

cooperative farm of the highlands of the occident of Mexico. All cows presented a history of repeat breeding, and further more, during palpation the presence of an ovarian cyst was detected. Divided at random in three groups of 15 cows. Group one was treated with 100 µg GnRH im on the oestrus day of insemination. Group 2 was treated with naloxone, 5 mg im at 12 hour intervals for three consecutive days, treatment commenced since one day before insemination. Group 3 was used as a control injected with 5 ml im of saline solution at 12 hour intervals for three consecutive days, injections commenced since one day before estrual insemination. Cows were inseminated twice (12 h apart) according to the AM-PM rule and pregnancy was confirmed by rectal palpation between 12 and 18 weeks after the last insemination. Pregnancy rates in GnRH treated repeat breeder cows was 56%, while pregnancy rate in naloxone treated cows was 89% ( $p < 0.01$ ) and control cows showed a 20% pregnancy rate. There was a significant correlation between progesterone levels and pregnancy rate in all groups. It was concluded that opioids participate significantly in the expression of estrous behaviour and ovulation in repeat breeder Holstein cows.

**Key Words:** GnRH, naloxone, dairy

**247 Use of OVSYNCH and alternative protocols to synchronize estrus and ovulation in dairy cows managed in a seasonal grass-based system.** M. M. Herlihy<sup>\*1,2</sup>, M. A. Crowe<sup>2</sup>, M. G. Diskin<sup>3</sup>, and S. T. Butler<sup>1</sup>, <sup>1</sup>*Teagasc Moorepark DPRC, Fermoy, Co. Cork, Ireland*, <sup>2</sup>*SAFVM, University College Dublin, Ireland*, <sup>3</sup>*Teagasc, APRC, Athenry, Co. Galway, Ireland*.

Lactating dairy cows ( $n=1,623$ ) were enrolled in a study to evaluate estrus/ovulation synchronization protocols. Cows in each herd ( $n=8$ )

were divided into 3 groups based on days in milk (DIM) at mating start date (MSD): Group 1, 2 and 3 animals were  $\geq 42$ , 21-41 and 0-20 DIM at MSD. At 10 d before MSD Group 1 animals were sorted by parity and calving date and randomly assigned to: 1) d -10 GnRH (10 µg i.m. Buserelin) and CIDR insert (1.38 g P4); d -3 PGF<sub>2α</sub> (25 mg i.m. dinoprost); d -2 CIDR out and AI at observed estrus (CIDR\_OBS); 2) same as CIDR\_OBS, but GnRH 36 h after CIDR out and TAI (timed AI) 18 h later (CIDR\_TAI); 3) same as CIDR\_TAI, but no CIDR (OVSYNCH) or 4) Untreated Controls (CTL). The efficiency of each protocol was assessed by measuring plasma P4 on d 0 and 11 ( $< 1\text{ng/mL} = \text{low}; \geq 1\text{ng/mL} = \text{high}$ ). The numbers of visible corpora lutea and follicles per cow were counted by ultrasound before assignment to treatment. Treatment facilitated estrus/TAI on day 0 (MSD), day 21 and day 42 for Group 1, 2 and 3. The proportion of cows with low P4 on d 0 was similar (0.99, 0.99, and 0.97 for CIDR\_OBS, CIDR\_TAI and OVSYNCH). The proportion of cows with elevated P4 on d 11 was highest ( $P < 0.001$ ) for CIDR\_TAI (0.88, 0.97, and 0.89 for CIDR\_OBS, CIDR\_TAI and OVSYNCH). Treatment affected ( $P < 0.05$ ) conception rate to first service (CRFS) (53.7, 49.4, 42.6 and 49.3% for CIDR\_OBS, CIDR\_TAI, OVSYNCH and CTL). CRFS was greater ( $P < 0.001$ ) for cows with a CL at the time of treatment than for those that did not (53 vs. 44%). Calving to service interval was shorter ( $P < 0.001$ ) for CIDR\_TAI and OVSYNCH compared with CIDR\_OBS and CTL. Calving to conception interval was 8 days shorter ( $P < 0.01$ ) for CIDR\_TAI compared with CTL (76 vs. 84 days). Estrus and ovulation synchronization protocols were effective at achieving earlier first service and conception in grass-based seasonal calving dairy herds.

