T164 Effects of low doses of bST during transition period on milk component percentages and yields and milk production of Holstein cows. M. S. Gulay*[1], M. Liboni[2], A. Garcia[3], M. J. Hayen[2], T. Belloso[2], and H. H. Head[2], [1]*Department of Physiology, Burdur Veterinery Faculty, Akdeniz University, Burdur, Turkey,* [2]*Department of Animal Sciences, University of Florida, Gainesville,* [3]*Universidad del Zulia, Facultad de Veterinaria, Universidad del Zulia, Maracaibo, Venezuela*.

Experiment was designed to evaluate whether supplementing Holstein cows with low doses of bST during the transition period affected milk constituent percentages and yields, and milk production. Data obtained from three hundred forty six multiparous Holstein cows from four separate trials were combined for analyses. Cows in bST supplemented group (n=177) received biweekly POSILAC® to provide approximately 5.1 or 10.2 mg bST/d beginning approximately 21 d (±3 d) before expected calving and continued through 42 d (±2 d) postpartum, whereas control cows (n=169) were not supplemented with bST during the same time period. Milk samples were collected the same day each week at three consecutive milkings during the first 9 wk of lactation for analyses of milk constituents. Proc Mixed procedure was used for data analyses and analyses were included treatment, trial, the two-factor interaction, and wk. No apparent calving problems were associated with bST. Overall, the percentages of fat and protein, and SCC were affected by trial ($P<0.01$), but not the milk yield. During first 9 wk of lactation no differences due to bST were observed in percentages of protein (2.87±0.02 vs. 2.85±0.02) or fat (3.92±0.04 vs. 3.92±0.04). However, control cows had greater SCC than treated during the first 9 wk of lactation (438±46 vs. 288±47 x10^3; $P<0.04$). Supplemented cows had greater mean yields of milk fat, milk protein and milk (1.54±0.03, 1.18±0.03 and 39.4±0.8 kg/d, respectively; $P<0.01$) than non-supplemented control cows (1.41±0.03, 1.07±0.03 and 36.2±0.7 kg/d, respectively). The SCC of cows supplemented with a low dose of bST was significantly less even though MY of the treated cows was greater. This implies that a low dose of bST supplemented during transition period may have a potential role in reducing incidence of mastitis in dairy cows without affecting percent fat and protein in milk.

Key Words: Transition Cow, bST, Milk Constituents

T165 Response of milk yield and reproduction to bovine somatotropin (bST) in low and high producing Holstein cows. S. A. Mosley*[1], M. A. McGuire[1], W. Stouder[2], M. F. McGrath[3], J. L. Vicini[3], and S. C. Denham[3], [1]*University of Idaho, Moscow,* [2]*Stouder Holsteins, Wendell, ID,* [3]*Monsanto Co., Chesterfield, MO*.

Sixty-four Holstein cows were selected on milk production from the top and bottom one-third of the herd. Cows were then blocked by parity and randomly assigned to receive bovine somatotropin (bST, Posilac, Monsanto Co.) or no injection starting the 9th or 10th wk of lactation. Biweekly bST injections continued up to 24 injection cycles. Monthly test day was used for milk yield, and body condition (5 pt scale by 0.25 units) determined by a single evaluator was recorded monthly. Reproductive data were recorded using the farms record system. The Proc Mixed procedure of SAS was used to evaluate the effects of parity, bST, production level, all possible interactions and a covariate representing the deviation from production level block. No significant effect of any interaction ($P>0.2$) was detected for milk production but effects of parity ($P<0.006$), production level ($P<0.011$) and bST ($P<0.07$) were detected. Multiparous cows produced 4.4 kg/d more milk than first lactation animals. Production levels across lactation were 34.6 and 30.6 kg/d for high and low groups. Response to bST across parities and production level was 2.9 kg/d. Over the entire lactation, average body condition was reduced in primiparous cows by both production level ($P<0.0001$) and bST (3.20 for low control vs 3.08 for low bST compared to 3.01 for high control vs 2.96 for high bST; $P<0.002$). In multiparous cows, average body condition was lower due to bST (0.25 points for low production cows and 0.14 points for high production cows; $P<0.0001$). However, irrespective of production level or bST, body condition score increased from initiation of bST treatment to cessation of treatment. There were no differences in days open (primiparous = 99.6 d and multiparous = 123.9 d) or services per conception (primiparous = 2.0 services and multiparous = 2.7 services) due to production level or bST. High and low producing cows respond to bST without any differential effects on reproduction.

