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46 Effect of feeding high-linoleate safflower seeds on reproductive endocrine dynamics in postpartum beef females. M. H. J. Grant*[1], B. W. Hess[1], D. L. Hixon[1], E. A. Van Kirk[1], B. M. Alexander[1], T. M. Nett[2], and G. E. Moss[1], [1]*University of Wyoming, Laramie, WY,* [2]*Colorado State University, Fort Collins, CO.*

The objective of this study was to determine if fat supplementation immediately postpartum influenced serum concentrations of progesterone, LH, FSH, estradiol, and PGF-metabolite (PGFM). Twenty-four three-year-old beef cows were individually fed hay and low-fat control (C, beet pulp pellets) or high-fat (HL, high-linoleate safflower seed) supplements from d 1 to 80 postpartum. Diets were formulated to be isonitrogenous and isoenergetic and HL was formulated to provide 5 % dietary fat. Cows were treated with 100 μg GnRH on d 40 to 45 postpartum (d 0) and $PGF_{2\alpha}$ 7 d later (7 d). Concentrations of progesterone did not differ ($P = 0.9$) between dietary treatments prior to ovulation. Magnitude of the GnRH-induced LH ($P = 0.8$) and FSH ($P = 0.9$) surges did not differ between dietary treatments. The interval from the GnRH-induced preovulatory surge release of LH to a significant increase in serum concentrations of progesterone tended ($P = 0.1$) to be longer in HL than C cows. By d 7, however, concentrations of progesterone (ng/mL) were greater ($P = 0.02$) in HL (1.1 $\pm$ 0.1) than C (0.7 $\pm$ 0.9) cows. Peak concentrations of estradiol (pg/mL) during the ensuing proestrus were lower ($P = 0.04$) in HL (5.7 $\pm$ 1.2) than C (9.4 $\pm$ 1.2) cows. Concentrations of PGFM (pg/mL) were greater ($P = 0.01$) in HL (469 $\pm$ 24) than C (328 $\pm$ 23) from d 25 to 80 postpartum. First service conception rates tended ($P = 0.1$) to be greater in C (66.7%) than HL (33.3%), however, conception rates were identical by the end of the breeding season. Conception occurred earlier ($P = 0.02$) postpartum in the C (60 $\pm$ 5 d) than HL (81 $\pm$ 6 d) cows. Fat supplementation with high-linoleate safflower seeds detrimentally affected early postpartum fertility possibly because of the elevated production of prostaglandin $F_{2\alpha}$.

Key Words: Fat, Cow, Postpartum

47 Effects of barley processing, bulk density and oil type on feedlot performance and carcass characteristics of finishing beef steers. M. F. McDonnell*, J.G.P. Bowman, L.M.M. Surber, J. J. Kincheloe, M. A. Thompson, K. A. Anderson, and T. K. Blake, *Montana State University, Bozeman, MT.*

Eighty crossbreed beef steers weighing 385 kg ($\pm$ 5.77 kg) were fed a finishing diet (83% barley, 6% chopped straw, 3% oil and 8% supplement) in a study examining the effects of barley processing (whole vs. cracked), barley bulk density (**BD**; heavy vs. light; 63.1 kg/hL and 50.8 kg/hL, respectively) and oil type (soybean vs. high linoleic acid safflower oil) on animal performance (ADG, DMI, and DMD) and carcass characteristics. A processing by BD interaction ($P < 0.01$) was detected for final weight, ADG, DMI, and feed efficiency (**FE**). Final weight was highest ($P = 0.005$) for steers fed cracked heavy barley (**CH**) and cracked light barley (**CL**; avg. 573 kg), intermediate for steers fed whole light barley (**WL**; 505 kg) and least for steers fed whole heavy barley (**WH**; 468 kg). Average daily gain was highest ($P = 0.001$) for steers fed CH and CL (avg. 1.65 kg/d), intermediate for steers fed WL (1.06 kg/d), and least for steers fed WH (0.75 kg/d). Dry matter intake was greatest ($P = 0.01$) for steers fed CH and CL (avg. 11.6 kg/d), intermediate for steers fed WL (9.7 kg/d), and least for steers fed WH (8.1 kg/d). Feed efficiency (gain/100 units of feed) was highest ($P = 0.002$) for steers fed CH (14.7), followed by CL (13.9), WL (9.7), and WH (8.1). Cracked barley (**CB**) had higher ($P = 0.001$) NE_m and NE_g values than whole barley (**WB**; avg. 2.06 vs. 1.69 Mcal/kg for NE_m; avg. 1.42 vs. 1.09 Mcal/kg NE_g). There was no effect ($P = 0.40$) of BD on NE_m or NE_g values. No differences ($P > 0.08$) in carcass characteristics were detected for BD, processing, or their interaction. No effects ($P > 0.07$) of oil on ending weights, ADG, or carcass characteristics were found. In summary, barleys with BD of 63.1 and 50.8 kg/hL had similar energy contents, while NE_m and NE_g for cracked barley were 22 and 30% higher, respectively, than for whole barley fed to finishing steers.