**Key Words:** estrus synchronization, TAI, dairy cow

## Ruminant Nutrition: Feedlot, Byproduct Feeds

**248 Effects of ruminally degradable N in diets containing wet corn distillers grains and steam-flaked corn on feedlot cattle performance and carcass characteristics.** C. H. Ponce<sup>\*1</sup>, M. S. Brown<sup>1</sup>, N. A. Cole<sup>2</sup>, C. L. Maxwell<sup>1</sup>, and J. C. Silva<sup>1</sup>, <sup>1</sup>*Feedlot Research Group, West Texas A&M University, Canyon*, <sup>2</sup>*USDA ARS Conservation and Production Research Laboratory, Bushland, TX*.

Assessment of degradable N needs in diets containing wet corn distillers grains with solubles (WCDGS) is needed to aid the cattle industry in managing feed costs. Yearling steers ( $n = 525$ ; initial weight = 373 +/- 13 kg) were housed in 54 pens (9 to 10 steers/pen) and received treatments in a 2 x 3 + 1 factorial. Factors included WCDGS (15 or 30% of DM) and non-protein N (NPN; 0, 1.5, or 3.0% of DM) from urea. The control diet without WCDGS contained 3.0% NPN (1.06% urea) and cottonseed meal. Steers were fed twice daily for 129 d and WCDGS was obtained three times/week from a local plant. Final shrunk BW was less ( $P < 0.02$ ) for 30% WCDGS than for the control or 15% WCDGS. Overall DMI was not different ( $P > 0.31$ ) between the control diet and 15 or 30% WCDGS, but overall DMI increased linearly ( $P = 0.04$ ) as NPN increased. Overall ADG and gain efficiency were affected by both WCDGS and NPN (interaction,  $P < 0.12$ ). Overall ADG for steers fed 15% WCDGS was greater for 1.5 and 3.0% NPN than for 0% NPN ( $P < 0.07$ , quadratic); however, ADG was not influenced by NPN for 30% WCDGS. Overall ADG was not different between the control and 15% WCDGS, but ADG was lower ( $P < 0.02$ ) for 30% than for 15% WCDGS. Overall gain efficiency among steers fed 15% WCDGS was greatest for 1.5% NPN and least for those fed 0% ( $P < 0.07$ , quadratic),

whereas gain efficiency decreased linearly ( $P < 0.09$ ) as NPN increased in 30% WCDGS diets. No interactions between WCDGS and NPN were evident for carcass traits. Dressing percent was greater ( $P < 0.01$ ) for the control diet than for 15% or 30% WCDGS (65.1, 64.2, and 63.9% for control, 15% WCDGS, and 30% WCDGS, respectively). Hot carcass weight was not different between the control and 15% WCDGS ( $P = 0.44$ ), whereas carcass weight was less for 30% WCDGS than for 15% WCDGS ( $P < 0.01$ ). Other carcass measurements were not different among treatments. Data suggest that optimum performance occurs between 1.5 and 3.0% NPN when diets contain 15% WCDGS, and with 1.5% NPN or less when diets contain 30% WCDGS.

**Key Words:** protein, beef cattle, byproduct feeds

**249 Evaluation of lighter density fraction from dried distillers grains with solubles as a feedstuff for ruminants.** J.M. Greene<sup>\*1</sup>, R. Srinivasan<sup>2</sup>, and B.J. Rude<sup>1</sup>, <sup>1</sup>*Animal and Dairy Sciences, Mississippi State University, Starkville*, <sup>2</sup>*Agricultural and Biological Engineering, Mississippi State University, Starkville*.