Key Words: Bovine Somatotropin, Milk Yield, Body Condition Score

T166 Lactation persistence is enhanced in transgenic mice overexpressing des(1-3)hIGF-I in the mammary gland. D. L. Hadsell*[1,2], D. T. Torrres[1,2], J. George[1,2], G. S. Shelton[1,2], and M. L. Fiorotto[1,2], [1]*USDA/ARS Childrens Nutrition Research Center, Houston, TX,* [2]*Baylor College of Medicine, Houston, TX*.

Transgenic overexpression of IGFs within the mammary gland during lactation delays involution and inhibits apoptosis. The goals of this study were; 1) to determine if mammary apoptosis was associated with increased oxidative damage and decreased milk yield during prolonged lactation, and 2) to test the hypothesis that overexpression of des(1-3)hIGF-I within the mammary glands of transgenic mice (WAP-DES) would increase lactation persistence. Mammary morphology, apoptosis, proliferation and protein carbonyl content were compared among normal mice (N=3-13) during early and prolonged lactation. Persistence was compared among nontransgenic (N=9) and WAP-DES (N=13) mice by measuring the weight gain of cross-fostered litters (10 pups/litter) from day 14 to 35 postpartum. Apoptosis and proliferation were measured using immunohistochemical markers. Proliferation was highest on day 2 (6.3±0.5 and 18.3±1.8 % for phospho-histone H3 and BrdU, respectively) decreased dramatically on day 3 (1.8±0.5 and 3.1±2.0 %, respectively), and remained low throughout the rest of lactation. Apoptosis was low throughout lactation (0.3±0.04 and 0.1±0.01 % for TUNEL and active-caspase 3, respectively). Protein carbonyl content, as measured by dinitrophenyl-hydrazine reactivity, peaked on day 2 postpartum (0.4±0.2 nmole/mg), decreased on day 5 (0.2±0.1 nmole/mg), and remained low through the rest of lactation. Litter gain dropped in both nontransgenic and WAP-DES mice beginning on day 21 postpartum. By day 35, litter gain was 6.6±2.6 and 2.4±2.7 gm/wk for the WAP-DES and nontransgenic mice, respectively. Mammary gland wet weight at day 35 was also greater in WAP-DES mice than their nontransgenic counterparts (448±24 and 346±25 mg, respectively). Milk composition, however, was similar among genotypes. These data support the conclusion that neither increased apoptosis nor oxidative damage is responsible for declining milk yield during prolonged lactation. The data also support the conclusion that overexpression of des(1-3)IGF-I allows for the maintenance of a greater mammary tissue mass and enhanced lactation persistence. Supported by USDA NRI grant number 2001-35206-11145.

Key Words: IGF, Transgenic, Persistence

T167 IGF-I and TGF-α activate different upstream signaling molecules in bovine mammary epithelial cells. K. A. Hogan[2], U. Sivaprasad[1], G. Desury*[1], and W. S. Cohick[1], [1]*Rutgers,The State University of New Jersey, New Brunswick,* [2]*Rutgers, The State University of New Jersey and The University of Medicine and Dentistry of New Jersey, Piscataway, NJ*.

