIN (0.06 kg/d) diet compared with heifers on LOSS treatment (−0.35 kg/d). These results suggest that even small changes in nutrition during the 21 d immediately after breeding can reduce conception rates. Data suggests that keeping heifers on a similar plane of nutrition before breeding and maintaining it through the first 21 d post-AI is beneficial.

Key Words: heifers, reproduction, nutrition

44 Dietary intake in a group of old mares. S. Otabachian* and T. Hess, *Colorado State University, Fort Collins.*

Dietary intake for 32 old (21.9 ± 0.65), non-pregnant, idle mares was tracked between February to July and was compared with the 2007 National Research Council predicted values for idle maintenance horses. Mares were maintained in stalls with access to ad libitum water and a salt block. Dietary intake was assessed weekly and changes were averaged. A mix diet of alfalfa and grass hay with commercial grain concentrates were weighed, fed twice a day, and any refusals were recorded. Caloric intake per kilogram of body weight was calculated by dividing the total calorie intake by the body weight (kg). Hay was analyzed for DE, CP, ADF, NDF, lignin, ethanol soluble carbohydrates (ESC), water soluble carbohydrates (WSC), starch, crude fat (CF), and minerals. Nutrient intake was analyzed by ANOVA and significant differences among months compared by least squares means analysis. Regressions were calculated between predicted and actual nutrient intake including BCS in the regression if significant. Overall, actual caloric intake was 13.8% higher than predicted caloric intake ($P < 0.0001$); more specifically, in the month of June, actual was higher than predicted by 21.6%. In addition, actual intake of CP, Ca, P, Mg, Zn, and Cu was higher in June than predicted intake of those same nutrients ($P < 0.0001$) in all other months. WSC and CF intake increased ($P = 0.03$; $P = 0.02$) from May (WSC = 6.7%; CF = 0.49%) to July (WSC = 7.6%; CF = 0.59%), occurred with the increase in DMI from May to June. Dietary caloric intake increased

by an average of 20% from May to July and BCS increased ($P < 0.05$) from 5.8 to 6.4; yet NCS ($P = 0.71$) and BW ($P = 0.99$) did not vary even though most of the time the mares were fed on average, 13.8% above DE requirements. No variation was found in CP, Ca, P, K, S, Zn, and Se ($P > 0.15$) intake. When BCS was included in regression between predicted and actual BW adjusted caloric intake, results were significant, but weak ($P < 0.001$; $r^2 = 0.17$). Regression between predicted and actual CP, Ca, P, were significant but weak and intake above required levels. Although previous research has indicated that nutrient intake is similar between old and young horses, in the current study, mares did not increase in BW or BCS when fed 10% above DE requirements.

Key Words: body condition score, water soluble carbohydrates, old horse