A novel combination of sieving and air classification has been developed to separate dried distillers grains with solubles (DDGS) into different fractions based upon density and size. The lighter fractions have greater fiber than the original DDGS. The objective of this trial was to evaluate the lighter fraction of DDGS as a possible feedstuff for cattle diets. Angus and Hereford ( $n = 12$ ;  $238 \pm 5.74$  kg) steers were randomly

assigned to three treatment groups to evaluate the lighter fraction resulting from DDGS separation using the elusieve process. Each treatment group received diets consisting of either the lighter fraction of DDGS (L), a DDGS based diet (D), or a control diet (C). After a 14 day diet adaptation, steers were placed in metabolism crates for 10 days and allowed ad-libitum access to feed and water. The first 3 days were used for adaptation to the crates followed by 7 days of data collection. During the data collection period, feed offered,orts, and fecal and urinary output were recorded and sampled (5%) to determine nutrient digestibility and crude protein retention. Dry matter intake was greater ( $P = 0.0394$ ) for steers consuming C (6.5 kg/d) compared to those consuming L (4.3 kg/d) with steers consuming D being intermediate (6.0 kg/d). Crude protein digestibility was greatest ( $P = 0.0008$ ) for the steers consuming L (78%) with steers fed D (72%) digesting more CP than C (63%). Protein retention did not differ ( $P = 0.2452$ ) among treatments ranging between 254 and 424 g/d. Fat digestibility was greatest ( $P = 0.0036$ ) for steers consuming the L and D diets (69 and 71%, respectively) compared to those consuming C (53%). Digestibilities of dry matter (ranged between 65 and 72%), OM (ranged between 66 and 72%), ash (ranged between 59 and 66%), NDF (ranged between 54 and 62%), ADF (ranged between 51 and 57%), hemicellulose (ranged between 55 and 68%), crude fiber (ranged between 55 and 65%) and energy (ranged between 66 and 72%) did not differ ( $P > 0.05$ ) among treatments. These data suggest that the lighter fraction of DDGS can be effectively fed to cattle without adversely affecting digestibility.

**Key Words:** distillers grains, digestibility, beef cattle

**250 Effects of grain processing method and use of dried corn distillers grains on beef carcass composition, heterocyclic amine concentration and fatty acid profiles of lean and lipid portions.** P. L. Black<sup>\*1</sup>, G. L. Parsons<sup>1</sup>, M. K. Shelor<sup>1</sup>, M. E. Dikeman<sup>1</sup>, K. K. Karges<sup>2</sup>, M. L. Gibson<sup>2</sup>, J. S. Smith<sup>1</sup>, and J. S. Drouillard<sup>1</sup>, <sup>1</sup>*Kansas State University, Manhattan*, <sup>2</sup>*Dakota Gold Research Association, Sioux Falls, SD*.

Carcass composition and fatty acid profiles were analyzed from separated 9<sup>th</sup>-10<sup>th</sup>-11<sup>th</sup> rib sections of crossbred heifers ( $n=689$ ,  $302 \pm 65$  kg initial BW) fed finishing diets of steam-flaked corn (SFC), dry-rolled corn (DRC), and dried corn distiller's grains with solubles (DDG). The study was a randomized complete block design with a 2 x 2 factorial arrangement of treatments. The SFC based diets contained 0 or 25% DDG and 0 or 25% DRC. Heifers were individually weighed and blocked into heavy and light groups. Within block, heifers were assigned randomly to pens containing 25 animals each. Heifers were fed once daily *ad libitum*, and heavy and light weight blocks were harvested after 137 and 157 d, respectively. Four heifers were randomly selected from each of 24 pens (3 pens per treatment at each harvest point). Three heifers were removed due to excessive trimming of the carcass. 9-10-11<sup>th</sup> rib sections were removed from one side of the selected carcasses after a 24-h chill and physically separated into lean, fat, and bone as described by Hankins and Howe (1946). Separated portions of lean and fat were evaluated by proximate analyses and for fatty acid profiles. Steaks were used to determine concentrations of heterocyclic amines after cooking at 204°C. Diet had no effect on concentrations of heterocyclic amines in cooked steaks ( $P > 0.15$ ). There were no differences among treatments in the separable portions of lean, fat, and bone; or percentages of protein, moisture, and ether extract ( $P > 0.10$ ). In the fatty acid triglyceride portion, oleic acid decreased while proportions of stearic and linoleic acids increased ( $P < 0.05$ ) in response to feeding DDG. Diet had little impact on fatty acids within the phospholipid fraction. DDG and DRC can be added to SFC diets with little impact on composition of the carcass.