IGF-I and TGF-α play critical roles in growth and development of the mammary gland. We have shown that these two growth factors stimulate DNA synthesis and IGFBP-3 expression in an additive manner in the bovine mammary epithelial cell line MAC-T. However, the molecular mechanisms by which this occurs are unknown. In MAC-T cells, IGF-I and TGF-α differentially activate Akt, a downstream signaling molecule in the phosphatidylinositol 3-kinase (PI3K) pathway, over time. TGF-α activates Akt transiently while IGF-I demonstrates a slower, prolonged activation of Akt. TGF-α also mediates the rapid and transient phosphorylation of ERK 1/2, a downstream component of the Ras/Raf/MAPK pathway. While basal activation of ERK 1/2 is readily apparent in untreated cells, further activation is not observed following IGF-I treatment. These data suggested that these two growth factors may signal through different upstream molecules. To test this hypothesis, cell lysates were collected from MAC-T cells treated with IGF-I (50 to 200 ng/mL) or TGF-α (2.5 to 100 ng/mL) over time. Activation of signaling molecules was determined by immunoprecipitation or immunoblotting using phosphospecific antibodies. Following IGF-I treatment, the IGF-I receptor was phosphorylated at 1 min, with maximal activation subsiding after 5 min. Immunoprecipitation of the IGF-I receptor docking protein IRS-1 revealed activation from 1 to 15 min,

and IRS-1 coimmunoprecipitated with the p85 subunit of PI3K. TGF-α did not activate IRS-1. Neither growth factor activated IRS-2, although total IRS-2 protein was detectable. TGF-α-mediated PI3K activation could involve direct binding of the p85 regulatory subunit with the EGF receptor (EGFR) or the Src tyrosine kinase. In contrast to IGF-1, TGF-α activated the adapter protein Shc (5 to 45 min), which explains its ability to activate ERK1/2. Therefore, the additive effects of IGF-I and TGF-α on DNA synthesis and IGFBP-3 expression may be a consequence of divergence in the upstream signaling molecules recruited to their respective receptors.

Key Words: Mammary, IGF, TGF

T168 Expression of prolactin receptor, STAT5a, STAT5b and whey acidic protein in mammary tissue of lactating Large White and 50% Meishan sows. M. F. Palin and C. Farmer*, *Agriculture and Agri-Food Canada, Dairy and Swine R & D Centre, Lennoxville, QC, Canada*.

The association between mammary gland composition and prolactin receptor (PRL-R), whey acidic protein (WAP), STAT5a and STAT5b mRNA levels were investigated in sows. Twenty lactating 50% Meishan (GM) and 15 Large White (LW) sows were slaughtered on day 25 of lactation. Their mammary glands were collected for dissection of parenchymal and extraparenchymal tissues and tissue composition analyses. Parenchymal tissue samples were also collected, frozen immediately in liquid nitrogen and stored at -80°C until mRNA analyses. Semi-quantitative RT-PCR was performed to measure PRL-R, WAP, STAT5a and STAT5b mRNA expression levels. Data were analyzed using a Sudent's T test with breed as the main effect. Correlation analysis were calculated using the PROC CORR procedure of SAS. Levels of PRL-R mRNA (58.0 vs 43.3 $\pm$ 5.2, $P< 0.05$) and of STAT5a mRNA (50.5 vs 26.9 $\pm$ 5.3, $P<0.01$) were higher in GM than in LW sows and there was a tendency for STAT5b to be higher in GM than in LW (58.6 vs 47.1 $\pm$ 5.7, $P<0.10$). Correlation analyses in the overall sow population showed associations between PRL-R mRNA levels and RNA concentrations ($r=0.41$, $P<0.01$), total RNA ($r=0.33$, $P<0.05$) and RNA/DNA ratio($r=0.32$, $P<0.05$) in parenchymal tissue. Such associations were not found in GM but were present in LW sows, with correlation coefficients of 0.51, 0.48 and 0.46 for RNA concentrations ($P<0.05$), total RNA ($P<0.10$) and RNA/DNA ratio ($P<0.10$), respectively. In the overall sow population, there was an association between STAT5a mRNA levels and RNA concentrations in the parenchymal tissue ($r=0.34$, $P<0.05$), but this association was not confirmed in GM or LW sows taken separately. There was no association between mammary gland composition variables and WAP or STAT5b mRNA levels ($P>0.05$). The positive associations between the RNA content of lactating mammary glands and PRL-R and STAT5a mRNA levels suggest a possible involvement of the PRL-R signalling pathway in protein synthesis capacity of sow mammary glands.

