detect fluorescence intensity. The sperm-transporting stream is transformed into droplets that are electrically charged differently for X- and Y-chromosome-bearing sperm. Two electro-magnetically charged fields draw oppositely charged droplets towards separate collection vessels. Not all of the sperm can be sorted for a variety of reasons, for example, improper orientation of the flat surface of the sperm toward one of the sensors. Also, dead sperm are discarded in the process. For most bulls, 3000 - 5000 live sperm of each sex can be sorted/s, but sorting rates may double in the near future as technology improves. Insemination of flow-sorted sperm in six species, primarily cattle has resulted in thousands of live offspring, with an accuracy of 85 - 95% of the predicted sex. Insemination of virgin heifers with sorted frozen/thawed sperm at dosages ranging 1 - 6 x 10^6 total sperm usually results in 60-d pregnancy rates of 70 10% of unsexed controls that contain 20 x 10^6 total sperm. Rates of abortion and normality of offspring have been similar to those for unsexed controls. Bovine sex-sorted semen is currently available for purchase and commercial use in the United Kingdom, and soon will be available in other countries.

Key Words: DNA, Hoechst 33342, sex, sperm

Animal Health
Transition Cow Health

753 Effects of nonesterified fatty acids on lymphocyte functions in dairy heifers. U. Bernabucci*, D. Scalia, O. Franci, B. Ronchi, A. Nardone, and N. Lacetera, *Dipartimento di Produzioni Animali, Viterbo, Italy*.

This in vitro study was carried out to assess the effects of nonesterified fatty acids (NEFA) on DNA synthesis, immunoglobulin M (IgM), and interferon gamma (IFN-gamma) secretion of cows peripheral blood mononuclear cells (PBMCs). Concentrations of NEFA were designed to mimic those in healthy cows and cows affected with subclinical or clinical ketosis. Nine pregnant, non lactating, and non ketotic Holstein heifers were utilized as blood donors. After isolation, the PBMCs were incubated with various concentrations of NEFA (0, 0.0625, 0.125, 0.250, 0.5, 1, and 2 mmol/l). The first three concentrations of NEFA were intended to mimic those of healthy cows, whereas the others were intended to mimic those of ketotic cows. The mixture of NEFA was represented by C16:0 (30%), C16:1 (5%), C18:0 (15%), C18:1 (45%), and C18:2 (5%). The DNA synthesis was measured after stimulation of PBMCs with phytohemagglutinin (PHA, 2.5 microg/ml), concanavalin A (Con-A, 2.5 microg/ml), or pokeweed mitogen (PWM, 1 microg/ml); the IgM secretion was measured after stimulation of PBMCs with PWM (0.2 microg/ml); the IFN-gamma secretion was measured after stimulation of PBMCs with Con-A (2.5 microg/ml). Under the present culture conditions, the addition of NEFA to cell cultures was responsible for significant impairment of PBMCs functions. The DNA synthesis in PHA-, Con-A-, and PWM-stimulated PBMCs was inhibited at concentrations of NEFA of 2, 1, and 0.5 mmol/l (P ranging from ≤ 0.0001 and ≤ 0.05). The IgM secretion in PWM-stimulated PBMCs was diminished at concentrations of NEFA of 2, 1, 0.5, and 0.25 mmol/l ($P \leq 0.05$). Secretion of IFN-gamma in Con-A stimulated PMBCs was depressed at concentrations of NEFA of 2, 1, 0.5, 0.25, and 0.125 mmol/l (P ranging from ≤ 0.0001 and ≤ 0.005). Results of the present study indicate that the increases of plasma NEFA might contribute to explain the impairment of the immune response or higher incidence of infections reported for cows suffering from subclinical or clinical ketosis.

Key Words: Cows, Nonesterified fatty acids, Immunoresponse

754 Acute phase response indicates inflammatory conditions may play a role in the pathogenesis of fatty liver in dairy cows. B. N. Ametaj*, B. J. Bradford, G. Bobe, Y. Lu, R. Nafikov, R. N. Sonon, J. W. Young, and D. C. Beitz, [1]*Iowa State University, Ames, IA*.

