

Graduate Student Competition: ADSA Southern Section (Graduate)

179 Volatile fatty acids and biohydrogenation intermediates in continuous cultures are returned to normal by addition of potassium carbonate but not by potassium chloride. P. H. Morris^{*1}, J. G. Andrae¹, J. K. Bernard², E. Block³, and T. C. Jenkins¹, ¹*Clemson University, Clemson, SC*, ²*University of Georgia, Tifton*, ³*Arm & Hammer Animal Nutrition, Princeton, NJ*.

In previous work, an increase in milk fat percentage has been reported when lactating cattle were fed $K_2CO_3 \cdot 1.5 H_2O$, and addition of K_2CO_3 to continuous cultures of ruminal microorganisms partially or totally returned volatile fatty acid (VFA) and biohydrogenation patterns back to normal. The objective of this study was to determine if shifts in conjugated linoleic acids (CLA) and VFA observed previously with K_2CO_3 were also caused by addition of KCl. Six dual-flow continuous fermenters were fed 60 g/d of 1:1 forage (dehydrated alfalfa pellets) to concentrate mix in 2 equal portions at 0800 and 1600 h. The study was conducted as a randomized complete block design consisting of 4 blocks (4 10d periods) and 6 treatments. Treatments consisted of the following additions to the control diet; 1) 0% fat and 0% K 2) 0% fat and 3% K from K_2CO_3 3) 0% fat and 3% K from KCl 4) 3% soybean oil and 0% K 5) 3% soybean oil and 3% K from K_2CO_3 , and 6) 3% soybean oil and 3% K from KCl. Addition of K_2CO_3 but not KCl increased ($P < 0.05$) pH, although average daily pH values for all treatments were maintained between 6.1 and 6.5. Supplemental fat increased ($P < 0.05$) production rates (mg/d) of trans-10 18:1 and trans-10, cis-12 CLA, and decreased ($P < 0.05$) acetate:propionate. Addition of K_2CO_3 increased ($P < 0.05$) cis-9, trans-11 CLA outflow from 7.3 to 16.0 mg/d and increased ($P < 0.05$) trans-11 C18:1 outflow from 130.8 to 272.3 mg/d, but trans-10 C18:1 decreased ($P < 0.05$) from 221.2 to 143.6 mg/d. No effect on CLA or trans monene outflows were observed with the addition of KCl. Trans-10, cis-12 CLA outflow was not affected by addition of either K_2CO_3 or KCl. The addition of K_2CO_3 increased ($P < 0.05$) acetate:propionate at 4 h after feeding from 1.77 to 2.06 in the 0% fat diets and from 1.54 to 1.86 in the 3% fat diets. No changes in VFA were seen when KCl was added. The results of this experiment show that disturbances of VFA and biohydrogenation patterns induced by high fat were alleviated by addition of 3% K as K_2CO_3 as previously observed, but were not alleviated by the same dose of K from KCl.

Key Words: conjugated linoleic acid, biohydrogenation, potassium

180 Dietary L-arginine supplementation effects on growth and health parameters in neonatal Holstein bull calves. A. N. Vanderlick^{*1}, G. A. Holub¹, and W. T. Bissett², ¹*AgriLife Research Texas A&M University, College Station*, ²*College of Veterinary Medicine, Texas A&M University, College Station*.

The purpose of this study was to determine if calves fed 4 L of arginine supplemented milk replacer daily differed in growth and health parameters as compared with calves supplemented with alanine in heat stress conditions. Previous studies performed in piglets and calves showed increased body weight gains when supplementation of arginine was provided. Calves were supplemented with 0.484 g/d of arginine or 0.818 g/d of alanine (isonitrogenous control). Holstein bull calves ($n = 30$) < 2 d of age were assigned to a trial based on initial body weight, physical health score, and total serum protein levels. The study was conducted for 56 d from July 24 to September 17, 2011. Fecal scores (FS) of 1 to 4 (1 = hard, firm, 2 = soft, firm, 3 = no form, and 4 = watery) were recorded

