
0023 Utilization of wet brewers grain as a winter feed supplement for beef cows grazing native annual grasslands.

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Objectives of this study were to determine the effects of wet brewers grain (WBG) as a winter supplement on cow and calf performance while grazing native annual grasslands. The study was conducted at the Sierra Foothill Research and Extension Center (Browns Valley, CA) during 2014–2015 and 2015–2016 winter grazing seasons (i.e., November through January). A total of 92, fall-calving Angus × Hereford cows grazing native annual pastures (12.12 ha/pair for 84 d; 3.56% CP, 39.3% TDN, 75.3% NDF) were supplemented with either molasses low moisture protein block, available ad libitum (CON; $n = 28$; CP, 26%) or WBG (fed 3 times/wk; formulated to offer 0.68 kg CP head/d on DM basis; CP, 26%). Treatment groups were housed in adjacent pastures during the 84 d supplementation period and weights were taken in 28 d intervals. Dependent variables included: cow and calf BW and cow BCS. Data were analyzed as a randomized block design where block = year of study. Treatment × block interaction was not significant ($P > 0.05$). Calves were born before beginning of study each year and calf date of birth was fit as a covariate. Brewers grain supplemented cows were heavier on d 56 compared with CON cows (560.63 vs. 529.86 ± 13.99 kg; $P = 0.03$). Similarly, WBG calves were also heavier on d 56 compared with CON calves (117.97 vs. 110.06 ± 3.72 kg; $P = 0.03$). Calves born to WBG supplemented cows tended ($P < 0.10$) to be heavier than those of CON supplemented cows on d 0 (57.96 vs. 58.81 ± 2.73 kg) and d 86 (141.64 vs. 152.03 ± 3.74 kg). Results indicate that cows and calves supplemented with WBG recovered weight more quickly than those consuming liquid protein supplement. Therefore, WBG may have considerable potential as a winter protein supplement on California grasslands; however, economic analyses need further investigation.

Key Words: annual grasslands, feed supplementation, wet brewers grain

0024 Derivation of economic values for feedlot performance traits in commercial and lowline-influenced angus steers.

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Feed costs and market volatility make identifying cattle biological types and performance traits with significant economic impact at the feedlot imperative. Thus, the objective of this study was to determine the economic values of feedlot performance traits in commercial Angus ($n = 20$), half-blood

Lowline-influenced Angus ($n = 20$), and full-blood Lowline Angus ($n = 8$) steers. Steers were fed for 72-d after a 28-d adjustment period at the CSU, Chico Agricultural Teaching and Research Center's beef cattle feeding facility. Upon delivery, steers were randomly assigned to three, 7 × 18 m pens, each fitted with two GrowSafe feed nodes and allowed ad libitum access to water and finishing ration (CP = 11.9%, TDN = 72.58%, NDF = 20.20%). After the 72-d GrowSafe trial, steers continued in their assigned GrowSafe pens until slaughter. Feedlot performance traits with significant economic impact were identified using stepwise, multiple-trait linear regression of net revenue onto residual feed intake (RFI), ADG, DMI, slaughter weight, and dummy variables representing breed type. Net revenue was defined as gross revenue minus feed costs. Gross revenue for each steer was determined by multiplying each animal's slaughter weight by market price at the time of sale (\$3.26/kg). Costs included yardage (\$.50/hd/d), billed daily feed consumption, and average feeder price (\$3.68/kg) multiplied by delivery weight. Average net revenue (±SD, USD) for the commercial Angus, half-blood Lowline-influenced and full-blood Lowline Angus steers were \$10.13 ± 86.97, \$-44.30 ± 69.98, and \$-105.05 ± 86.97, respectively. Multiple linear regression results identified slaughter weight, DMI, and ADG as significant predictors of feedlot net revenue ($R^2 = 0.41$; $P < 0.05$). Coefficients representing economic values for slaughter weight, DMI and ADG were \$0.66, \$-32.92, and \$71.30, respectively. Results suggest that slaughter weight, DMI, and ADG are key predictors of feedlot net revenue, and deserve consideration in the development of breeding objectives with the goal of improving feedlot profitability.

Key Words: economic values, feedlot cattle, performance

**ASAS WESTERN SECTION
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0025 Effects of organic or inorganic Co, Cu, Mn, and Zn supplementation to late-gestating beef cows on productive and physiological responses of the offspring.