The goal of the present study was to search for the presence of acute phase response in normal and fatty liver cows. Liver and blood samples of multiparous Holstein cows with elevated (n=4) and normal (n=4) triacylglycerols (TAG) concentrations in liver were obtained at d -4, 3, 8, 12, 14, 22, 27, and 36 postpartum and analyzed for concentrations of total lipid in liver (TLL) and tumor necrosis factor-alpha (TNF-alpha), serum amyloid A (SAA), haptoglobin (Hp), calcitonin gene-related peptide (CGRP), prostaglandin E2 (PGE2), cortisol, total cholesterol (TC), triacylglycerols (TAG), lactate, non-esterified fatty acids (NEFA), glucose, and bilirubin in plasma. Fatty liver cows reached peak TLL concentrations at d 3, 8, and 12 postpartum with 11 % (wet weight), respectively, compared with 6 % in normal cows, respectively ($P < 0.05$). Cows with fatty liver had before parturition greater plasma TNF-alpha, NEFA, and lower lactate concentrations than did cows with normal liver ($P < 0.1$). Cows with fatty liver had at the time of peak TLL concentrations, at least at one time-point, higher plasma Hp, SAA, cortisol, and NEFA concentrations and lower plasma lactate and TNF-alpha concentrations than did cows with normal liver ($P < 0.1$). Concentrations of TLL at d 12 postpartum were a) correlated positively with concentrations of plasma TNF-alpha and NEFA at 0.96 and 0.75, respectively, and negatively with plasma CGRP at -0.75 before calving, b) correlated positively with concentrations of plasma Hp, SAA, and NEFA at 0.71, 0.80, and 0.74, respectively, and negatively with plasma PGE2, CGRP, and TC at -0.70, -0.75, and -0.72, respectively, at d 3, 8, and 12 postpartum, and c) correlated positively with concentrations of plasma bilirubin and cortisol at 0.70 and negatively with plasma glucose and lactate at -0.69 and -0.75 after d 12 postpartum ($P < 0.1$). Results of this study indicate that inflammatory conditions may play a role in the pathogenesis of fatty liver. (Partly supported under CREES-USDA agreement 99-35005-8576).

Key Words: acute phase response, fatty liver, dairy cows

755 Titration of the proper dose of calcium propionate (NutroCAL) to be included in an oral drench for fresh cows. J.P. Goff*[1], T.F. Brown[2], S.R. Stokes[3], C.L. Brawley[2], and F.R. Valdez[4], [1]*USDA-Agricultural Research Service,* [2]*Tarleton State University,* [3]*Texas A&M University,* [4]*Kemin Industries*.

Periparturient cows typically suffer some degree of hypocalcemia and negative energy balance. Calcium propionate (CaProp) is a rapidly absorbed source of Ca and gluconeogenic precursors included in drenches for fresh cows. An effective dose will raise blood Ca and improve energy status . A safe dose will not excessively increase blood Ca. Seventeen cows were assigned to one of 4 treatments; 0, 0.68, 1.02, or 1.36 kg of CaProp (NutroCAL, Kemin, Des Moines, IA) in 9 L water administered using an esophageal pump at calving. Blood was collected 0, 1, 2, 3, 4, 5, 6, 12, and 24 h post-drench. Plasma Ca at time zero averaged 7.19 mg/dl. Plasma calcium levels were significantly affected ($P<.0001$) by drench. Blood Ca concentration decreased in cows receiving water only reaching a nadir of 6.16 mg/dl 3 h post calving. Drenching cows with 0.68 kg CaProp at calving significantly increased blood Ca concentration above 8.0 mg/dl within 2 h and maintained this level through the next 24h. In cows receiving 1.02 or 1.36 kg CaProp, plasma Ca concentration exceeded 10 mg/dl within 12 h. In 2 of 4 cows receiving 1.36 kg CaProp, plasma Ca exceeded 11 mg/dl within 2 h and in 1 of those 2 cows blood Ca exceeded 15 mg/dl for more than 3 hrs, which should be considered toxic. Blood B-hydroxybutyrate (OH-butyr) increased in cows not receiving CaProp, suggesting decreased energy balance. However, plasma OH-butyr decreased in cows treated with any dose of CaProp ($P=0.0025$), an indication that energy status had improved in these cows. While no problems were observed with the 1.02 kg CaProp dose, there was no advantages in terms of blood OH-butyr. Since the 1.36 kg dose of CaProp proved toxic to 1 cow, it would seem prudent to maintain at least a 2:1 toxic/therapeutic index when dosing cows. We propose that a safe and effective dose of Ca propionate is 0.68 kg in Holstein cows.

