

## Ruminant Nutrition: Beef

**277 Effect of yeast  $\beta$ -glucan and antibiotics on growth and gastrointestinal development in pre-ruminant calves.** Y. Zhou, Y. Tu,\* Q.-Y. Diao, Q. Yun, X.-H. Gao, and L.-H. Zhao, *Feed Research Institute of Chinese Academy of Agricultural Sciences, Beijing, China.*

This experiment was conducted to investigate the effect of yeast  $\beta$ -glucan and bacitracin zinc on growth performance and gastrointestinal morphological development of pre-ruminant calves. Twenty healthy Holstein male neonatal calves were randomly allotted to 4 treatments with 5 replicates each. The calves were fed diets supplemented with 0 (Treatment A), 75 mg yeast  $\beta$ -glucan/kg (Treatment B and C), 60 mg bacitracin zinc /kg (Treatment D). The experiment lasted for 28 d. Feed intake (FI) was recorded daily, body weight was measured every 2 weeks, and average daily gain (ADG) was calculated every 2 weeks. On d 21, the calves of Treatments A,B and D were challenged orally with *Escherichia coli* (O141:K99), with Treatment C fed normally. The rectal content was collected after challenged and diluted for microorganism counts. On d 28, calves were slaughtered and tissues from saccus cranialis, duodenum, jejunum and ileum were obtained and used in tissue slice. Data were analyzed using the GLM procedure of SAS software. The results showed as following: Comparing with Treatment A, the ADG of calves in Treatment B increased by 26.17% and 24.93% in the 2 phases before the *E. coli* challenged ( $P < 0.05$ ), the ADG of calves in Treatment B and D increased by 30.38% and 30.81% after the *E. coli* challenged ( $P < 0.05$ ). As for the F/G, which in Treatment B and D were significantly lower than that in Treatment A ( $P < 0.05$ ). Compared with Treatment A, the amount of *E. coli* in rectum at 12h and 24h in Treatment B and D were significantly decreased ( $P < 0.05$ ), and the amount of *Lactobacillus* was significantly decreased in the Treatment D ( $P < 0.05$ ). Compared with the control treatment, the rumen papilla height and width of yeast  $\beta$ -glucan were significant higher than the control treatment ( $P < 0.05$ ). The crypt depth of duodenum in treatment C and D were significant lower than the control treatment and the treatment D ( $P < 0.05$ ), the ratio of villous height to crypt depth (V/C) in treatment B, C and D were higher than the control treatment ( $P < 0.05$ ). It could be concluded that yeast  $\beta$ -glucan at the dosage of 75 mg/kg could erase the decrease of growth performance of pre-ruminant calves, improve the gastrointestinal morphological development and protect pre-ruminant calves, which challenged with *E. coli* K99, thus using  $\beta$ -glucan in calves feed may decreased the usage of antibiotics.

**Key Words:** calves, intestinal microflora, yeast  $\beta$ -glucan

**278 Effect incremental levels of exogenous enzyme preparation on extent of ruminal fermentation, nutrient digestibilities and average daily gain in steers.** H. Gado\*<sup>1</sup>, A. Z. M. Salem<sup>2</sup>, and B. E. Borhami<sup>3</sup>, <sup>1</sup>Department of Animal Production, Faculty of Agriculture, Ain Shams University, Cairo, Egypt, <sup>2</sup>Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma del Estado de México, Toluca Estado de México, México, <sup>3</sup>Department of Animal Production, Faculty of Agriculture (El-Shatby), Alexandria University, Alexandria, Egypt.