Key Words: Barley, Processing, Bulk density

48 Evaluation of time to AI with a modified Co-Synch protocol and calf removal in postpartum beef cows. R. S. Walker*[1], P. D. Burns[2], G. E. Sides[3], and D. D. Zalesky[1], [1]*San Juan Basin Research Center, Hesperus, CO, USA,* [2]*Colorado State University, Fort Collins, CO, USA,* [3]*Intervet, Inc., Millsboro, DE, USA.*

The objective of this study was to evaluate optimal timing for timed AI using a modified Co-Synch protocol with or without a second injection of GnRH and calf removal. Suckling, multiparous Composite and Hereford beef cows (n=202, postpartum interval (PPI) = 67 d, body condition score (BCS) = 5) were synchronized for AI in two different calving seasons. Early calving cows (ECC; n=79, PPI=67 d, BCS=5.2) and late calving cows (LCC; n=123, PPI=67, BCS=4.9) were randomly assigned to one of four treatments. All cows were injected with GnRH (100 g; i.m.) on day 0, followed by an injection of $PGF_{2\alpha}$ (25 mg; i.m.) on day 7. Calves were removed at time of PG injection and returned to nurse at time of insemination. Half of the cows were time-inseminated (TAI) 48 h post PG injection, with (48-TAI-G) or without (48-TAI) a second injection of GnRH. The second half of the cows were inseminated 72 h post PG injection, with (72-TAI-G) or without (72-TAI) a second injection of GnRH. Pregnancy rates to TAI were higher for cows inseminated at 72 h compared to cows inseminated at 48 h post PG injection ($P < 0.05$) for both ECC and LCC. Pregnancy rates at 48 and 72 h were improved when GnRH was incorporated at the time of insemination ($P < 0.05$) for both ECC and LCC. However, pregnancy rate was no longer significant when sire was used as a random variable in the statistical model ($P > 0.05$). Pregnancy rates for Sire A (31.3 %) and Sire B (49.4 %) across all treatments accounted for the variability in pregnancy rates between treatments. We concluded that semen from the two sires used, affected pregnancy rates over all treatments, but delaying TAI to 72 h with a second injection of GnRH may improve pregnancy rates for mass mating programs.

Key Words: Estrous synchronization, GnRH, Calf removal

49 Glucose half-life decreased in young postpartum range cows from spring to summer. R. L. Endecott*, D. L. Dunlap, R. C. Waterman, A. C. Fitzgerald, V. A. Munn, K. L. Shirley, S. H. Cox, J. A. Hartung, C. A. Loest, and M. K. Petersen, *New Mexico State University.*

Young beef cows experience a negative energy balance after parturition and during lactation when grazing dormant New Mexico range. As a result, sensitivity to insulin may be decreased due to the physiology of lactation and poor forage quality. However, with adequate precipitation during the growing season, forage quality improves, and insulin sensitivity may increase. An experiment was conducted to investigate seasonal changes in nutrient status of young range cows (n = 22) at the New Mexico State University Livestock Research Center and the Corona Range and Livestock Research Center. Two glucose tolerance tests (GTT) were conducted, one at 35 d postpartum (spring) and one at 165 d postpartum (summer). At the time of the spring GTT, 2-year-old cows were group fed a mixture of wheat straw and alfalfa hay (7 to 8% CP, OM basis) similar to New Mexico native range in March and April. Cows were grazing New Mexico green forage at the time of the summer GTT. For each GTT, 50% dextrose solution was infused at 0.5 $mL \cdot kg^{-1}$ BW via indwelling jugular catheter and serum was collected at 14 intervals for 180 min beginning 3 min post-infusion. Serum glucose and insulin areas under the curve were calculated using trapezoidal summation. Glucose half-life was estimated by determining the time required for a 50% decrease in peak serum glucose concentration. Glucose area under the curve was smaller ($P < 0.05$) in the summer (9606 $\pm$ 573) than in the spring (11337 $\pm$ 541). This relationship also existed ($P < 0.01$) for insulin area under the curve (445 $\pm$ 25 vs. 302 $\pm$ 27 for spring and summer, respectively). Glucose half-life was 50% shorter ($P < 0.01$) in the summer when compared to the spring (87 vs. 45 $\pm$ 6 min). Cows grazing green summer forage were more insulin sensitive than cows consuming a poor quality diet. Differences in cow performance between late winter and summer may be due to hormonally regulated differences in energy metabolism.