Key Words: Drench, Calcium propionate, Gluconeogenesis

756 Effects of oral drenching of glycerol on blood parameters and milk production in dairy cattle at parturition. S. R. Stokes[1], G. E. Kaiser*[2], J. P. Goff[3], and C. L. Brawley[2], [1]*Texas A&M University, Stephenville, TX,* [2]*Tarleton State University, Stephenville, TX,* [3]*USDA-ARS NADC, Ames, IA.*

Several strategies are used to overcome the reduction in dry matter intake around calving because of the deleterious effects associated with negative energy balance at the onset of lactation. The objective of this study was to determine the effects of oral drenching glycerol for cows at parturition on energy status and milk production on a commercial dairy. One hundred and one animals (seventy one cows, thirty heifers) were assigned to one of two treatments. Treatments were: 9.5 L water (C) or 1.5 L glycerol added to 8.0 L water for a total volume of 9.5 L (GLY). Drenches were administered via esophageal pump (McGrath Pump) within 6 h post-calving and again at 24 h post-calving. Prior to each drench and on d 4 and 10, blood samples were obtained from the jugular vein. Plasma was separated and frozen for subsequent analysis of glucose, non-esterified fatty acids (NEFA), and beta-hydroxybutyrate (BOHB). Milk production records were collected monthly from DHIA test weights. Concentrations of plasma glucose and NEFA were unaffected by treatment (P = 0.4495 and 0.3332 for glucose and NEFA, respectively). Plasma BOHB averaged 4.549 and 5.820 mg/dl at parturition in heifers and cows, respectively. Animals receiving GLY had reduced BOHB levels at 24 h post-calving compared to concentrations at 0 h (26 and 9 % for heifers and cows receiving GLY, respectively); however, animals receiving C experienced increased BOHB levels at 24 h post-calving compared to concentrations at 0 h (26 and 17 % for heifers and cows receiving C, respectively). Milk production averaged 34.5 and 37.1 kg per day for animals receiving C and GLY, respectively, but failed to be statistically significant due to great variation among animals within each treatment (P = 0.3455).

Key Words: Glycerol, Parturition, Ketosis

757 Effect of 14-day subcutaneous injections of several dosages of glucagon on the health of lactating dairy cows. G. Bobe*[1], B. N. Ametaj[2], D. C. Beitz[1], and J. W. Young[1], [1]*Iowa State University, Ames, IA,* [2]*Purdue University, West Lafayette, IN.*

Elevated triacylglycerol (TAG) concentrations in liver in the first weeks after calving have been associated with increased incidences of several infectious and metabolic diseases in dairy cows. Liver TAG concentrations can be decreased by continuous intravenous infusions of glucagon. We tested whether 14-day subcutaneous injections of several dosages of glucagon decrease the incidence of diseases in dairy cows. Multiparous Holstein cows (n=32) were grouped on the basis of their liver TAG concentration at d 4 postpartum into "Normal" (n=8; <10 mg TAG/g wet weight) and "Susceptible" (n=24; >10 mg TAG/g wet weight). "Susceptible" cows were assigned randomly to 3 groups and received beginning at d 8 postpartum 0 (Saline Susceptible), 2.5 (7.5 mg/d Glucagon), or 5 mg (15 mg/d Glucagon) glucagon in 60 ml saline (pH 10.25) by subcutaneous injections of glucagon every 8 h for 14 d. "Normal" cows (Saline Normal) received the same treatment as "Saline Susceptible" cows. Health was determined by measuring twice daily body temperature and flake occurrence in milk, once daily stool consistency, urinary ketones, and vaginal discharge, and twice weekly somatic cell count. "Saline Normal" cows had less mastitis than did "Saline Susceptible" cows ($P \leq 0.1$). Glucagon-treated cows had less mastitis during the subsequent lactation than did "Saline Susceptible" cows ($P \leq 0.01$). During the injection period, glucagon-treated cows had more days with elevated but not "subclinical ketotic" urinary ketone concentrations than did "Saline Susceptible" cows ($P \leq 0.05$). Body temperature, vaginal discharge, and stool was not affected by liver TAG concentrations or glucagon treatment ($P \geq 0.1$). We conclude that 2.5 and 5 mg subcutaneous glucagon injections every 8 h for 14 d beginning at d 8 postpartum improve the mammary health in dairy cows and, therefore, improve the overall health of dairy cows. (Partly supported under CREES-USDA agreement 99-35005-8576).