The aim of this experiment was to investigate the effect of the gradual increasing levels of an exogenous enzymes preparation (mixture of cellulase, xylanase,  $\alpha$ -amylase and proteases enzymes) in the diet on ruminal fermentations activates, nutrients digestibility and animal performance in steers. Forty 8 steers (Baladi  $\times$  Friesian, 151  $\pm$  0.95 kg BW) were randomly allocated in 3 experimental groups of the following treatments (12 steers for each): 0 (control, ENZ0), 40 (ENZ40) and 60

(ENZ60) g of ENZ/head/d. A complete randomize block design was set up and a repeated measurement in time model used to analyze the data. The ENZ doses were mixed daily with a part of their daily ration. Steers were fed a total mixed ration (TMR) contained: 11% cracked corn, 8.5% agwa (minced date), 26.5% biscuits (bakery waste), 10% sugar cane molasses, 19% sesame cake, 2% soybean meal, 6% beans, 14.2% rihan straw, 1% salt, 1% limestone and, 0.3 mixture of mineral and vitamins. Steers were fed the TMR for 206 d as experimental period. Feed and orts samples were collected twice weekly to calculate dry matter intake and animals were weighted each 2 weeks during the experiment. At the end of experiment, rumen liquor of 3 animals of each treatment (fitted with permanent rumen fistulated) was collected to determine the concentrations of volatile fatty acids (by gas liquid chromatography) and NH<sub>3</sub>-N. Nutrients digestibility were determined during the last week of the experiment, using chromium, as a marker, in fecal samples by atomic absorption spectrophotometry. Total digestibility of nutrients, was increased ( $P < 0.01$ ) by addition of ENZ (ENZ40 and ENZ60) vs control (DM, 65.1 and 69.8 vs 61.7%; CP, 66.1 and 68.9 vs 60.3%; NDF, 50.8 and 54.7 vs 41.7%; ADF, 40.8 and 43.5 vs 32.2%, respectively). Average daily gain also improved by the addition of the 2 doses of ENZ (1.45 and 1.58 vs 1.25 kg/d, respectively-  $P < 0.05$ ). Ruminal fermentation activities were improved by the addition of the 2 ENZ doses, however, VFA were higher ( $P < 0.05$ ) in ENZ40 and ENZ60 compared with ENZ0 (120 and 128 vs 100 mM/100mL, respectively), and NH<sub>3</sub>-N were higher ( $P < 0.05$ ) in the same treatments vs control (ENZ0) (65 and 63 vs 54 mg/L, respectively). Supplementing steers with ENZ could enhance animal performance, ruminal activities and nutrient digestibility in fattening steers.

**Key Words:** beef production, exogenous enzyme, steers

**279 Effect of a blend of castor oil and cashew nut shell liquid on performance, eating pattern, rumen health and carcass quality in Holstein bulls fed high-concentrate rations.** M. Devant\*<sup>1</sup>, A. Aris<sup>1</sup>, A. Bach<sup>2,1</sup>, and J. Torrent<sup>3</sup>, <sup>1</sup>IRTA-Ruminant Production, Animal Nutrition, Management, and Welfare Research Group, Torre Marimon, Caldes de Montbui, Barcelona, Spain, <sup>2</sup>ICREA, Barcelona, Spain, <sup>3</sup>Oligo Basics USA LLC, Excelsior, MN.

This study evaluated the effects of a blend of castor oil and cashew nut shell liquid (Essential, Oligo Basics, Brazil) on the performance, eating pattern, rumen health and carcass characteristics of Holstein bulls. A total of 120 bulls (295  $\pm$  2.5 kg of BW and 214  $\pm$  1.1 d of age) were divided into 2 treatments: 1) control and 2) supplemented with Essential (0.5 g/kg of concentrate as fed). Individual concentrate intake and eating pattern were recorded daily with a computerized concentrate feeder, and BW was recorded every 14 d. Rumen fluid was collected through rumenocentesis for pH and VFA analysis at d 114 of study. Animals were slaughtered after 124 d and HCW, rumen wall ulcers, papillae clumpings, parakeratosis and color, as well as liver abscesses were evaluated. Data were analyzed using a mixed-effects model with repeated measures that included initial BW, Essential supplementation, time, and the interactions among these factors, as fixed effects, and animal as a random effect. The statistical model for rumen pH included previous meal size, total daily concentrate intake and time since last meal as covariates. Essential supplementation improved ( $P < 0.001$ ) ADG (1.6 and 1.4  $\pm$  0.07 kg/d, respectively), and decreased ( $P < 0.001$ ) the CV of daily concentrate intake (14.3 and 20.4%  $\pm$  0.96, respectively) during the first 2 wk of the trial, but these differences in both parameters

