

Graduate Student Paper Competition: National ADSA Production MS Oral

481 Effect of *Origanum vulgare* on ruminal fermentation, nutrient utilization, and production in dairy cows. J. A. Tekippe*¹, A. N. Hristov¹, K. S. Heyler¹, T. W. Cassidy¹, V. D. Zheljzkov², and G. A. Varga¹, ¹Pennsylvania State University, University Park, ²Mississippi State University, NMREC, Verona.

A lactating cow trial was conducted to study the effects of dietary addition of oregano (*Origanum vulgare* L.; 0, control vs. 500 g/d, OV) on ruminal fermentation, total tract digestibility, manure emissions, N losses, milk taste, and dairy cow performance. Eight primiparous and multiparous Holstein cows (80 ± 30 DIM; 6 of the cows were ruminally cannulated) were used in a switch over design with 2, 21-d periods. Cows were fed once daily. The OV material was top-dressed to the TMR. Intake of DM averaged 26 ± 0.83 kg/d and did not differ between treatments. Apparent total tract digestibility of DM, OM, NDF, ADF, crude protein, and total nonstructural carbohydrates did not differ between treatments. Rumen pH and concentration of total and individual VFA, acetate:propionate ratio, and total free amino acids concentration were also not affected by treatment. Ruminal ammonia concentration was increased by OV compared with the control (5.3 vs. 4.3 mmol/L; $P < 0.001$). Blood urea N and glucose concentrations were not affected by treatment. Average milk yield, milk fat, protein, and lactose concentrations, MUN, and SCC were unaffected by diet. Milk sensory parameters were also not affected by treatment. Fat-corrected (3.5%) milk yield and 3.5% FCM feed efficiency were increased ($P = 0.03$ and < 0.001) for OV compared with the control (42.2 vs. 40.7 kg/d and 1.63 vs. 1.53 kg/kg, respectively). Ruminal microbial N flow, urinary and fecal N losses, and manure ammonia, methane, and carbon dioxide emissions were similar between treatments. Under the current experimental conditions, supplementation of dairy cow diet with 500 g/d of *Origanum vulgare* did not affect ruminal fermentation, nutrient digestibility, and manure gas emissions. However, there is a potential for increased FCM and feed efficiency of FCM.

Key Words: *Origanum vulgare*, rumen fermentation, milk production

482 Effect of prostaglandin F_{2α} on growth of *Staphylococcus aureus* associated with bovine mastitis. C. A. Autran*¹, A. Ahmadzadeh¹, B. Shafii¹, M. A. McGuire¹, and J. C. Dalton², ¹University of Idaho, Moscow, ²University of Idaho, Caldwell R & E, ID.

Some fatty acids inhibit the growth of mastitis-causing *Staphylococcus aureus*. The objective of this study was to determine the bacteriostatic and bactericidal effects of prostaglandin F_{2α} (PGF_{2α}) on *S. aureus*. Tryptic soy broths were inoculated (1:100) with an *S. aureus* (Novel) overnight culture and subsequently treated with 0, 0.3, 0.6, 1.2 and 2.4 mg/mL of PGF_{2α} (dinoprost tromethamine). Cultures were incubated for 24 h at 37°C (with shaking at 250 rpm), and sampled at 0 h and every 3 h thereafter to determine growth, as measured by optical density at 600 nm (OD) and colony forming units (log CFU). Data were analyzed by ANOVA repeated measures using mixed procedures. Mean OD and log CFU values were not different between treatments at 0 h. There was an effect ($P < 0.05$) of treatment and treatment by time interaction on mean OD and log CFU. Overall mean OD values for PGF_{2α} treatments were different ($P < 0.05$) from control and decreased with increasing concentrations of PGF_{2α} in a dose dependent manner. Initial OD for treatments and control averaged 0.15 ± 0.11 at 0h, and the control reached 22.6 ± 0.27 at 24 h. In contrast, the 0.3, 0.6, 1.2 and 2.4 mg/mL treatments

