

59 In vitro modulation by beta-glucan and ascorbic acid of blood leukocyte toll-like receptor and acute phase cytokine expression. S. D. Eicher^{*1}, T. R. Johnson², and K. A. McMunn¹, ¹USDA-ARS, West Lafayette, IN, ²Purdue University, West Lafayette, IN.

In a previous study, neutrophil functions were decreased for calves fed a non-water soluble beta-glucan product derived from *Saccharomyces cerevisiae* in conjunction with ascorbic acid at day 7 and 28 post-transport. The objective of this study was to determine if in vitro stimulation of whole blood leukocytes with that beta-glucan plus ascorbic acid was dependent on the age of the calf. Blood samples were taken from 12 non-transported Holstein calves at 1, 3, 7, 10, 14, 18, 21, 24, and 28 days-of-age. Leukocytes were stimulated with ascorbic acid (0.3 ug/ml) and beta-glucan (0.4 ug/ml) for 1 hour, red blood cells were lysed, and RNA extracted. The RNA was subjected to real-time RT-PCR for quantification of the expression of interleukin-1 (IL-1) and its receptor antagonist (IL-1Ra), tumor necrosis factor-alpha (TNF), and toll-like receptors 2 and 4 (TLR2 and TLR4). TLR2 and TLR4 had treatment effects ($P < .05$), but not day or treatment by day interactions. TLR2 was greater ($P < .05$) for treated cells on day 7, 14, and 24 and tended ($P < .10$) to be greater on day 10. In contrast, TLR4 was only greater for treated cells on day 7 ($P < .05$) and tended to be ($P < .10$) on day 24. IL-1 had a treatment main effect and a treatment by day interaction ($P < .05$), but IL-1Ra had main effects for treatment and day ($P < .05$) and only a trend ($P < .10$) for a treatment by day interaction. IL-1 was greater for treated cells ($P < .05$) on all but day 4. IL-1Ra was greater ($P < .05$) for treated cells only on days 1, 7, 10, and 24. TNF was only different for a main effect of day ($P < .05$), but not for treatment or treatment by day interaction. Only IL-1 and its receptor antagonist expression were stimulated on day 1. On days 7 and 24 all tested receptors and cytokines had increased RNA expression. So, it appears that there are periods during which the blood leukocytes may be refractory for increased RNA expression of cytokines and toll-like receptors in response to beta-glucan and ascorbic acid stimulus.

Key Words: Innate immunity, Ascorbic acid, Beta-glucan

60 An evaluation of rumen-protected choline and a monensin controlled release capsule on the health and metabolic function of periparturient dairy cows. L. C. Zahra^{*1}, T. F. Duffield¹, S. J. LeBlanc¹, K. E. Leslie¹, T. Overton², and D. Putnam³, ¹Department of Population Medicine, Guelph Ontario, Canada, ²Department of Animal Science, Ithaca NY, ³Balchem Corporation, Slate Hill NY.

During early lactation, high-producing dairy cows undergo a phase of negative energy balance. This can lead to metabolic disorders and subsequently cause losses in production. To prevent this, ionophores are often administered to ruminants. Administration of monensin controlled release capsules (CRC) in early lactation cows improves energy balance, while choline aids in fat metabolism and transport. Choline, however, can be a limiting nutrient in lactating dairy cows. The objective of this study was to determine whether there is an interaction between these two supplements on metabolic parameters. In this study, 53 primiparous and multiparous Holsteins were randomly assigned to receive a monensin CRC 3 weeks before their expected calving date, or a topdress of 56g rumen-protected choline (RPC; Reashure[®] choline, Balchem Encapsulates, New Hampton, NY) once daily from 3 weeks before calving until 28 DIM, or both (RPC & CRC), or neither (CON).

62 Transhumance and dry-season supplementation for cattle in the Sahel. S. Fernandez-Rivera^{*}, A. Salla, P. Hiernaux, and T. Williams, *International Livestock Research Institute, Addis Ababa, Ethiopia.*

We assessed the effect of dry-season supplementation and seasonal transhumance on ADG and weaning rates of cattle in the Sahel. 108 cows (60 in Katanga and 48 in Guro-Yena, 50 km East of Niamey, Niger) were allotted to 6 treatments, i. e. factorial combinations of 3 supplement levels (0, 360 and 720 g DM/d of millet bran, 16% CP) and two management systems (year-long sedentary management and transhumance to the pastoral zone during the rainy season and to intensely cultivated areas after grain harvest). The study lasted 4 years (1999-