were not observed thereafter. Ruminal pH, VFA, HCW and carcass characteristics were unaffected by dietary treatments. Control bulls tended ( $P = 0.08$ ) to have darker rumen walls (3.4% and 0% black, for control and Essential, respectively), more ( $P = 0.09$ ) papillae clumpings (3.5% and 0% clumping, for control and Essential, respectively), and greater ( $P = 0.10$ ) presence of liver abscesses than supplemented bulls (31.1 and 13.3%, for control and Essential, respectively). Essential® improves intake and growth during the first 2 wk of supplementation, but no further effects are observed thereafter. However, Essential tends to improve rumen wall integrity and decrease liver abscesses.

**Key Words:** beef, eating pattern, functional oil

**280 Yeast cell wall supplementation alters the performance of beef heifers during the receiving period.** T. R. Young\*<sup>1</sup>, N. C. Burdick<sup>2</sup>, J. A. Carroll<sup>2</sup>, M. A. Jennings<sup>1</sup>, J. T. Cribbs<sup>1</sup>, R. J. Rathmann<sup>1</sup>, J. R. Corley<sup>3</sup>, and B. J. Johnson<sup>1</sup>, <sup>1</sup>Texas Tech University, Department of Animal and Food Sciences, Lubbock, <sup>2</sup>USDA-ARS, Livestock Issues Research Unit, Lubbock, TX, <sup>3</sup>Lesaffre Feed Additives, Milwaukee, WI.

A study was designed to determine the effect of feeding yeast cell wall (YCW) products on feedlot performance of newly-received crossbred heifers. Heifers ( $n = 140$ ;  $225 \pm 9.4$  kg) were obtained from commercial sale barns and transported to the Texas Tech University Beef Center in New Deal, Texas. Heifers were sorted by source ( $n = 2$ ) upon arrival and arranged in a completely randomized block design (35 pens; 7 pens/treatment; 4 heifers/pen). Heifers were separated into treatment groups receiving a Control Diet (CON;  $n = 28$ ), YCW A ( $2.5 \text{ g} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$ ;  $n = 28$ ), YCW AA ( $5.0 \text{ g} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$ ;  $n = 28$ ), YCW B ( $2.5 \text{ g} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$ ;  $n = 28$ ), or YCW C ( $2.5 \text{ g} \cdot \text{hd}^{-1} \cdot \text{d}^{-1}$ ;  $n = 28$ ) and were fed for 56 d. Daily DMI was recorded and individual BW was collected every 14 d. A significant source by treatment interaction was detected, and data were analyzed accordingly. In Source 1, YCW A ( $278 \pm 8.0$  kg) and YCW C ( $285 \pm 8.1$  kg) showed a greater increase in 28 d BW compared with CON ( $272 \pm 8.0$  kg;  $P = 0.03$ ). YCW C exhibited a higher 42 d BW compared with all other treatments ( $P = 0.02$ ). From d 0 to 28, YCW A ( $1.87 \pm 0.09$  kg) and YCW C ( $2.10 \pm 0.10$  kg) had higher ADG compared with CON ( $1.65 \pm 0.09$  kg;  $P = 0.03$ ). YCW C showed improved ADG from d 0 to 42 compared with all other treatments ( $P < 0.01$ ). DMI was improved for YCW AA ( $7.27 \pm 0.20$  kg) and YCW C ( $7.92 \pm 0.23$  kg) compared with CON ( $6.75 \pm 0.20$  kg;  $P = 0.04$ ) for d 0 to 42. YCW C had higher DMI vs. CON from d 14 to 28 and d 28 to 42 ( $P = 0.05$  and  $0.02$ , respectively). Cumulative F:G was lower for YCW B compared with all other treatments ( $P = 0.03$ ). In Source 2, a linear effect for YCW A was detected from d 0 to 14 in BW, ADG, and G:F ( $P = 0.01$ ,  $0.02$ , and  $0.03$ , respectively). Collectively these data suggest that YCW supplementation can offer advantages in performance of newly received beef heifers.