reached OD values of 15.6, 8.1, 5.47, and 1.1 ± 0.27, respectively at 24 h post-treatment. All PGF_{2α} treatments also differed ($P < 0.05$) in mean log CFU compared with control. Initial log CFU for treatments and control averaged 8.12 ± 0.02 at 0 h, and the control reached 10.5 ± 0.04 at 24 h. The 0.3, 0.6, 1.2 and 2.4 mg/mL treatments reached 9.4, 9.0, 8.1, and 1.8 ± 0.04 log CFU, respectively at 24 h post-treatment. The mean log CFU, over a 24 h period of time, for 0.3mg/mL and 0.6mg/mL were not different from each other. However, mean log CFU for 1.2mg/mL and 2.4mg/mL were different ($P < 0.05$) when compared with each other and also compared with 0.3mg/mL and 0.6mg/mL treatments. These results provide evidence for the first time, that PGF_{2α} has both bacteriostatic and bactericidal effects on the growth of in vitro.

Key Words: *S. aureus*, prostaglandin F_{2α}, mastitis

483 Effects of partial replacement of corn grain with high fiber byproducts in calf starter on growth and ruminal pH in dairy calves during weaning transition. A. H. Laarman* and M. Oba, University of Alberta, Edmonton, Alberta, Canada.

This study evaluated the effects of partially replacing corn grain with high fiber byproducts in calf starter on growth and rumen pH in dairy calves during the weaning transition. Forty-two 2 wk old Holstein bull calves were blocked by BW and experiment start date, and offered one of 3 texturized calf starters. Control starter (CON) contained dry ground corn at 19% of dietary dry matter (DM) in the pellet. For a beet pulp starter (BP) and a triticale dried distillers' grains with solubles (DDGS) starter (DG), dry ground corn was replaced by beet pulp and triticale DDGS at 10% dietary DM. All calf starters contained steam flaked corn and steam rolled barley grain at 19 and 10% of dietary DM, and were formulated to contain 21.5% CP. Calf starter was provided ad libitum up to 2500 g/d. Calves were fed milk replacer (26% CP, 18% fat) at 1200 g/d until wk 5, and 900 g/d and 600 g/d for wk 6 and 7, respectively. Starting wk 8, when calves were completely weaned, hay was provided ad libitum. When a calf consumed at least 2450 g for 3 consecutive days, a small ruminant rumen pH-measuring device (20.6 mm diameter, 138 mm length, 245 g mass) was inserted orally to measure rumen pH continuously for 4 d. Statistical analysis was conducted using mixed procedure of SAS with fixed effects of block and treatment. Average daily gain (1.01 ± 0.02 kg/d) was unaffected by treatment. While mean rumen pH (5.78 ± 0.07) and acidosis duration (857.7 ± 38.7 min/d), time rumen pH was less than 5.8, were not affected by treatment, calves fed DG had more severe acidosis, indicated by a greater area under pH 5.8, than calves fed CON or BP (487.8 ± 57.8 vs 366.4 ± 57.8 and 325.1 ± 52.5 min × pH/d, respectively; $P < 0.05$). Mean rumen pH was positively correlated to hay intake ($r = 0.416$; $P < 0.05$) but not water intake, indicating that hay intake may play an important role in rumen pH regulation during the weaning transition in dairy calves. In conclusion, partially replacing corn grain with high fiber byproducts does not ameliorate, but may exacerbate, rumen acidosis during the weaning transition.

Key Words: rumen pH, calf starter, weaning transition

484 Effect of a pre-synchronization injection of prostaglandin F_{2α} during the voluntary waiting period on dairy cattle. K. D. Baldock*¹, M. E. Wilson², and D. L. Smith¹, ¹Eastern New Mexico University, Portales, ²West Virginia University, Morgantown.