**Key Words:** carcass composition, distiller's grains, feedlot cattle

**251 Optimal roughage level in finishing diets containing combinations of flaked corn and dried distiller's grains with solubles.** K. A. Miller<sup>\*</sup>, M. K. Shelor, G. L. Parsons, and J. S. Drouillard, *Kansas State University, Manhattan*.

Flaked corn finishing diets containing dried distillers grains with solubles (DDGS) were fed to crossbred heifers ( $n=298$ , initial BW=336 kg) to determine optimal concentration of alfalfa hay as the source of roughage. Cattle were stratified by weight and allotted, within strata, to 20 dirt-surfaced pens with 15 animals per pen. Diets consisted of steam-flaked corn (density = 0.36 kg/L) with 25% DDGS, 8% corn steep liquor, and ground alfalfa hay at 3, 6, 9, 12, or 15% of diet DM (4 pens per level of alfalfa hay). Monensin, tylosin, and melengestrol acetate were fed at the rates of 300, 90, and 0.5 mg/animal daily. Cattle were fed once daily *ad libitum* for 126 days and then transported to a commercial abattoir for harvest. Carcass data were collected following a 24-h chill. Heifers fed 3, 6, 9, 12, and 15% alfalfa had DMI of 10.69, 11.06, 11.25, 11.85, and 11.52 kg/d, respectively (linear  $P < 0.01$ , quadratic  $P < 0.05$ ). Gain efficiencies were not impacted (linear,  $P = 0.19$ ; quadratic,  $P = 0.82$ ) by roughage level (0.144, 0.144, 0.143, 0.140, 0.140, for 3, 6, 9, 12, and 15% alfalfa, respectively). Hot carcass weight tended to increase with increasing level of roughage (336.0, 339.8, 342.1, 345.3, 341.6 kg for 3, 6, 9, 12, and 15% roughage, respectively; linear effect,  $P = 0.087$ ). Carcass-adjusted ADG was increased by 7.7% for heifers fed 12% roughage compared to those fed 3% roughage. Yield grade increased linearly ( $P < 0.05$ ) as percent alfalfa in the diet increased. There was a tendency for a quadratic effect of alfalfa hay level on deposition of intramuscular fat ( $P = 0.06$ ), with 9% alfalfa yielding the most marbling. The percentages of carcasses grading USDA Choice or better were 59, 67, 63, 55, and 49 for cattle fed 3, 6, 9, 12, and 15% roughage, respectively (linear,  $P = 0.15$ , quadratic,  $P = 0.23$ ). Performance and carcass characteristics of heifers may be influenced by dietary roughage level when distiller's grains are fed in combination with steam-flaked corn.

**Key Words:** distiller's grains, steam flaked corn, roughage

**252 The effect of corn or sorghum dried distillers grains + solubles on growth performance and carcass characteristics of beef steers.** K. M. Wood<sup>\*1</sup>, H. Salim<sup>1</sup>, P. L. McEwen<sup>2</sup>, I. B. Mandell<sup>1</sup>, S. P. Miller<sup>1</sup>, and K. C. Swanson<sup>1</sup>, <sup>1</sup>*Department of Animal and Poultry Science, University of Guelph, Guelph, ON, Canada*, <sup>2</sup>*Ridgetown Campus, University of Guelph, Ridgetown, ON, Canada*.