**Key Words:** cattle, performance, yeast

**281 Feedlot performance of Nellore young bulls fed biodiesel coproduct.** R. L. Oliveira\*<sup>1</sup>, C. H. da Cruz<sup>1</sup>, N. B. de Santana Filho<sup>2</sup>, W. G. Cerutti<sup>3</sup>, C. A. dos Santos Dias<sup>2</sup>, E. I. de Souza Costa<sup>1</sup>, O. L. Ribeiro<sup>1</sup>, A. G. Leão<sup>1</sup>, M. C. A. Santana<sup>1</sup>, and A. A. Pinheiro<sup>1</sup>, <sup>1</sup>Universidade Federal da Bahia, Salvador, Brazil, <sup>2</sup>Universidade Federal do Recôncavo Baiano, Cruz Das Almas, Brazil, <sup>3</sup>Universidade Federal de Santa Maria, Santa Maria, Brazil.

Feedlot performance of Nellore young bulls fed diets with different levels of palm kernel cake (PKC) was evaluated by analysis of average

daily weight (ADW), dry matter intake (DMI) and feed conversion ratio (FCR). Thirty-two Nellore breed young bulls ( $420 \pm 2.0$  kg) were used in a completely randomized experimental design and allocated into 4 treatments: 0, 7, 14 and 21% PKC inclusion on DM basis. Diets consisted of forage (Tifton-85 hay, as 35% of diet), concentrate (corn and soybean meal and palm kernel cake) and mineral salt. The animals were fed during 92 d and weighted at the beginning of the experiment and every 28 d, after fasting for 16 h. Feeding level was adjusted according to individual intake to remain between 10 and 20% of orts. FCR was obtained using the ratio between DMI and ADW. Data were submitted to regression and variance analysis using a significance level of 5%. The bulls' DMI and ADW average were, respectively, 10.16 and 1.15 kg per day. There were no effects of PKC level ( $P > 0.05$ ) on the animal's ADW (SE = 0.06) and FCR (SE = 0.85). The DMI ( $P = 0.037$ , SE = 0.32) linearly decreased ( $\hat{Y} = 11.235 - 0.1021X$ ) as PKC was included to the diet. PKC addition to a diet of Nellore young bulls did not compromise feedlot performance on despite of the decreasing on DMI.

**Key Words:** beef cattle, palm kernel cake, performance

**282 Effect of corn oil or corn protein supplementation on performance and rumen fermentation characteristics of feedlot lambs consuming a 90% concentrate diet containing 30% DDGS.** C. L. Shelley,\* M. Pimentá, J. Caballero, J. Browne-Silva, S. L. Lodge-Ivey, and S. A. Soto-Navarro, New Mexico State University.

Feeding values of corn dried distillers grains with solubles (DDGS) are best when included in concentrate diets at 20 to 30% of the diet. When DDGS are included at levels greater than 30%, high EE or CP content may cause a decrease of feeding value. This study evaluated effects of corn oil and corn protein supplementation on feedlot diets containing dry rolled corn (DRC) and DDGS. Twenty-one Suffolk cross wethers (average BW =  $41.8 \pm 1.95$  kg) were randomly assigned to 1 of 4 treatments and were individually fed once daily. Experimental diets were DRC based containing 10% alfalfa (DM basis). Treatments included: 1) DDGS at 30% of the diet (30%), 2) DDGS at 60% of the diet (60%), 3) DDGS at 30% of the diet containing similar EE to the 60% diet supplied by corn oil (OIL), and 4) DDGS at 30% of the diet containing similar CP to the 60% diet with protein supplied by corn gluten meal (PROTEIN). Animals were weighed on d 1 and d 56 of the 56 d experiment. Ruminal fluid samples collected on d 48 via oral lavage 4 h post feeding were analyzed for pH, VFA, ammonia, and bacterial populations. Final BW and DMI were not affected ( $P \geq 0.13$ ) by treatments. Average daily gain and G:F were 69% higher ( $P = 0.01$ ) for 30% than OIL. Ruminal pH tended to be lower for 30% than for 60% or OIL ( $P \geq 0.06$ ). Ammonia concentrations increased 47% when 60% was fed compared with 30% ( $P = 0.01$ ). Total VFA production was not affected ( $P > 0.20$ ) by treatment. Bacterial populations were analyzed using PCR-denaturing gradient gel electrophoresis (DGGE) using the 16S rDNA gene. Bacterial presence or absence was analyzed using Richness index and was not affected ( $P = 0.89$ ) by treatment. Overall, all samples were 60.21% similar in DGGE banding pattern. Animals fed OIL had the least similar DGGE banding pattern (57.73%) when compared with all other treatments. In conclusion, adding enough corn oil to match the EE of 60% DDGS decreased animal performance and resulted in shifts in bacterial populations.