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Eighty-four multiparous, nonlactating, pregnant Angus × Hereford cows were ranked by pregnancy type (AI = 56, natural service = 28), BW, and BCS, and allocated to 21 drylot

pens at the end of their second trimester of gestation (d 0). Pens were assigned to receive forage-based diets containing: (1) sulfate sources of Cu, Co, Mn, and Zn (INR), (2) an organic complexed source of Cu, Mn, Co, and Zn (AAC; Availa®4; Zinpro Corporation, Eden Prairie, MN), or (3) no supplemental Cu, Co, Mn, and Zn (CON). Diets were offered from d 0 until calving, and formulated to meet requirements for energy, protein, macrominerals, Se, I, and vitamins. The INR and AAC diets provided the same daily amount of Cu, Co, Mn, and Zn. Cow BW and BCS were recorded, and liver samples were collected on d -10 and 2 wk (d 75) before the calving season. Within 3 h after calving, calf BW was recorded, liver samples were collected, and the expelled placenta was retrieved ($n = 47$ placentas). Calves were weaned on d 283 of the experiment, preconditioned for 45 d (d 283 to 328), transferred to a growing lot on d 328, and moved to a finishing lot on d 440 where they remained until slaughter. Liver Co, Cu, and Zn concentrations on d 75 were greater ($P \leq 0.05$) for INR and AAC compared with CON cows, whereas INR had reduced ($P = 0.04$) liver Co but greater ($P = 0.03$) liver Cu compared with AAC cows. In placental cotyledons, Co concentrations were greater ($P \leq 0.05$) in AAC and INR compared with CON cows, whereas Cu concentrations were only increased ($P = 0.05$) in AAC compared with CON cows. Calves from INR and AAC had greater ($P < 0.01$) liver Co concentrations at birth compared with calves from CON cows. Liver Cu and Zn concentrations at birth were greater ($P \leq 0.05$) in calves from AAC compared with cohorts from CON cows. Weaning BW was greater ($P \leq 0.05$) in calves from AAC compared with cohorts from CON cows, and this difference was maintained until slaughter. In the growing lot, calves from AAC cows had reduced ($P < 0.01$) incidence of bovine respiratory disease compared with CON and INR cohorts. Collectively, these results suggest that feeding the AAC diet to late-gestating beef cows stimulated programming effects on postnatal offspring growth and health compared with the CON diet. Therefore, supplementing late-gestating beef cows with an organic complexed source of Co, Cu, Zn, and Mn instead of no supplementation appears to optimize offspring productivity in beef production systems.

Key Words: trace mineral, beef cow, supplementation

0026 Altered rumen microbial populations in response to high sulfate water in lambs.

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Water is involved directly or indirectly in essentially every bodily process. Therefore, access to quality water sources is critical for livestock wellbeing. In the western United States,

however, high sulfate (SO_4^{2-}) water sources are frequently encountered. High SO_4^{2-} water can cause overproduction of ruminal H_2S and result in compromised health and performance of the host. An initial trial (Trial 1) was conducted to determine the impact of high SO_4^{2-} drinking water on the rumen microbiome of growing lambs. A follow-up trial (Trial 2) then sought to confirm rumen microbial species involved in the response to high SO_4^{2-} drinking water and additionally identify species that adapt to SO_4^{2-} challenges. Each trial consisted of individually penned Hampshire-cross lambs ($n = 43$ in Trial 1; $n = 16$ in Trial 2) which had access to ad libitum feed and high SO_4^{2-} water (3000 mg $\text{SO}_4^{2-}/\text{L}$) for a 28 d period. Trial 2 also included a 7 d posttreatment period to obtain recovery data for later analysis. DNA was extracted and sequenced from d 0, 7, and 28 rumen samples and then compared with known 16S rDNA reads for microbial identification. Operational taxonomic units (OTU) were defined as sequence clusters with $\geq 97\%$ identity and analyzed for the fixed effect of sampling day using the GENMOD procedure of SAS. Trial 1 resulted in a total of 145 OTU found in at least one of the 24 sequenced samples (eight lambs; three sampling dates); eight OTU were affected ($P \leq 0.05$) by sampling day. Trial 2 resulted in 287 OTU identified in at least one of the 24 sequenced samples (eight lambs; three sampling dates), with sampling day affecting ($P \leq 0.05$) 38 of those OTU. Collectively, these results indicate a shift in rumen microbe relative abundance in response to high SO_4^{2-} water. Abundance variation may confer differences in host animal ability to tolerate and adapt to high SO_4^{2-} water. Similarities in microbial abundance changes across the two trials suggest that particular species are especially reactive to high ruminal SO_4^{2-} and are likely important to host response. Furthermore, certain microbial species demonstrated greater potential to adapt over time to a high SO_4^{2-} environment. Greater understanding of the rumen microbes involved in the response to high SO_4^{2-} drinking water is necessary for development of effective treatment and prevention strategies for ruminant livestock maintained in high SO_4^{2-} water regions.

Key Words: DNA sequencing, microbes, rumen, sheep, sulfate

0027 Immunological implications of pregnancy:

A focus on inflammatory cytokines. S. Z. Prosser*, K. E. Quinn, and R. L. Ashley, *New Mexico State University, Las Cruces.*