Sixty crossbred steers (Angus X;  $n=36$  and Charolais X;  $n=24$ ) were used in a randomized complete block design to investigate the effects of feeding corn or sorghum dried distiller's grains in growing and finishing rations on growth performance and carcass traits. Steers were randomly assigned to one of three dietary treatments, used in both feeding periods: a Control ration containing soybean meal ( $n = 20$ ; CON), a ration containing 20% (DM basis) corn dried distiller's grains + solubles ( $n=20$ ; CDDGS) and a ration containing 20% (DM basis) sorghum dried distiller's grain + solubles ( $n=20$ ; SDDGS). Steers were fed a corn silage (CS) based grower ration (~75% CS) for 56 d and then switched to a high grain finisher ration (15% CS). Intakes were measured using Insentec ( $n=48$ ) and Calan gate ( $n=12$ ) feeding systems. Animals were weighed and ultrasounded for backfat and rib eye area (REA) every 28 d and slaughtered at an estimated backfat of 10 mm. Data were analyzed using PROC GLM in SAS; the model included the effects of block (barn), breed and dietary treatment and  $P < 0.05$  was used to indicate significance. Dietary treatment did not affect DM intake in the growing phase, although ADG was lower for SDDGS vs. CON ( $P = 0.008$ ) and CDDGS ( $P = 0.02$ ). This resulted in a

lower gain:feed in the growing phase for SDDGS vs. CON ( $P=0.07$ ) and CDDGS ( $P=0.04$ ). In the finishing phase, inclusion of corn or sorghum DDGS did not affect ADG, DM intake or gain:feed. Total trial ADG was  $1.56 \text{ kg d}^{-1} \pm 0.04$  for CON,  $1.54 \text{ kg d}^{-1} \pm 0.04$  for CDDGS, and  $1.51 \text{ kg d}^{-1} \pm 0.04$  for SDDGS and did not differ between treatments. However, fewer days on feed were required for SDDGS to reach the target backfat for slaughter than CDDGS ( $P=0.03$ ) and CON ( $P=0.05$ ). There was no difference between treatments for final weight ( $P>0.60$ ) and hot carcass weight ( $P>0.57$ ), when days on feed was included as a covariate in the model. These results indicate that sorghum dried distiller's grain can be included at 20% inclusion level, similar to corn distiller's grains, in grower and finisher rations, without negatively influencing overall growth or carcass traits.

**Key Words:** distiller's grains, steers, sorghum

**253 Effect of feeding fiber from wet corn gluten feed and silage in diets containing 30% modified wet distillers grains plus solubles on feedlot cattle performance and nitrogen mass balance.** A. R. Rich\*, M. K. Luebbe, G. E. Erickson, T. J. Klopfenstein, and J. R. Benton, *University of Nebraska, Lincoln.*

Ninety-six calves ( $307 \pm 7 \text{ kg}$ ) were stratified by BW, and assigned randomly to 12 pens to evaluate the effects of feeding fiber from wet corn gluten feed (WCGF) and corn silage in diets containing 30% modified wet distillers grains plus solubles (MDGS) on steer performance, manure N removed, and N lost via volatilization. Steers were fed for 178 d from November to May. Dietary treatments consisted of either 30% MDGS, 65% corn, and 5% supplement (DGS), or a diet with 30% MDGS, 30% WCGF, 15% corn silage, and 5% supplement with the WCGF and silage replacing corn (DGS+CGF). Nitrogen excretion was determined by the difference between N intake and individual steer N retention. Total N lost was calculated by subtracting manure and runoff N from excreted N. Dry matter intake ( $P=0.01$ ) and ADG ( $P=0.01$ ) were less for the steers fed the DGS treatment, while G:F was similar ( $P=0.63$ ) to steers fed the DGS+CGF treatment. Likewise, HCW ( $P=0.02$ ) and fat depth ( $P=0.08$ ) were lower for the DGS diet. Nitrogen intake was greater ( $P<0.01$ ) for the steers fed DGS+CGF ( $53.7 \text{ kg}$ ) than for steers fed DGS ( $41.1 \text{ kg}$ ). Nitrogen retention was greater ( $P=0.01$ ) for the DGS+CGF treatment than for the DGS treatment (due to greater ADG). Nitrogen excretion was also greater ( $P<0.01$ ) for the DGS+CGF treatment ( $47.8 \text{ kg}$ ) than the DGS treatment ( $35.8 \text{ kg}$ ). Manure N was greater ( $P=0.03$ ) for the DGS+CGF treatment ( $16.2 \text{ kg}$ ) compared to the DGS treatment ( $10.8 \text{ kg}$ ). However, N runoff was not different ( $P=0.98$ ) between treatments. The amount of N lost was greater ( $P=0.01$ ) for the DGS+CGF treatment ( $31.1 \text{ kg}$ ) than for the DGS treatment ( $24.5 \text{ kg}$ ) but the percent loss (percent of excreted N) was not different ( $P=0.50$ ) between treatments. Feeding wet corn gluten feed and corn silage with distillers grains increased N excretion which increased N in manure and the amount lost; however, % loss was unaffected compared to feeding distillers grains alone.