**Key Words:** sheep, distillers byproducts, rumen bacteria

**283 Prospects of raising Sahiwal cow calves for veal production under tropical environment.** S. A. Bhatti\*<sup>1</sup>, K. Nazir<sup>1</sup>, M. J. Basra<sup>2</sup>, M. S. Khan<sup>3</sup>, M. Sarwar<sup>1</sup>, and M. A. I. Mughal<sup>2</sup>, <sup>1</sup>*Institute of Animal Nutrition and Feed Technology, University of Agriculture, Faisalabad, Punjab, Pakistan*, <sup>2</sup>*Livestock and Dairy Development Department, Punjab, Lahore, Pakistan*, <sup>3</sup>*Department of Animal Breeding and Genetics, University of Agriculture, Faisalabad, Punjab, Pakistan*.

Sahiwal is a tropical dairy cattle breed of Pakistan known for its heat tolerance and tick resistance. Potential of Sahiwal calves for veal production has not been explored. The objective of present study was to evaluate the growth potential of Sahiwal calves for veal production on whole milk or a combination of whole milk and milk replacer in a ratio of 50:50. For this purpose, 48 Sahiwal calves (both male and female) were assigned to 4 dietary treatments having 12 animals/treatment. Calves in the first 2 treatments were fed milk 15 or 20% of their body weight (BW) upto d 84 adjusted on weekly basis. The calves in remaining 2 treatments received the same amount of milk as in the other 2 treatments till d 21; after which 50% of the milk offered was replaced with a blend of chickpea (*Cicer arietinum*) flour and vegetable (corn) oil mixed in water (MR) till d 84. The constituted MR had 3.1, 2.8 and

14.3%, CP, EE and DM, respectively. The growth and intake data were analyzed using repeated measures analysis, with MIXED Procedures of SAS in 2 × 2 factorial arrangements. The 2 factors were feeding level and feeding source. Calves offered whole milk grew faster ( $P < 0.05$ ) and had greater weaning weights ( $P < 0.05$ ) than those offered milk + MR ( $606.4 \pm 18.1$  vs  $331.3 \pm 18.1$  g/d and  $70.4 \pm 1.5$  vs  $47.8 \pm 1.5$  kg, respectively). Greatest daily BW gain ( $656 \pm 26$  g/day) and weaning weight ( $74.6 \pm 2.1$  kg) were observed in calves offered milk 20% of body weight. Numbers of scour days were higher in calves fed milk + MR than those offered milk. Calves offered milk 15% of their body weight had the lowest production cost per kg of daily BW gain ( $\approx$ US\$3.5  $\pm$  0.1). Replacement of 50% milk with a blend of chickpea flour and vegetable oil was neither able to support growth equivalent to whole milk nor was effective for reducing feeding cost during weaning period. Greatest average daily BW gain of Sahiwal calves during 12 weeks period was 650 g/d. However, daily BW gain of calves from 5 to 8 and 9–12 weeks was 717 and 837 g/d, respectively. Sahiwal calves have a promise for being raised for veal production under tropical environments.

**Key Words:** calf nutrition, Sahiwal calves, veal