The present studies aim to (1) determine expression of (C-X-C motif) Ligand 12 (CXCL12), CXCR4, and inflammatory cytokines in corpus luteum (CL) and fetal-maternal interface during early pregnancy and when CXCR4 signaling is inhibited in ewes, and (2) determine alterations in CL cytokine expression using an in vivo model with hCG-stimulated P4 levels. Several human studies highlight CXCL12-CXCR4 signaling in regulating cytokine production, but whether similar mechanisms occur in livestock is uncertain. Our laboratory

reported activation of CXCL12-CXCR4 signaling axis at the fetal-maternal interface in sheep but whether this axis is involved in modifying reproductive tissue or peripheral blood inflammatory responses is uncertain. We hypothesized CXCL12-CXCR4 signaling acts as a potentiator during early pregnancy in ewes by altering cytokine populations at the fetal-maternal interface and the luteal microenvironment. To test this hypothesis, CL tissue was collected from NP (d 10 of estrous cycle) and pregnant ewes on d 20 and 25. In a separate study, we utilized AMD3100, a potent CXCR4 antagonist, to disrupt CXCR4 signaling to determine inhibition effects on fetal-maternal cytokines. Mini-osmotic pumps were surgically installed on d 12 of gestation and delivered AMD3100 or PBS into the uterine lumen ipsilateral to CL for 7 d. Endometrium (caruncular and intercaruncular) and fetal membrane tissues were collected on d 23 of gestation. Gene expression of inflammatory cytokines were investigated using real time PCR. During gestation, proinflammatory cytokines increased ($P < 0.05$) in CL from pregnant compared with NP ewes. Similarly, CXCL12 and CXCR4 increased ($P < 0.05$) on d 20 of gestation in pregnant compared with NP ewes. Under hCG stimulation, interferon γ (IFNG) decreased ($P < 0.01$) on d 25 in CL tissue compared with control ewes. In AMD3100-treated ewes, transcripts for tumor necrosis factor (TNF; $P < 0.05$) and interleukin 12 (IL12A; $P < 0.01$) increased in caruncle, while transforming growth factor β 1 (TGFB1) and IL12A tended ($P = 0.2$) to increase in intercaruncular endometrium compared with control. Interleukin 10 (IL10) transcript from treated ewe fetal membrane tended ($P = 0.1$) to increase compared with control. Using immunofluorescence, IL10 protein was localized to uterine luminal and glandular epithelium, and TNF to uterine glandular epithelium and stroma. Using flow cytometry, we established peripheral blood T lymphocytes are CXCR4-positive. Our results highlight the role CXCL12-CXCR4 signaling may play in regulating localized inflammation at the fetal-maternal interface and immune cell trafficking in peripheral blood, contributing to pregnancy maintenance.

Key Words: chemokine receptor 4, cytokines, inflammation

MEETING TODAY'S ANIMAL CARE STANDARDS: ARE YOU READY?

0028 New *Ag Guide*—What should we expect?

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The first edition of the *Ag Guide* was published in 1988 to define standards of care for agricultural animals used in agricultural research and teaching. These standards were to accomplish two important objectives. One was to ensure that the agricultural animals used for research and teaching are fit

subjects so as not to compromise outcomes by having poor condition. The other objective was to give regard to and preserve the wellbeing of these animals based on our growing recognition that they, by their nature, ought to be in the realm of human moral concern. The second edition of the *Ag Guide* came out in 1999, with an expanded authorship and chapters devoted to specific types of agricultural animals. The current third edition (2010) has 62 authors and additional chapters covering institutional policies and principles related to health care, husbandry, environmental enrichment, and handling and transport. The title of the third edition was changed to *Guide for the Care and Use of Agricultural Animals in Research and Teaching*, on the principle that the standards therein are applicable to agricultural animals in all research and teaching situations, not just those seen as strictly agricultural. The *Ag Guide* has become the reference document for agricultural animals by IACUC's nationwide, and has been adopted by AAALAC as a primary standard to evaluate animal care and use programs. At the last meeting of the FASS Scientific Advisory Committee on Animal Care (SACAC) in May 2015, it was decided to revise the *Ag Guide* to produce a fourth edition. Items were identified for each chapter and a tentative timeline was developed. The sale of ASAS and PSA interests in FASS to ADSA in 2015 provided for transfer of ownership of the *Ag Guide* to ADSA, ASAS, and PSA and dissolved the SACAC, temporarily suspending action on the *Ag Guide*. As of the writing of this abstract, the revision process has been initiated, but a determinable timeline for publication has not been established. The three societies recognize the vital importance of an up-to-date *Ag Guide* and intend to jointly publish a revised fourth edition.

Key Words: *Ag Guide*

0029 How ag research and teaching differs from “rodent” studies in AAALAC international accreditation. J. J. McGlone*, *Texas Tech University, Lubbock.*

Ethical care of farm animals is required for conduct of farm animal research and teaching, journal article submission, and production on commercial farms. The highest standard of animal care is provided when an agricultural research and teaching institution becomes accredited by AAALAC International. Some people in animal agriculture are leery of AAALAC accreditation because they have experienced laboratory animal ethics applied to farm animal research and teaching. Here I argue that the fundamental ethical principles underlying farm animal care are often different than those that underpin laboratory animal care. The laboratory animal community lean heavily on the 3 R's (reduce, replace, and refine). I argue that these are not appropriate for farm animals as they are for laboratory animals. Agricultural research doesn't reduce the sample size, it optimizes the sample size. Agricultural animal researchers don't often replace animal models with a “lower” model species (say using a mouse rather than a chimp for a