It is a common practice on United States dairies to use a prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) injection, during the voluntary waiting period to improve reproductive management. It has been hypothesized that $PGF_{2\alpha}$ will accelerate uterine involution which may decrease the number of days open, while improving first service conception rates. Our hypothesis is that $PGF_{2\alpha}$ given during the voluntary waiting period will improve the reproductive performance of the lactating dairy cow. The objective of this experiment was to administer $PGF_{2\alpha}$ to lactating Holstein dairy cattle during the voluntary waiting period and analyze the effects on first service conception rates, number of days open, services per conception, and days to first service. Lactating, Holstein dairy cows ($n = 753$) milked 3x per day, were randomly assigned either to the control group ($n = 374$; no injection of $PGF_{2\alpha}$ between d 30 and 36 postpartum) or treatment group ($n = 379$; injection of $PGF_{2\alpha}$ between d 30 and 36 postpartum). There were no significant differences ($P > 0.28$) between the treatment and control groups in first service conception rates, number of days open, services per conception and days to first service. Some earlier research suggested a benefit to a pre-synchronization injection of $PGF_{2\alpha}$. However, other researchers reported no benefit. In all cases, low animal numbers may have contributed to inconclusive results. Based on these findings in a large sample group, the common practice of $PGF_{2\alpha}$ administered during the voluntary waiting period of dairy cattle is not a beneficial reproductive management tool.

Key Words: dairy cow, prostaglandin $F_{2\alpha}$, volunteer waiting period

485 Effects of feeding brown midrib corn silage and dried distillers grains with solubles on performance of lactating dairy cows. H. A. Ramirez Ramirez*¹, P. J. Kononoff¹, and K. Nestor², ¹University of Nebraska-Lincoln, ²Dow AgroSciences LLC, Wooster, OH.

Thirty-six Holstein cows (4 fitted with a rumen cannula), averaging 111 ± 35 DIM and 664 ± 76.5 kg BW were used in a replicated 4×4 Latin square. The objective was to investigate the effects of 2 corn hybrids, brown midrib (*bm3*) and conventional (DP) corn silages, and the inclusion of dried distillers grains and solubles (DDGS) on milk production and digestibility. In each 28 d period cows were assigned to one of 4 treatments that differed by corn silage hybrid and inclusion rate of DDGS: DP corn silage plus 0% DDGS (CON); *bm3* corn silage plus 0% DDGS (BMR); DP corn silage plus 30% DDGS (CONDG); and *bm3* corn silage plus 30% DDGS (BMRDG). Dry matter intake was affected by hybrid and DDGS ($P < 0.01$); and it was higher for cows consuming diets with *bm3* (25.8 and 24.4 ± 0.47 kg for *bm3* and DP), likewise for cows consuming DDGS (24.3 and 25.9 ± 0.47 kg/d for 0 and 30%). Hybrid and DDGS had an effect ($P < 0.01$) on total tract digestibility of NDF (NDFD). Compared with DP hybrid, NDFD was higher for *bm3* (32.5 vs. $38.1 \pm 1.79\%$). In diets containing DDGS, NDFD was 37.8 and $42.2 \pm 1.79\%$ for CONDG and BMRDG. There was an interaction ($P < 0.01$) for total concentration of volatile fatty acids (VFA) and rumen pH as the highly digestible treatment BMRDG resulted in the highest concentration of VFA and the lowest pH. Milk yield was not affected by hybrid nor DDGS ($P > 0.05$) and averaged 30.6 ± 1.09 kg/d. Compared with DP, milk protein yield (MPY) was greater ($P < 0.01$) for *bm3* (0.97 vs. 0.93 ± 0.029 kg/d), similarly MPY was greater ($P < 0.01$) for diets containing DDGS (0.98 vs. 0.92 ± 0.029 kg/d). There was a hybrid by DDGS interaction ($P = 0.02$) for milk fat yield (MFY) resulting in 1.03 , 1.08 , 0.84 and 0.78 ± 0.045 kg/d for CON, BMR, CONDG and BMRDG. Fat corrected milk (FCM) was only affected by DDGS ($P < 0.01$) and averaged 30.0 and 26.4 ± 1.0 kg/d for 0% and 30% inclusions; there was a trend ($P = 0.13$) to increase FCM when cows were fed *bm3* without DDGS. These results indicate that *bm3* corn silage and DDGS

increase DMI, NDFD and MPY; however high inclusion of corn silage with 30% DDGS reduces FCM.