**Key Words:** cattle, fiber, nitrogen

**254 Effects on ruminal pH, hydrogen sulfide concentration, and feed intake when using wet distillers grains with solubles to adapt cattle to finishing diets compared to forage.** K. M. Rolfe\*, G. E. Erickson, T. J. Klopfenstein, and J. T. Vasconcelos, *Department of Animal Science, University of Nebraska, Lincoln.*

Eight ruminally fistulated steers ( $348 \pm 34 \text{ kg}$ ) were used to determine effects of using wet distillers grains with solubles (WDGS) when adapt-

ing cattle to a finishing diet. Steers were assigned randomly to one of two adaptation systems: 1) alfalfa hay decreased from 45% to 7.5% inclusion and dry-rolled corn increased while 5% supplement and 35% WDGS were constant (CON) and 2) WDGS decreased from 87.5% to 35% inclusion and dry-rolled corn increased while 5% supplement and 7.5% alfalfa were constant (TRT). Four, 7-d adaptation diets (step 1 to 4) were fed within each adaptation system followed by 7 d on a common finishing diet (52.5% dry-rolled corn, 35% WDGS, 7.5% alfalfa hay, and 5% supplement; DM basis). Ruminal pH and DMI were monitored continuously with wireless submersible pH probes and feed bunks suspended from load cells. On the last day of each step, ruminal  $\text{H}_2\text{S}$  was measured 8 and 23 h post feeding. In step 1, no differences in ruminal pH were observed; however, TRT steers had lower DMI ( $P < 0.01$ ) than CON steers. In step 2, steers on TRT had lower DMI ( $P = 0.01$ ), lower average pH ( $P = 0.03$ ) and greater  $\text{H}_2\text{S}$  ( $P = 0.08$ ). In step 3, TRT steers had lower DMI ( $P = 0.06$ ) compared to CON steers, while average pH was lower in TRT steers during steps 3 ( $P = 0.01$ ) and 4 ( $P = 0.04$ ). No differences in DMI, pH, or  $\text{H}_2\text{S}$  were observed between TRT and CON steers on the finishing diet ( $P > 0.19$ ). No drastic decreases in DMI or ruminal pH (SD similar to CON) were observed in steers adapted with TRT, with lowest average pH (5.36) on the finishing diet. Steers on TRT had greater  $\text{H}_2\text{S}$  during steps 1 and 2, with the greatest concentration being  $28.4 \mu\text{mol/mL}$ , but based on previous research and visual appraisal, sulfur was not a problem. Adapting cattle to finishing diets with WDGS may lower DMI and pH, but appeared to adapt cattle to corn since no differences were observed on the finishing diet.

**Key Words:** grain adaptation, steer, wet distillers grains plus solubles

**255 High sulfur content in distillers grains alters ruminal fermentation and diet digestibility by beef steers.** S. Uwituzo\*, M. K. Shelor<sup>1</sup>, G. L. Parsons<sup>1</sup>, K. K. Karges<sup>2</sup>, M. L. Gibson<sup>2</sup>, L. C. Hollis<sup>1</sup>, and J. S. Drouillard<sup>1</sup>, <sup>1</sup>*Kansas State University, Manhattan*, <sup>2</sup>*Dakota Gold Research Assn, Sioux Falls, SD.*