Key Words: Glucose, Insulin, Season

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51 Explant culture supports survival and proliferation of Bovine spermatogonial stem cells. J. M. Oatley*, D. J. McLean, D. M. de Avila, and J. J. Reeves, *Washington State University*.

ABSTRACT: Spermatogonial stem cells (SSC) continually give rise to mature spermatozoa; at this time SSC can only be identified and evaluated by their ability to colonize in a recipient testis. Support of these cells in culture may lead to an ability to genetically modify livestock. The present study was designed to evaluate the survival and proliferation of bovine SSC in an explant culture system over a 3wk period. Explants of calf (1-2mo) testicular parenchyma were placed on 0.45um pore membranes in culture and maintained for 1-3wk in DMEM containing 10% fetal bovine serum at 32°C. Histological examination of fresh (t0) and cultured tissues revealed intact seminiferous tubules. Germ cell numbers/tubule increased ($P \leq 0.05$) after culture vs. t0, yet maturation was not observed. Testosterone was detected in medium throughout the culture period, 6.4±2.7 (1wk), 3.3±1.3 (2wk), and 2.5±1.1 ng/ml (3wk), indicating functional Leydig cells. Sertoli cell and spermatogonial viability was sequentially evaluated by RT-PCR for cell specific gene expression of stem cell factor and protein gene product 9.5, respectively. Results demonstrated the expression of both genes at 1, 2, and 3wk of culture. Single cell suspensions were prepared from the testicular tissues at t0 and during culture and transplanted into nude mouse recipient testes to investigate SSC viability. One-month after transplantation, colonies of round bovine cells were identified in all mouse testes analyzed, indicating survival of SSC. Time in culture enhanced ($P \leq 0.05$) resulting colony numbers after wk2 and 3 of culture, 30±2.3 (t0), 35±4 (1wk), 48±9.5 (2wk), and 70±3.7 (3wk). This increase in colony numbers over time in culture indicates SSC proliferation in vitro. Bovine Leydig cells, Sertoli cells, spermatogonia, and SSC remain viable during explant culture for at least 3wk. This explant culture system appears to provide an environment for enhanced proliferation of bovine spermatogonial stem cells.

Key Words: Bovine, Culture, Spermatogonial stem cells

52 Undegradable true protein, and not ruminally-protected methionine, increases nutrient utilization by growing beef heifers. V. A. Munn*, C. A. Loest, C. P. Mathis, M. K. Petersen, P. J. Defoor, J. E. Sawyer, and C. A. Rogers, *New Mexico State University, Las Cruces, NM*.

Eight Charolais-cross heifers (266 ± 18 kg) were used in a replicated 4 × 4 Latin square to determine whether supplementation of ruminally-protected methionine or undegradable true protein would improve nutrient utilization when allowed ad libitum access to a mixture of wheat straw and alfalfa to supply 8.2% CP (DM basis). Treatments were 1.18 kg DM/d of: 1) soybean hull-based supplement (NC; 13% CP); 2) NC containing degradable intake protein (DIP; 22% CP, 6.4 and 3.3% of CP equivalent from urea and sodium caseinate, respectively); 3) DIP containing rumen-protected methionine (MET; 22% CP, supplied 10 g/d methionine); and 4) DIP containing undegradable intake protein (UIP; 40% CP, 21% of CP equivalent from undegradable true protein sources). Periods were 21 d; 14 d for adaptation, 1 d for blood collection (data not presented), and 6 d for collection of forage and supplement, total orts, and total urine and fecal output (using fecal bags). Representative samples were composited for each heifer by period and analyzed for DM, OM, and N. Supplementation did not affect ($P > 0.10$) forage OM intakes (4.00, 4.04, 3.84, and 4.03 ± 0.12 kg/d for NC, DIP, MET, and UIP, respectively) and retention of OM (57.4, 58.9, 57.9, and 58.8 ± 1.1% for NC, DIP, MET, and UIP, respectively). Intakes of total N (89.9, 105.6, 103.0, and 140.3 ± 2.0 g/d for NC, DIP, MET, and UIP, respectively) were lowest for NC, intermediate for DIP and MET, and greatest for UIP ($P < 0.05$). Total N excretion (54.2, 58.2, 58.3, and 77.6 ± 2.1 g/d for NC, DIP, MET, and UIP, respectively) was greater ($P < 0.01$) for UIP, and tended ($P < 0.20$) to be greater for DIP and MET compared to NC. Retention of N (35.7, 47.4, 44.8, and 62.7 ± 2.7 g/d for NC, DIP, MET, and UIP, respectively) was greater ($P < 0.05$) for DIP and MET when compared to NC, but increased further ($P < 0.05$) for UIP. Results suggest that supplementation of rumen undegradable true protein, and not rumen-protected methionine, improves nutrient utilization over rumen degradable protein for cattle consuming average quality forage.