Blood samples were collected from the tail vein at enrollment, one week before calving, and in the first and second weeks post-calving. Body condition (BCS) was scored at enrollment and in the second week after calving. Liver biopsies were obtained from multiparous cows randomly selected from each treatment group within 48 hours of calving and 3 weeks post-calving. Daily milk records up to 60 DIM and health records were obtained. Adjusting for parity and BCS at enrollment, beta-hydroxybutyrate (BHB) levels in the first week post-calving were lower in the RPC and CRC groups than controls (934, 916 and 1466 $\mu\text{mol/L}$ respectively, $P=0.05$). Non-esterified fatty acids (NEFA) in the first week post-calving were lower in each group than in controls (CON = 0.76, RPC = 0.38, CRC = 0.47, RPC & CRC = 0.63 mEq/L, $P \leq 0.03$). Plasma aspartate transaminase (AST) in the RPC group was 73 U/L compared to 103 U/L in the RPC & CRC group at the first week post-calving ($P=0.01$). Overall, urea levels were lower in the CON group (3.95 mmol/L) than either the RPC (4.53 mmol/L) or the RPC & CRC groups (4.65 mmol/L) ($P \leq 0.05$). There were no significant differences in blood glucose or cholesterol levels between the treatment groups.

Key Words: Dairy, Choline, Metabolism

61 Metabolism and gastric transport of ergot alkaloids in ruminants grazing endophyte-infected tall fescue. N. S. Hill^{*1}, A. W. Ayers¹, J. A. Stuedemann², F. N. Thompson¹, P. T. Purinton¹, and G. Rottinghaus³, ¹University of Georgia, ²USDA-ARS, J. Phil Campbell Natural Resources Laboratory, ³University of Missouri.

Livestock grazing endophyte-infected (E+) tall fescue suffer from chronic ergot alkaloid toxicity. Ergovaline is repeatedly implicated as the toxin causing the anomaly, but little or no credible evidence exists as such. Towards that end our objective was to examine gastric metabolism and transport of ergot alkaloid in E+ tall fescue. First, in vitro ruminal digests of E+ and E- tall fescue were conducted for 0, 6, 12, 24, and 48 h and alkaloids in the aqueous fraction analyzed by ELISA and HPLC. Extracted alkaloids from the ruminal digests were tested for in vitro transport across ruminal and omasal tissues using parabiotic chambers. Secondly, three sheep each grazing E+ and E- tall fescue were anaesthetized and their right ruminal, right gastric, and mesenteric veins surgically catheterized. Whole blood was collected, plasma alkaloids extracted, and analyzed by ELISA. ELISA analysis from the ruminal digests found no alkaloids in ruminal fluids from E- tall fescue, but alkaloids in ruminal fluids from E+ tall fescue increased with time ($P < .01$). HPLC speciation of alkaloids in E+ ruminal fluids found only 9 ppb ergovaline at 0 h, which decreased to 1 ppb at 6 h. Conversely, lysergic acid concentration increased from 20 ppb at 0 h to 240 ppb at 48 h ($P < .01$). Lysergic acid was the only ergot alkaloid that transported across ruminal or omasal tissue. More lysergic acid transported across ruminal tissue than omasal tissue ($P < 0.1$) in the in vitro system. In the in vivo study, there were no differences ($P > .05$) in plasma ergot alkaloids from mesenteric or gastric veins regardless of whether sheep were grazing E+ or E- tall fescue. However, plasma sampled from the ruminal vein of sheep grazing E+ tall fescue had more (13.9 ppb) than that of sheep grazing E- tall fescue (0.56 ppb) ($P < .01$). These data indicate lysergic acid, not ergovaline, is the toxin causing fescue toxicosis and its site of absorption is the rumen.

Key Words: Fescue toxicosis, Tall fescue, Alkaloid metabolism

International Animal Agriculture

2002) in Katanga and 3 years (2000-2002) in Guro-Yena. Cows were individually supplemented for 103-134 d each year and weighed monthly, at the start and end of supplementation and at departure to and return from transhumance to the pastoral zone (98-124 d) and to the intensely cultivated areas (33-55 d). Weight loss (g/d) of non-lactating, non-late-gestating cows in the dry season was highest (-380 \pm 13) in 2002 and lowest (-258 \pm 16) in 1999 ($P < 0.01$). Over 4 years, cows receiving 0, 360 and 720 g supplement/d had ADG during the dry season of -384 \pm 10, -321 \pm 12 and -282 \pm 12 g/d, respectively ($P < 0.01$). Providing 1 kg millet bran/d decreased ($P < 0.01$) weight loss by 145 \pm 21 g/d. ADG (g/d) during the rainy season was lowest (428 \pm 20) in 2002 and highest (704 \pm 19) in 2001 ($P < 0.01$). Cows receiving 0, 360 and 720 g/d supplement during the previous dry season had ADG during the rainy season of 605 \pm 16,