Key Words: corn silage, DDGS, nutrient digestibility

486 Effects of equine chorionic gonadotropin administration during the synchronization protocol on luteal volume, progesterone concentration and embryo survival in embryo recipient lactating Holstein cows. A. G. Kenyon*¹, G. Lopes Jr.¹, L. G. D. Mendonca², J. R. Lima¹, R. G. S. Bruno¹, and R. C. Chebel^{1,2}, ¹Veterinary Medicine Teaching and Research Center, University of California Davis, Tulare, ²Department of Veterinary Population Medicine, University of Minnesota, Saint Paul.

Objectives were to determine the effects of treating embryo recipient lactating dairy cows with equine chorionic gonadotropin (eCG) during the synchronization protocol on luteal volume, progesterone concentration (P4) and pregnancy per embryo (P/ET). Cows not inseminated received the Presynch-Ovsynch (d -35 PGF, d -28 CIDR, d -21 PGF and CIDR removal, d -9 GnRH, d -2 PGF, d 0 GnRH) and cows inseminated started the resynchronization protocol (d -16 GnRH, d -9 GnRH, d -2 PGF, d 0 GnRH) 24 d after AI. Cows were randomly assigned to receive (eCG, $n = 139$) or not receive (control, $n = 152$) 800 IU of eCG on d -7. Blood was sampled on d -9, -2, 0, 7, and 14 and ovaries were examined by ultrasound on d -9, -2, and 7. Cows bearing a corpus luteum (CL) on d 7 received embryo transfer (ET). Pregnancy was diagnosed at 23 and 60 d after ET. Cows treated with eCG had more ($P = 0.03$) follicles >10 mm on d -2 than control cows (2.3 ± 0.1 vs. 1.9 ± 0.1) and there was ($P = 0.04$) an interaction between treatment and parity because eCG primiparous cows had more follicles >10 mm in diameter on d -2 than control primiparous cows (2.5 ± 0.1 vs. 1.7 ± 0.1), but there was no difference between multiparous cows (2.1 ± 0.1). Proportion of cows with estrous cycle synchronized from d -9 to d 0 was smaller ($P = 0.05$) for eCG treatment (61.0 vs. 71.7%) and fewer ($P = 0.03$) eCG cows received ET (79.1 vs. 87.5%). Among cows receiving ET, proportion with multiple CL on d 7 was not ($P = 0.35$) affected by treatment. Among cows receiving ET, eCG treatment increased ($P < 0.01$) total CL volume on d 7 (8.4 ± 0.4 vs. 6.6 ± 0.4 cm³) and tended ($P = 0.12$) to increase P4 between d 7 and 14 (4.1 ± 0.2 vs. 3.7 ± 0.2 ng/mL). Interaction between treatment and parity tended ($P = 0.07$) to affect P/ET at 60 d because eCG increased P/ET in multiparous cows (30.3 vs. 21.3%) and reduced P/ET in eCG primiparous (16.3 vs. 27.5%). Treatment with eCG reduced proportion of cows eligible to receive ET and only increased P/ET of multiparous cows.

Key Words: embryo transfer, equine chorionic gonadotropin, lactating Holstein cow

487 Adjusting milk replacer intake during heat stress and non-heat stress as a means of improving dairy calf performance. T. M. Chavez*, T. A. Wickersham, and G. A. Holub, Texas A&M University, College Station.

We evaluated the effects of varying planes of nutrition and heat stress on dairy calf performance. Holstein bull calves < 4 d of age were randomly assigned to 1 of 6 treatments arranged as a 2×3 factorial. The factorial consisted of 2 locations: inside (INS) or outside (OUT) and 3 feeding strategies: increasing amounts of milk replacer from 1.1% BW to 1.5% BW (INC), constant at 1.1% BW (CON), or decreasing from 1.6% BW to 1.2% BW (DEC). Provision of milk replacer was increased by 0.1% of BW weekly for INC and decreased by 0.1% of BW for DEC. Prior to initiating milk replacer treatments on d 9 all calves received 1.1% milk replacer per day. The BW used to determine the amount of