Key Words: Fatty Liver, Glucagon, Health

758 Effect of 14-day subcutaneous injections of several dosages of glucagon on reproductive success in lactating dairy cows. G Bobe*[1], B. N. Ametaj[2], D. C. Beitz[1], and J. W. Young[1], [1]*Iowa State University, Ames, IA,* [2]*Purdue University, West Lafayette, IN.*

Elevated triacylglycerol (TAG) concentrations in liver in the first weeks after calving decrease reproductive success in dairy cows. Liver TAG concentrations can be decreased by continuous intravenous infusions of glucagon. We tested whether 14-day subcutaneous injections of several dosages of glucagon improve reproductive success in dairy cows. Multiparous Holstein cows (n=32) were grouped on the basis of their liver TAG concentration at d 4 postpartum into "Normal" (n=8;<10 mg TAG/g wet weight) and "Susceptible" (n=24;>10 mg TAG/g wet weight) cows. "Susceptible" cows were assigned randomly to 3 groups and received beginning at d 8 postpartum 0 (Saline Susceptible), 2.5 (7.5 mg/d Glucagon), or 5 mg (15 mg/d Glucagon) glucagon in 60 ml saline (pH 10.25) by subcutaneous injections of glucagon every 8 h for 14 d. "Normal" cows (Saline Normal) received the same treatment as "Saline Susceptible" cows. Reproductive success was determined by measuring number of services, pregnancy rates, days to first heat, days to first insemination, days open, and days to conception resulting in a calf. "Saline Normal" cows had greater reproductive success in all measured parameters than did "Saline Susceptible" cows ($P \leq 0.1$). Glucagon injections, irrespective of dosage, had no effect on reproductive success of any measured parameter ($P \geq 0.1$), except that "15 mg/d Glucagon" cows were earlier in heat than did "7.5 mg/d Glucagon" cows ($P \leq 0.1$). Changes in liver TAG concentrations during the experimental period were similar in glucagon-treated and "Saline Susceptible" cows ($P \geq 0.1$). We conclude that even a slight liver TAG accumulation (>10 mg TAG/g wet weight)in the early postpartal period can be detrimental for reproductive success. Therefore, improved reproductive success can be attained by prevention/treatment of liver TAG accumulation; however, 2.5 and 5 mg subcutaneous glucagon injections every 8 h for 14 d beginning at d 8 postpartum are both not sufficient to improve reproductive success. (Partly supported under CREES-USDA agreement 99-35005-8576).

Key Words: Fatty Liver, Glucagon, Reproduction

759 The relationship of postpartum endometrial cytology and reproductive performance in dairy cows. R. Kasimanickam*, R. Foster, T. Duffield, C. Gartley, K. Leslie, J. Walton, and W.H. Johnson, *University of Guelph, Guelph, Ontario, Canada.*

Postpartum uterine disease is characterized by uterine inflammation and infection resulting in poor reproductive performance. Phagocytosis by neutrophils is the predominant uterine defense mechanism. The purpose of this study was to examine the association of endometrial cytology (EC) with reproductive performance in subclinical endometritis cows. Clinically normal cows (n=228), based on vaginoscope, at 20-33 DIM from 2 commercial dairy farms were enrolled. A thorough reproductive exam included per-rectal palpation, ultrasonography and EC. EC samples were collected from the base of the larger uterine horn using a cytobrush (Fisher Scientific Ltd.). Cytology slides were prepared by rolling the cytobrush on a microscopic slide, fixing with cytofixative (Cytoprep®, Fisher Scientific Ltd.), and staining with modified Giemsa stain (Protocol Hema-3®, Biochemical Sciences Inc.). The percentage of neutrophils (%PMN) was determined by counting a minimum of 100 cells at 400X magnification. Uterine and cervical size, %PMN, calving season, parity, peripartum diseases were included in the analysis. The analysis was performed using PHREG and LIFETEST procedure of SAS 6.12. Based on reproductive performance of cows, 18%PMN was selected as the threshold. Cows with >18%PMN had a 41% reduced risk of pregnancy over cows with <18%PMN (p=0.001). The risk of first service pregnancy was not different between >18%PMN and <18%PMN cows (p=0.2). Median days open for >18%PMN cows were 50 days more than <18%PMN cows (p<0.001). When EC was included in the model, all other variables were insignificant for the risk of pregnancy. EC at 20-33 DIM by the cytobrush technique may be a valuable predictor of the reproductive performance of postpartum dairy cows. EC should be interpreted differently if performed later as reproductive performance should be lower in cows with prolonged uterine infection.