590±17 and 547±18 g/d, respectively ($P<0.05$). Supplementing with 1 kg millet bran/d in the previous dry season decreased ($P=0.02$) ADG during the rainy season by 78.5±3.3 g/d. Cows in transhumance tended to gain more weight during the post-harvest season than those under the sedentary system (435±23 vs 383±22 g/d, $P=0.09$). Cows receiving 0, 360 and 720 g/d supplement during the end of the dry season weaned 0.37, 0.44 and 0.49 calves/yr (SEM=0.04; $P=0.09$). Supplementation decreases weight losses in the dry season and this effect is partially offset by lower gains during the following rainy season. Transhumance of cattle complements feed resources between the cultivated and pastoral zones, but does not affect weight changes or reproductive performance.

Key Words: Transhumance, Supplementation, Cattle

63 Effects of the recessive naked gene on postweaning fryer performance and thermo-tolerance characters in rabbits. A. D. Rogers* and S. D. Lukefahr, *Texas A&M University-Kingsville.*

This study investigated the effects of the naked gene on postweaning trait performance and thermo-tolerance characters in rabbit fryers during a 42-d growth phase in the summer of 2002 in subtropical south Texas. In 1999, a rare naked rabbit was born in El Campo, TX. "Fuzz", a Mini Lop rabbit, was mated to commercial New Zealand White does at Texas A&M University at Kingsville, which resulted in 16 F₁ litters and 113 offspring, all of which had normal fur coats. To reproduce the recessive naked gene in the homozygous state, F₁ x F₁ *inter se* matings were made between half-siblings to create an F₂ generation. In the F₂ generation, 91 weaned fryers from 18 fraternal litter groups were produced. Based on an expected 3:1 phenotypic ratio (furred to naked classes), 70 rabbits had normal fur coats and 21 rabbits were naked. Most litters produced some naked and furred kits. Fryers were randomly assigned to growing pens containing either two or three non-littermate furred or naked rabbits. Individual fryer traits included initial and final body weights and ADG, as well as respiratory rate, rectal body temperature, and ear length, which were recorded at the end of the study. Pen traits included feed intake as an indicator of feed appetite. Data were blocked for effects of fraternal-litter, random pen (within naked and furred groups), age batch, gender, and initial age of fryer as a linear covariate when analyzing body weight traits. Results consisted of naked fryers being 212 g heavier and having 2.69 g/d more rapid ADG than furred rabbits ($P<0.001$). Initial ear length was generally associated ($P<0.01$) with more rapid ADG (linear regression of 0.165±0.05 cm per g/d). Naked fryers had lower rectal body temperature (38.9 and 39.7°C; $P<0.001$) and had lower respiratory rate (119.7 and 160.6 bpm; $P<0.001$) at 1400 h compared to furred rabbits, respectively. In addition, pens of naked fryers had higher daily feed appetites by 28.8±4.5 g per fryer than pens of furred rabbits ($P<0.001$). Our results indicate that naked rabbits had better thermo-regulation ability than furred rabbits. Based on these promising results, plans for developing a new breed of naked rabbits is justified, which has the potential to contribute more meat and income for subsistence families in tropical regions.

Key Words: Rabbits, Thermoregulation, Tropical Agriculture

64 Study of some socioeconomic factors affecting small ruminant production in upland ranges of Balochistan. A. U. Hyder*¹, A. S. Lodhi², and O. U. Haider³, ¹*Department of Animal Breeding and Genetics, University of Agriculture, Faisalabad, Pakistan,* ²*Department of Clinical Medicine and Surgery, University of Agriculture, Faisalabad, Pakistan,* ³*Department of Agriculture, Qutta, Pakistan.*