Key Words: Heifers, Methionine, Nutrient retention

53 *Salmonella* destruction in frankfurters using hydrostatic pressure and bacteriocins. A. W. Wolf*, S. Bandyopadhyaay, N. Kalchayanand, B. Ray, and W.J. Means, *University of Wyoming, Laramie, WY, USA*.

Two to four million cases of salmonellosis occur in the U.S. annually. High hydrostatic pressure (HHP) is a non-thermal processing technique used to control pathogens. Our goal was to determine if HHP, in conjunction with bacteriocins of lactic acid bacteria, could destroy *Salmonella* in vacuum-packaged frankfurters. Ten strains of *Salmonella*, isolated and grown to early stationary phase, were subjected to HHP. Five pressure-resistant strains were mixed in an equal-ratio cocktail. Cocktail treatments were 345 MPa for 5 min at 50C (HHP50) with or without bacteriocin (2500 au nisin/2500 au pediocin) mixture (BMIX). Survivors were enumerated by serial dilution in sterile water followed by pour plating on TSY agar and incubation at 37C for 48 h. Twenty-eight packs of two 27 g frankfurters were inoculated with 7 log/ml of cocktail and subjected to HHP50 or HHP50+BMIX. Forty-eight packs were inoculated with 4 log/ml of cocktail and subjected to HHP50 or HHP50+BMIX and stored for 1, 14, or 28 days at 4C. Survivors were enumerated by serial dilution with sterile water followed by pour plating on TSY and XLD agars and incubation at 37C for 48 h. Controls did not differ (P=0.2066) for 1, 14, and 28 d. In 7 log-inoculated packs, HHP50 resulted in 4.71 and 5.39 log reduction on TSY and XLD, respectively; while HHP50+BMIX resulted in a 5.29 and 6.76 log reduction on TSY and XLD, respectively. HHP50 in 4 log-inoculated packs showed 2.99 and 3.96 log reduction on TSY and XLD, respectively; while HHP50+BMIX resulted in a 3.96 log reduction on TSY and XLD. HHP, in conjunction with bacteriocins, effectively controls *Salmonella*in low-heat processed meat products.

Key Words: *Salmonella*, Hydrostatic pressure, Pediocin

54 Increasing dietary high-linoleate safflower oil affects duodenal flow of esterified linoleate in wethers. R. L. Atkinson*, E. J. Scholljegerdes, S. L. Lake, V. Nayigihugu, B. W. Hess, and D. C. Rule, *University of Wyoming*.

We hypothesize that lambs fed a high-concentrate diet with high-linoleate safflower oil will have increased duodenal flow of 18:2$c9,c12$ (18:2, linoleic acid) due primarily to flow of esterified 18:2. Four cross-bred wethers (BW = 44.3 ± 15.7 kg) fitted with ruminal and duodenal cannulae were used in a 4 × 4 Latin square experiment to determine duodenal fatty acid flow when fed an 80% concentrate diet with increasing levels of high-linoleate (77%) safflower oil (oil; 0, 3, 6, or 9% of DM). Wethers were fed diets, at 2% of BW, that were formulated to be isonitrogenous and included bromegrass hay, cracked corn, corn gluten meal, urea, limestone, plus oil. Duodenal digesta, collected to represent every 2 h in a theoretical 24-h period, was extracted with chloroform, methanol, and water (1:2:0.8) in tubes containing tritridecanoate as internal standard. Half of each lipid extract was used for methyl ester preparation using 1.09% HCl in methanol to catalyze methyl esterification of total (both free and esterified) fatty acids. The other half of each lipid extract was transesterified with 0.2 M KOH in methanol to catalyze methyl esterification of only esterified fatty acids. Fatty acid intake increased (linear, $P < 0.005$) with increased dietary oil. Duodenal flow of both total (linear, $P = 0.03$) and esterified (linear, $P = 0.06$) fatty acids increased from 0 to 9% dietary oil. Total to esterified fatty acid ratio of duodenal digesta increased (cubic, $P = 0.02$) with increased dietary oil, indicating greater ruminal lipolysis with increased dietary oil. Ratio of total 18:2 to esterified 18:2 in duodenal digesta increased (linear, $P = 0.01$) from 0 to 9% dietary oil. However, within each treatment, duodenal flow of total 18:2 was not different ($P \geq 0.27$) than that of esterified 18:2. Ratio of 18:0 to 18:2 in duodenal digesta decreased (linear, $P = 0.04$) and duodenal flow of 18:1t-11, a major biohydrogenation intermediate, increased (linear, $P = 0.01$) as dietary oil increased suggesting that biohydrogenation was less complete as dietary oil increased. We conclude that the increase in duodenal flow of 18:2 that occurred from increased dietary oil could be accounted for by increased flow of esterified 18:2.

Key Words: High concentrate diet, Sheep, Fatty acid flow