Key Words: cytology, uterus, postpartum

760 Strategic herd selection to maximize the benefit of a Rumensin® controlled release capsule in transition dairy cows. T. Duffield*[1], R. Bagg[2], and P. Dick[2], [1]*Department of Population Medicine, University of Guelph, Guelph, Ontario, Canada,* [2]*Provel, Division of Eli Lilly, Inc, Guelph, Ontario, Canada.*

Targetted use of a Rumensin® controlled release capsule (CRC) in individual cows based on body condition score (BCS) precalving is a legitimate approach to prevention of subclinical ketosis. However, selecting individual cows for prevention within high risk herds may limit potential benefit. The purpose of this study was to compare the impact of Rumensin® CRC between herds identified to be at high risk for subclinical ketosis (SCK) and those herds at normal risk on dairy herd improvement (DHI) milk production obtained at second test day postcalving. Data from a trial conducted in 1995 in 1010 Holstein dairy cows from 25 herds was used for this retrospective analysis. These cows were randomly assigned to receive either a Rumensin® CRC or placebo CRC at 3 weeks prior to expected calving. Four criteria for identifying herds at increased risk of SCK were used: incidence of displaced abomasum > 5% (DA, 9 herds), prevalence of fat cows (BCS ≥4.0) precalving > 10% (Fat cows, 13 herds), > 40% of cows at first DHI test with a protein to fat ratio < 0.75 (Low PFR >40%, 10 herds), > 20% of cows with serum beta-hydroxybutyrate ≥1400 umol/L in week 1 or 2 postcalving (SCK >20%, 13 herds). Least squares means of milk production at second DHI test were generated to compare between treated cows within high and normal risk herds using the mixed procedure in SAS and controlling for days in milk, parity, season of calving and the random effects of herd. The table below illustrates the milk production (kg/d) response to Rumensin® CRC in normal and high risk herds using these 4 criteria. The data indicates that any of these 4 criteria could be used to assign risk of subclinical ketosis at the herd level. A significant increase in milk production at second DHI test is observed with whole herd use of Rumensin® CRC in transition cows in high risk herds. Within low risk herds, individual cow selection for Rumensin® CRC based on BCS might be more cost-effective.

	High Risk Herds			Low Risk Herds		
Criteria	Rumensin®	Control	P	Rumensin®	Control	P
DA >5%	37.6	35.5	0.002	36.5	36.4	0.73
SCK >20%	37.3	35.8	0.01	36.6	36.4	0.82
Low PFR >40%	38.2	36.8	0.03	36.0	35.6	0.41
Fat Cows >10%	37.3	36.1	0.03	36.2	35.8	0.50

Key Words: Rumensin, Subclinical ketosis, Controlled release capsule

761 Effect of method of delivery of Rumensin® on metabolic parameters in the periparturient dairy cow. T.M. Osborne*[1], K.E. Leslie[1], T. Duffield[1], B. McBride[1], T. Geishauser[1], R. Bagg[2], and G. Vessie[2], [1]*University of Guelph,* [2]*Elanco Animal Health, Division of Eli Lilly Canada Inc.*

Subclinical ketosis causes significant economic losses for dairy producers by decreasing milk production and increasing periparturient disease. In previous studies, Rumensin® Controlled-Release Capsule (CRC) has been shown to decrease the incidence of subclinical ketosis and periparturient disease. The objective of this study was to compare the efficacy of Rumensin® CRC to Rumensin® Premix in reducing the incidence of subclinical ketosis. A total of 136 multiparous and primaparous periparturient cows from the Elora Dairy Research Station, Elora, Ontario, Canada were enrolled at 3 weeks prior to their expected calving date. Animals were blocked based on parity and season and randomly assigned to one of three treatment groups (negative control, CRC or premix group) within each block. Rumensin® Premix was included in the diet at 22 ppm. Blood was collected at enrollment, one week prior to calving, on the day of calving, and at one and two weeks post-calving. Serum was analyzed at the Animal Health Laboratory, University of Guelph for beta-hydroxybutyrate (BHBA), glucose and non-esterified fatty acids (NEFA) concentrations. Results for BHBA, glucose and NEFA concentrations by treatment group and by time relative to calving are shown in Table 1. Over time, Rumensin® had a significant impact on BHBA and NEFA. There was a significant treatment by time interaction for BHBA. It appears that both Rumensin® CRC and Rumensin® Premix have a significant impact on reducing BHBA concentrations in the periparturient dairy cow.