This study comprised 120 sample farmers who were interviewed, out of which 32, 70 and 18 were from nomads, transhumants and sedentary

people, respectively. The literacy rate of nomads, transhumants and sedentary respondents were 1.4 percent, 18.6 percent and 27.8 percent in the study areas, while overall percentage of educated individuals was 15.8. The mean family size of the nomads, transhumants and sedentary respondents was 10.6, 12.5 and 17.3 family members, respectively. Their mean family size for all categories of respondents was 12.7 heads with the standard deviation of 5.73 heads. Almost all the roads were unpaved and unsafe in the rainy season. The overall mean distance from the metallic roads was 24.7 km. The overall mean distance from the livestock market was 32.2 km while the veterinary hospital on an average was 28.1 km away from the sample farmers in the study area. Surface wells, tube-well and karez were the major source of water in the target areas. Only 6.6 percent respondents had off farm income source while 26.2 and 67.2 percent were obtaining from agriculture and from livestock in sample areas, respectively. Nomads have no irrigated land, transhumant and sedentary respondents on average had 14.6 acres and 26.9 acres respectively. Overall, sailaba (rainfed) and khuskaba (small dams are constructed for irrigation) land holdings were 24 acres while irrigated land was 12.6 acres. Goats and sheep farming was dominant in the study area.

Key Words: Socioeconomic factor, Small ruminants production

65 Small ruminant production in upland ranges of Balochistan-cost of enterprise. A. U. Hyder*¹, A. S. Lodhi², and O. U. Haider³, ¹*Department of Animal Breeding and Genetics, University of Agriculture, Faisalabad, Pakistan,* ²*Department of Clinical Medicine and Surgery, University of Agriculture, Faisalabad, Pakistan,* ³*Department of Agriculture, Qutta, Pakistan.*

A survey study for the economic evaluation of different husbandry systems being practiced in Balochistan province of Pakistan was carried out during the year 2001-02. This study comprised 120 sample farmers out of which 32, 70 and 18 were from nomad, transhumant and sedentary husbandry systems, respectively. The stratification was based on the proportion of the farming population. The overall total annual production cost per flock was Rs. 46403.6 (1 US dollar = Rs. 58). The feeding/fodder, shepherd, grazing, health cover, shearing, marketing and miscellaneous costs were Rs. 24622.8, Rs. 12359.0, Rs. 2751.8, Rs. 3542.3, Rs. 844.1, Rs. 1430.8 and Rs. 892.6, respectively. Overall average consumption and social use was 9.0 percent of the total mean flock size. Nomads, transhumants and sedentary were marketing 27.5, 24.0 and 25.9 percent of mean flock size. Overall animals marketed were 25.0 percent of the total mean flock size. Nomads marketed 27.5 percent of their total flock, while sedentary and transhumant 24.0 percent and 25.9 percent, respectively. The overall total income from the mean flock size was calculated as Rs. 112282.0/annum. Overall average gross income was Rs. 112282.0. The Net income became Rs. 65878.4 per annum. The gross income, cost and net revenue per-animal under nomadic husbandry systems was Rs. 827.5, Rs. 294.2 and Rs. 560.1; under transhumant husbandry system, it was Rs. 918.8, Rs. 331.5 and Rs. 587.4; and under sedentary husbandry system it was Rs. 1258.5, Rs. 515.6 and Rs. 741.6, respectively. Overall benefit cost ratio was 2.4:1, however, for nomad, transhumant and sedentary husbandry systems, the benefit cost ratio were 2.8:1, 2.8:1 and 2.4:1, respectively. The poverty alleviation tools like government assistance in the form of micro-credit schemes during off season can play dramatic role in economic uplift of these lifestyles.

Key Words: Small ruminant production, Cost of enterprise

Nonruminant Nutrition: Sow nutrition

66 Nucleotides in sows colostrum and milk at different stages of lactation. C. D. Mateo*, H. H. Stein, and D. N. Peters, *South Dakota State University, Brookings, SD.*

An experiment was conducted with the objective of measuring the concentrations of CP and 5' monophosphate nucleotides (i.e., 5'AMP, 5'CMP, 5'GMP, 5'IMP, and 5'UMP) in sows' colostrum and milk. Twelve multiparity sows (Landrace x Yorkshire x Duroc) were used in

the experiment. Litter size was standardized at 11 piglets for all sows on the day of farrowing. Sows were fed an 18% CP corn-soybean meal diet throughout lactation. The experimental period comprised the initial 28 d of lactation with colostrum being collected within 12 h of farrowing and milk being collected on d 3, 7, 14, 21, and 28. Milk samples were analyzed for CP and 5'AMP, 5'CMP, 5'GMP, 5'IMP, and 5'UMP. The CP linearly decreased ($P < 0.01$) from 16.6% in colostrum to 7.7,