milk replacer fed was determined twice weekly. Calves had ad libitum access to commercial starter feed and water. Starter intake, water intake, and fecal score (1 to 4) were recorded daily. Respiration rates and rectal temperatures were collected twice daily at 0600h and 1800h. Temperatures averaged 23.0 ± 4.6 and $30.8 \pm 8.5^\circ\text{C}$ for INS and OUT, respectively; correspondingly, THI averaged 66.3 and 79.7 for INS and OUT, respectively. Over the 42 d study ADG was higher ($P < 0.01$) for INS calves compared with OUT (0.77 vs. 0.62 kg/d); however, no significant differences among feeding strategies were observed. Calves INS consumed more starter than those OUT (1.71 vs. 1.31 kg/d; $P < 0.01$). OUT calves had greater water intake than INS (3983 vs. 2228 mL/d; $P < 0.01$). INS had greater AM rectal temperatures (101.74 vs. 101.52; $P < 0.01$) while OUT exhibited greater PM rectal temperatures (102.10 vs. 101.86; $P < 0.01$). Respiration rates for OUT were greater ($P < 0.01$) in the AM and PM than INS (35.78 vs. 33.27 and 46.82 vs. 34.65, AM and PM, respectively). Alternate milk replacer feeding strategies were not effective in ameliorating the negative effects of heat stress nor did feeding strategy impact calf performance in animals subject to a more favorable environment.

Key Words: heat stress, dairy calves, milk replacer

488 Comparison of postpartum health, uterine involution, and resumption of ovarian cycles of Holstein and crossbred dairy cows. L. G. D. Mendonca*, C. C. Abade, E. M. da Silva, and R. C. Chebel, *Department of Veterinary Population Medicine, Saint Paul, MN.*

Objectives were to evaluate whether Holstein (HO) and Montbeliarde sired crossbred dairy cows (MS) differ in regards to postpartum health,

uterine involution, and resumption of ovarian cycles. Cows (HO = 46 and MS = 43) were enrolled in the study 45 d before expected calving date. Cows were examined daily from 0 to 14 DIM for diagnosis of pyrexia ($>39.5^\circ\text{C}$), retained fetal membranes (RFM), puerperal metritis, ketosis, and displacement of the abomasum (DA). At 24 DIM cows were examined by vaginoscopy for diagnosis of clinical endometritis. Starting at 14 DIM cows were examined by ultrasound every third day until 42 DIM and volume of the previous gravid and non-gravid uterine horns were recorded as well as number and size of corpora lutea (CL) and follicles class II (5-9 mm) and class III (>9 mm). At 42 DIM cytology of the uterus was performed for diagnosis of sub-clinical endometritis. Incidences of RFM (HO = 6.5, MS = 7.0%; $P = 0.89$), metritis (HO = 13, MS = 4.7%; $P = 0.12$), DA (HO = 2.2, MS = 0%; $P = 0.95$) were not different between by breed, but HO cows tended ($P = 0.07$) to be more likely to have pyrexia (HO = 54.4, MS = 34.9%) and were ($P = 0.03$) more likely to have at least one of the diseases described above (HO = 56.5, MS = 34.9%). MS cows were ($P = 0.01$) less likely to have endometritis (HO = 47.8, MS = 22%), consequently MS cows tended ($P = 0.07$) to have smaller uterine discharge score (HO = 1.7 ± 0.2 , MS = 1.1 ± 0.3). There were no ($P = 0.97$) differences in incidence of sub-clinical endometritis (HO = 14.3, MS = 10%). Breed was not associated with volume of gravid ($P = 0.70$) and non-gravid ($P = 0.27$) uterine horns from 14 to 42 DIM. Although HO cows had ($P = 0.01$) more follicles class III from 14 to 42 DIM (1.6 ± 0.1 vs. 1.2 ± 0.1), MS cows tended ($P = 0.07$) to be more likely to ovulate by 42 DIM (75.6 vs. 90.2%). Holstein cows were at higher risk for puerperal disorders and tended to be less likely to ovulate by 42 DIM.

Key Words: postpartum health, Holstein, crossbred