Parameter	Time	Overall	p-value	Control	CRC	Premix	p-value
BHBA	Pre	545	0.002	554	530	556	0.007
umol/L	Calving	633		678	608	602	
	Post	816		1023	718	720	
Glucose	Pre	2.90	0.520	2.88	2.98	2.86	0.241
mmol/L	Calving	3.30		3.44	3.02	3.44	
	Post	2.36		2.16	2.43	2.50	
NEFA	Pre	0.32	0.050	0.32	0.30	0.33	0.160
mEq/L	Calving	0.72		0.84	0.66	0.67	
	Post	0.44		0.48	0.40	0.45	

Key Words: Periparturient dairy cow, Ionophores, Metabolic parameters

762 Associations of serum vitamin A and E concentrations with health in peripartum dairy cows. S.J. LeBlanc*[1], T.H. Herdt[2], T.F. Duffield[1], and W.M. Seymour[3], [1]*University of Guelph, Ontario, Canada,* [2]*Michigan State University, E.Lansing, MI,* [3]*Roche Vitamins, Parsippany, NJ.*

The objective of this field study was to measure the association of selected antioxidants in serum with risk of peripartum disease. Beginning 1 week before expected calving, samples were collected weekly until the first week postpartum for measurement of serum α-tocopherol (α-T), cholesterol, β-carotene (β-C), and retinol (RET) concentrations. The occurrence of retained placenta for > 24 hours (RP), toxic metritis, clinical mastitis, and displaced abomasum (DA) within 30 days of calving, was recorded. Data were available from 1073 cows in 19 herds. Thresholds representing the quartile values for each vitamin variable were screened for association with disease risk. Final models were generated using logistic regression, adjusted for the correlation of cows within herd, season of calving, and parity. Concentrations of α-T, β-C, and RET declined sharply from 10 days prepartum until 3-5 days postpartum, whereas α-T:cholesterol mass ratio (α-T:C) was stable until declining sharply 1-2 days postpartum. There was no consistent relationship between serum α-T or α-T:C and the risk of RP, metritis, mastitis or DA. The incidence of RP was 15%. In the last week prepartum, cows with β-C $\geq$ 1.0 mg/ml were 1.6 times (P = 0.01) more likely to have RP, whereas cows with serum RET $\geq$ 175 ng/ml were half as likely (P = 0.006) to have RP as cows below those thresholds. The incidence of mastitis was 9.7% with median time to diagnosis of 2 days postpartum. Cows with serum retinol concentration $\geq$ 175 ng/ml in the last week prepartum were less than half as likely (odds ratio (OR) = 0.42, P = 0.01) to have clinical mastitis as cows below that threshold. The incidence of DA was 4.7%. Accounting for the effects of RP and ketosis, cows with serum retinol concentration $\geq$ 175 ng/ml in the last week prepartum were one third as likely (OR = 0.34, P = 0.0002) to have DA. Antioxidant status is a critical factor in the pathogenesis of disease in peripartum dairy cows. The optimum level and means of supplementation of vitamins A and E remain to be clarified.

Key Words: Retinol, Disease, Tocopherol

763 Influence of days fed a close-up dry cow ration and heat stress on subsequent milk production in western dairy herds. R.B. Corbett*[1], [1]*Dairy Health Consultation.*

Dairycomp 305 records were analyzed to determine the impact the number of days cows were offered a close-up prepartum ration had upon subsequent milk production. Data were collected for one-year from five commercial dairies in the western US (total of 13,000 cow records). Cows were divided into four groups based on the number of days they received the close-up dry cow ration prior to calving. Group 1 = 1-7 days (736 cows), Group 2 = 8-14 days (1224 cows), Group 3 = 15-21 days (2260 cows) and Group 4 was more than 21 days (7648 cows). The close-up dry cow rations were formulated to have a negative dietary cation-anion difference using BioChlor (Biovance, Omaha, NE). Crude protein ranged from 16.8 to 17.4% and DCAD ranged from #147 meq/kg to #233 meq/kg of dry matter. The average projected 305 day milk production was 9,242 kg, 9,740 kg, 10,169 kg and 10,350 kg for Groups 1, 2, 3 and 4 respectively. This represented increases of 5.39% between Group 1 and Group 2; an increase of 4.53% from Group 2 to Group 3 and an increase of 10.03% from Group 1 to Group 3. A similar response was seen when evaluating first test day milk yield and peak milk production. The same animals were split into two groups to determine the effect of heat stress on the same parameters. Group A freshened between January 1st,

2000 and May 1st, 2000. Group B freshened between June 1 st, 2000 and August 1st,2000. Group A out-produced Group B consistently in all four groups according to the number of days on the close-up ration as follows: Group 1, 894 kg; Group 2, 759 kg; Group 3, 684 kg and group 4, 599 kg. The results emphasize the importance accurate pregnancy diagnosis has in generating lists for moving dry cows to ensure adequate time on the close-up prepartum ration. Cows freshening during periods of high heat stress also benefit from a longer time on the close-up ration , but produce an average of 734 kg less milk than cows calving during cooler periods.