Twelve ruminally cannulated Angus cross steers were used to evaluate ruminal fermentation characteristics and diet digestibility when 30% (DM basis) dried corn distiller's grains with solubles (DDGS) containing normal or elevated levels of dietary sulfur were incorporated into finishing diets containing steam-flaked corn (SFC) or dry-rolled corn (DRC). The study was a randomized incomplete block design with a  $2 \times 2$  factorial arrangement of treatments. Factors consisted of dietary sulfur concentration (0.42% and 0.65% of DM; LS and HS, respectively), and grain processing method (steam-flaked or dry-rolled corn; SFC and DRC, respectively). HS was achieved by spiking the basal diets with sulfuric acid. Steers were randomly assigned to diet and individual, slatted-floor pens equipped with individual feed bunks and water fountains that allowed access to feed and clean water ad libitum. Two 15-d experimental periods were used, each consisting of a 12-d diet adaptation phase and a 3-d sample collection phase. Samples were collected at 2-h intervals post feeding during the collection phase. Ruminal pH was measured immediately after sampling. Concentrations of ruminal ammonia, and VFA were determined. Fecal samples were composited by animal and used to determine total tract digestibility of DM, OM, NDF, CP, starch, and ether extract. One animal became ill during the experiment and was removed from all analyses. HS tended to decrease DM intake ( $P = 0.08$ ), but increased ruminal pH and apparent total tract digestibility of DM and ether extract ( $P < 0.05$ ). HS increased ruminal ammonia and decreased total VFA and propionate concentrations ( $P < 0.01$ ). These effects were more exaggerated in cattle fed DRC (interaction,  $P < 0.01$ ). Concentrations of lactate and butyrate also

were decreased by HS ( $P < 0.01$ ). High sulfur levels may have negative consequences for ruminal fermentation.

**Key Words:** digestibility, sulfur, distiller's grains

### **256 High sulfur content in distillers grains with solubles may be deleterious to performance and carcass quality of finishing steers.**

S. Uwituzze\*<sup>1</sup>, M. K. Shelor<sup>1</sup>, G. L. Parsons<sup>1</sup>, K. K. Karges<sup>2</sup>, M. L. Gibson<sup>2</sup>, L. C. Hollis<sup>1</sup>, and J. S. Drouillard<sup>1</sup>, <sup>1</sup>*Kansas State University, Manhattan*, <sup>2</sup>*Dakota Gold Research Assn, Sioux Falls, SD*.

Crossbred yearling steers ( $n = 76$ ;  $410 \pm 2.7$  kg BW) were used in a finishing trial to evaluate effects of sulfur content in dried distiller's grains with solubles (DDGS) on growth performance and carcass characteristics of finishing steers. The study was a randomized complete block design with a  $2 \times 2$  factorial arrangement of treatments. Factors consisted of dietary sulfur concentration (0.42% and 0.65% of DM; LS and HS, respectively), and grain processing method (steam-flaked or dry-rolled corn; SFC and DRC, respectively). HS was achieved by spiking the basal diets with sulfuric acid. All diets included 30% DDGS (DM basis). Steers were blocked by weight and randomly assigned within block to treatments. Cattle were housed in individual, concrete-surfaced, partially enclosed pens equipped with feed bunks and water fountains. Steers were fed ad libitum amounts of their respective diets at approximately 0800 h each day. Steers were harvested on d 140. No interactions between grain processing method and sulfur level were observed. Steers fed diets with HS had 8.9% lower DMI ( $P < 0.001$ ); 12.9% poorer ADG ( $P = 0.006$ ); 4.3% lighter final BW ( $P = 0.006$ ); and tended ( $P = 0.13$ ) to have poorer G:F compared to steers fed diets with LS. Cattle fed HS yielded 4.3% lighter HCW ( $P = 0.006$ ) and had 16.2% less KPH fat ( $P = 0.009$ ) compared to steers fed LS. Steers fed HS had lower ( $P = 0.05$ ) percentage of liver abscesses compared to steers fed diets containing LS and lower yield grades ( $P = 0.04$ ) than their counterparts fed diets containing LS. There were no differences among treatments with respect to dressing percentage; 12th-rib back fat; REA; or USDA quality grades. Grain type had no effect ( $P > 0.15$ ). Feeding distiller's grains which are high in dietary sulfur may decrease DMI and compromise growth performance and carcass characteristics of feedlot cattle.