daily to monitor scouring. Calves with a FS of 4 were considered to have diarrhea requiring treatment. Respiration rates and rectal temperatures (RT) were recorded at 0600 and 1800 to monitor respiratory challenges while rectal temperatures were used to monitor febrile events. If RT was greater than 39.17°C calves were treated for fever. Calves provided arginine supplementation had a higher frequency of treatments for fever (0.957 treatments/d vs 0.03133 treatments/d, $P = < 0.0007$) than calves given alanine for the duration of the study; however, rectal temperatures in the AM or PM did not differ significantly for the 2 treatments. All growth parameters including body weight, hip height, hip width, wither height, heart girth, and cannon bone length were not significantly different for treatment by week, nor for the duration of the trial. Other health parameters including AM and PM respiration rates, fecal score, respiratory treatment, or scour treatment did not differ significantly for treatment by week, nor for the duration of the trial.

Key Words: arginine, calves, health

181 Changes in cortisol levels with alternating access to rotating cow brushes. R. A. Black^{*1}, M. R. P. Elmore², D. L. Ray¹, A. B. Klingenfus³, B. L. Klingenfus³, J. D. Clark¹, and J. M. Bewley¹, ¹*University of Kentucky, Lexington*, ²*University of Illinois, Urbana*, ³*Harvest Home Dairy, Crestwood, KY*.

Rotating cow brushes are an environmental enrichment device for dairy cows that may satisfy grooming behavior needs. The objective of this study was to quantify changes in cortisol with alternating access to rotating cow brushes. Twenty lactating (2 groups of 10) Holstein cows were provided alternating access to a rotating cow brush (Lely Luna, Maasluis, the Netherlands) in a crossover experiment at the University of Kentucky Coldstream Dairy. Addition or removal of the brush occurred on d 0, 10, 20, 30, 40, and 50. Blood samples were collected on study days -1, 1, 5, 9, 11, 15, 19, 21, 25, 29, 31, 35, 39, 41, 45, 49, 51, 55, and 59 to establish an immediate change, short-term change, and a baseline for the alternating brush access. Samples were collected between 0800 and 0900h in the freestall, feedbunk, or holding pen with minimal added stress. Locomotion scores (Sprecher, 1997; 1 = normal, 5 = severely lame) were evaluated by the lead author. The MIXED procedure of SAS (Cary, NC) was used to assess the effect of sample day, brush access (with or without), group (1 or 2), locomotion score, and their interactions on cortisol level. Cortisol levels were normalized using a natural log-transformation. All interactions were tested using backward elimination ($P < 0.05$). No difference ($P > 0.05$) in cortisol between group 1 ($0.32 \pm 0.10 \mu\text{g/mL}$) and group 2 ($0.40 \pm 0.10 \mu\text{g/mL}$) was observed. Cortisol was not altered by changing brush access (0.40 ± 0.10 vs. $0.32 \pm 0.09 \mu\text{g/mL}$ with and without brush access, respectively, $P > 0.05$). Cortisol was lower in group 1 ($0.24 \pm 0.13 \mu\text{g/mL}$) than in group 2 ($0.43 \pm 0.13 \mu\text{g/mL}$) when access to the brush was restricted; however, no difference in cortisol was observed when brush access was permitted ($0.44 \pm 0.14 \mu\text{g/mL}$ vs. $0.37 \pm 0.14 \mu\text{g/mL}$, $P > 0.05$). A brush access \times group interaction was observed ($P < 0.05$) with higher cortisol for group 1 ($0.24 \pm 0.13 \mu\text{g/mL}$) than group 2 ($0.43 \pm 0.13 \mu\text{g/mL}$) when brush use was restricted and no differences in cortisol when brush use was permitted (0.44 ± 0.14 and $0.37 \pm 0.13 \mu\text{g/mL}$ for groups 1 and 2, respectively). Other behavioral and physiological effects of rotating cow brush use should be examined.

Key Words: rotating cow brush, cortisol, stress