Key Words: transition, DCAD, heat stress

764 Efficacy of two sustained-release intraruminal selenium supplements. B Renquist*[1], C Maas[2], J Oltjen[1], M Sween[1], and D Flavell[1], [1] *University of California, Davis,* [2] *Pacific Trace Minerals, Inc.*

Our objective was to test the efficacy of sustained-release selenium (Se) boluses for beef cattle. Fifty-five English breed heifers (mean initial body weight = 245.84 kg) were randomly assigned to one of four treatment groups: D1- one Dura-Se# bolus (Schering-Plough Co.) on day 0; D2- one Dura-Se# bolus on day 0 and day 121; P- one Se-365 bolus (Pacific Trace Mineral, 30 g, 10% elemental Se) on day 0; and C- control no additional Se. Heifers grazed Se deficient native foothill range without any additional supplement. Body weights and blood samples were taken for Se analysis from animals in all 4 groups at days #28, 14, 28, 49, 63, 121, 183, 293, and 365. No evidence of excess Se intake was observed (lameness, alopecia, brittle hair, coronitis). Data were analyzed in a model with Se treatment as the main effect; a log transformation for blood Se was used to make variances among treatments similar. On day 14 blood Se levels were higher for the three supplemented groups than for the control group ($p< 0.05$). On day 28 group P had higher blood Se levels than either D1, D2, or C ($p<0.05$). At days 183 and 293, the D2 had the highest blood Se levels (231.1 22.7 and 133.4 13.4 mg/L), with groups P (136.8 23.0 and 75.8 17.9 mg/L), D1 (114.3 16 and 34.8 8.8 mg/L), and C (21.26 2.8 and 15.53 2.7 mg/L) having descending Se blood levels, respectively. On day 365, groups D2 and P provided blood Se levels above the 50 mg/L that is considered deficient. Groups D1, D2, and P gained 11.2, 23.2 and 11.7 kg more than the 100.0 kg gain of the control group ($p = 0.084$, 0.0006 and 0.022, respectively). Se supplementation with the Se-365 pellet provided sufficient Se to raise the blood Se levels above deficient levels. When compared with 1 Dura-Se# bolus, the Se-365 pellet prevented blood Se levels from falling to deficient levels for a more extended period.

Key Words: Selenium, Supplement, Intraruminal

765 Evaluation of Mannan Oligosaccharide on the immune status of dairy cows and their calves. S.T. Franklin[1], K.E. Newman*[2], and M.C. Newman[1], [1] *University of Kentucky,* [2] *Venture Laboratories, Inc.*

Because of legislation against subtherapeutic antibiotic use in livestock, producers are looking for alternative products that may demonstrate similar performance, health and economic benefits. Mannan oligosaccharide (MOS) has been shown to provide benefits in a number of livestock species that are similar to antibiotic growth promoters. Among the benefits documented are increased colostrum immunoglobulin levels in sows receiving MOS. Forty cows were divided into two treatment groups by parity to evaluate the effect of MOS (10-g/h/d) on serum and colostrum immunoglobulin levels, blood parameters and vaccine antibody titers to rotavirus and calf immune status and growth. No overt differences were noted in blood parameters. Antibody titers to rotavirus vaccination following calving were numerically greater in calves from cows receiving MOS than in calves from unsupplemented cows (24,381 vs. 22,345 in colostrum and 12,777 vs. 6,809 in calf serum). Serum immmunoglobulin levels were also numerically greater 24-h post-calving in calves whose dams received MOS than calves from unsupplemented cows (IgG 1902 vs. 1718 mg/dl; IgM 278 vs. 243 mg/dl). The exact mechanism of the effect of MOS on immune function is not fully understood, but improved immune status of the calf may provide an aid in performance and a reduction in the use of antibiotic use in milk replacer formulations.