**Key Words:** distiller's grains, grain processing, sulfur

### **257 Evaluation of feedlot and carcass performance of steers fed different levels of ECORN™, a potential new feed product from ethanol plants.**

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The objective of this study was to evaluate the use of ECORN™ (ECORN), a corn-based by-product from the production of ethanol and food grade corn oil, as a replacement to dry-rolled corn (DRC) in feedlot finishing diets containing wet distillers grains plus solubles (WDGS) or wet corn gluten feed (WCGF). One-hundred twenty individually-fed crossbred yearling steers ( $372 \pm 17$  kg) were blocked by initial BW and assigned randomly to one of eight treatments (15 steers/treatment) in a  $2 \times 4$  factorial design. Diets were formulated to contain 30% WDGS or WCGF and either 0, 20, 40, or 60% ECORN (DM basis). The diets were formulated to replace DRC with ECORN at an equal proportion of DM and all diets contained 5% corn stalks and 5% dry supplement. The ECORN product contains 10.9% CP, 1.5% fat, 0.1% S, and 17.4% NDF. Steers were fed 153 d. As the level of ECORN increased from 0 to 60% diet DM, DMI increased quadratically ( $P=0.04$ ) with 20 and 40% inclusion having similar DMI ( $P>0.10$ ). As ECORN increased in the diet, G:F (0.139, 0.144, 0.131, and 0.140) responded cubically ( $P=0.02$ ) while ADG (1.37, 1.43, 1.33, 1.33) was unaffected ( $P>0.21$ ). Linear decreases in marbling score, fat depth, and calculated yield grade were observed with increased ECORN inclusion ( $P<0.01$ ); whereas, LM area responded cubically ( $P<0.01$ ). Steers fed WDGS had lower DMI and greater G:F versus steers fed WCGF ( $P<0.02$ ), with carcass characteristics unaffected by by-product type ( $P>0.17$ ). Results of this study would suggest replacing DRC with ECORN at 20% of the diet DM would optimize G:F and offer a feeding value equal to 118% the relative value of corn. However, no difference in ADG or G:F between the 0 and 60% ECORN suggests ECORN may replace corn in diets containing WDGS or WCGF. Further research to explain decreases in marbling score, fat depth, and yield grade (with no affect on HCW) should be considered.

**Key Words:** finishing cattle, fractionation, wet distillers grains

## **Ruminant Nutrition: Forage Digestibility Estimates; Obtaining and Applying Meaningful Values**

### **258 Opportunities and challenges in determining forage digestibility values.** R. Ward\*, *Cumberland Valley Analytical Services, Hagerstown, MD*.

In the last ten years, the use of NDF digestibility (NDFD) has evolved from strictly a research evaluation to a common commercially available value provided by forage laboratories. Cumberland Valley Analytical Services (CVAS) recorded requests for NDF digestibility values in excess of 820 in 2000; 13,200 in 2004; and 39,500 in 2008. Despite the wide acceptance and use of NDF digestibility values, there remain significant questions as to the appropriate use of this information for forage evaluation and nutritional modeling systems. There are no standard procedures for NDF digestibility and most systems reference a procedure by Tilley and Terry from 1963. Values generated by laboratories vary widely, and later time points have been advocated for consistency but

do little more than define an asymptotic value. Reported NDFD values and associated estimates of rate are only relevant within procedures, and even then have questionable relationship to animal models. NDF digestibility values generated by a system will be dependent on drying method, grinder type and grind size, inoculum source, buffer, and type of containment system. NDF digestibility systems that generate relevant values will 1) exhibit consistency over time, 2) generate repeatability within run, 3) be sufficiently sensitive to define differences between forages, and 4) be robust across commercial laboratory settings. These objectives are critical to a laboratory providing information of value and are necessary points to be understood by users of this information.

**Key Words:** NDF digestibility