Key Words: oligosaccharide, colostrum, calf

Goat Species

766 Feed intake and efficiency measurements in goats. J.M. Dzakuma* and E. Risch, *Prairie View A&M University, Prairie View, TX. USA.*

Two breeds of goats, the Spanish (SP) and the Tennessee Stiff-legged (TS), were fed three levels (100% or *ad libitum*, 85% and 70% of *ad lib*) of the same ration containing, approximately, 18%CP and 65% TDN. These goats were classified as intermediate (SP=47.5 kg) and small (TS=36.8 kg) mature sizes. They were individually penned and fed. Feed intake, orts, excreta, and bi-weekly weights were collected until yearling age. After weaning at, approximately, 70 d, 48 goats (24M and 24F) from each breed were divided into three groups of 8, by sex, and placed on the ration. Twenty-four goats (4M and 4F from each dietary level) were slaughtered at 6 mo of age. The other 24 goats were slaughtered at 13 mo and carcass data collected. The objective of this study is to understand nutrition, genotype and management interactions. Adjusted weaning(WN) wt, WNWT = BRWT + 70(ADG birth to weaning). Average Daily Gain, ADG = Wt gain/Interval in days. Feed Efficiency, FE = Wt gain/Feed consumed. ADG post-weaning and FE were calculated between WN and 6 mo and between 9 and 13 mo, corresponding to when data were collected. Analyses of all variables were performed using the GLM procedure in SAS (1998), with dietary level, breed and sex as main effects, and their secondary effects. No statistically significant differences were observed in feed intake amounts between the SP and the TS breeds throughout the duration of the study. Cumulative amount of feed intake for the SP and the TS goats, respectively, from WN to 6 mo were, 51.3 and 50.5 kg, and from 6 to 13 mo were, 67.7 and 66.7 kg. The TS, being a smaller size breed, ate the same amount of feed ($P>.05$) as the SP, an intermediate sized breed. Calculated FE were: (SP_{wn-6mo}=.122 kg per kilogram of feed consumed vs TS_{wn-6mo}=.167 kg per kilogram of feed consumed ($P<.01$) and SP_{6-13mo}=.088 kg per kilogram of feed consumed vs TS_{6-13mo}=.104 kg per kilogram of feed consumed) and ADG: (SP_{wn-6mo}=.058 kg vs TS_{wn-6mo}=.083 kg ($P<.01$) and SP_{9-13mo}=.034 kg vs TS_{9-13mo}=.038 kg). It would appear the TS is growing more efficiently than the SP. The project has been repeated with the addition of Boer, a large mature breed size, and will be reported. Knowledge of the interactions of feed intake, genotype and body composition changes will help characterize growth curves in goats.

Key Words: Spanish, Tennessee Stiff-legged, Goats, Feed Intake, Feed Efficiency

767 Prediction of energy requirements for maintenance and gain of growing goats. J. Luo, A. L. Goetsch, and T. Sahlu, *E (Kika) de la Garza Institute for Goat Research, Langston University, OK.*

Literature data were compiled and a database was constructed to estimate ME requirements for maintenance (ME_m) and BW gain (ME_g) for three different biotypes of growing goats (i.e., $\geq$ 50% Boer or meat, dairy, and indigenous) by regressing ME intake (MEI, kJ/kg $BW^{0.75}$) against ADG (g/kg $BW^{0.75}$). Because of differences among biotypes in intercepts and slopes ($P < 0.05$), data subsets for the different biotypes were used. The meat subset included 60 observations from 11 publications, representing 548 goats; the dairy subset had 116 observations from 25 publications with 1,851 goats; and there were 157 observations from 34 publications and 1,024 goats in the indigenous subset. Dairy and indigenous subsets were split into two groups-one for equation development and a second for evaluation. Observations with residuals greater than 1.5 times the residual SD from initial regressions were deleted. Equations were meat: MEI = 457.0 (SE = 22.3) + (25.23 (SE = 1.74) × ADG) ($n = 57$; $R^2 = 0.79$); dairy goats (development subset, $n = 63$): MEI = 573.7 (SE = 46.2) + (23.56 (SE = 3.10) × ADG) ($n = 56$; $R^2 = 0.52$); and indigenous (development subset, $n = 87$): MEI = 500.0 (SE = 11.9) + (18.59 (SE = 1.64) × ADG) ($n = 76$; $R^2 = 0.63$). Intercepts and slopes from regressions of observed against predicted MEI with evaluation subsets based on dairy and indigenous equations were not different from 0 and 1, respectively. Prediction equations for the three biotypes