Key Words: Mammary Gland, mRNA, Swine

T169 Expression of prolactin receptor (PRL-R) mRNA in somatic cells of bovine milk. K. J. Hohmann*, T. L. Auchtung, and G. E. Dahl, *University of Illinois, Urbana*.

Determination of the cellular function of the mammary gland using non-invasive techniques has practical implications for the dairy industry. Current research techniques utilize invasive biopsies of the mammary gland that can lead to health problems such as mastitis. Our objective was to assess the ability to use bovine somatic cells as an indicator of cellular function of the bovine mammary gland. Our laboratory has observed a positive relationship between PRL-R expression and milk production. In addition, we have established the importance of PRL sensitivity in management practices such as photoperiod and frequent milking. Therefore, we examined expression of PRL-R mRNA in somatic cells of bovine milk as an initial assessment of PRL sensitivity. To isolate the somatic cell fraction from milk, a minimum of 1 L of milk was separated into 20-50 mL fractions. The fractions were centrifuged for 10 min at 500 x g. The pellets were re-suspended in 5 mL of PBS and combined into 2-50 mL conical tubes. The tubes were then centrifuged for 10 min at 500 x g and the pellets were suspended in 5 mL of Trizol. Expression of PRL-R mRNA was performed using real-time PCR, with 18S as the endogenous reference. Somatic cells from bovine milk were found to express PRL-R mRNA. Because the somatic cell fraction contains cells of epithelial origin as well as leukocytes, the approach is being refined to further separate the somatic cells into lymphocytes, neutrophils, and epithelial (i.e., secretory) cells. Studies are underway to determine the differential expression of PRL-R in the various fractions of bovine somatic cells from animals milked at different frequencies. Observation that the somatic cell fraction contained cells that express PRL-R suggests that this approach may be a viable, non-invasive alternative to assess mammary function in lactating cows.

Key Words: Cattle, Somatic Cells, Prolactin Receptor

T170 Mammary cytokine gene expression during lactation. C. G. Prosser*, C. S. Smith, A. J. Hodgkinson, V. C. Farr, and E. A. Carpenter, *AgResearch*.

This study examined the expression of immune related genes in the mammary epithelium as a preliminary to understand the changes in immune function within the mammary gland occurring around parturition in dairy cattle.
Mammary secretory tissue was obtained from 6 Friesian-Jersey cross cows 221-235 days of pregnancy and 6 cows within 48 h of calving. Expression pattern of different immune or immune-related genes was measured by RT-PCR on total RNA extracted from the tissue.
The mRNA for IL-2, 6 10 and TNF-α were more highly expressed in tissue from all animals 48h post-calving. Whilst expression of IL-8, 12, 15 and 18 was more variable between animals, their expression levels were usually higher at this time. Very little IL-4 or 5 were detected and there was no change from pregnancy to colostrum.
A number of the cytokine genes observed to increase at the beginning of lactation are pro- or anti-inflammatory genes. The changes in their expression would indicate inflammation occurring naturally within the gland at this time in the absence of bacterial infection.

Key Words: Cytokines, Mammary, Bovine

T171 Effect of stage of lactation and parity on mammary gland gene expression. N. Miller*[1], L. Delbecchi[2], D. Petitclerc[2], B. G. Talbot[1], and P. Lacasse[2], [1]*Université de Sherbrooke, Quebec, Canada,* [2]*Dairy and Swine R&D Centre, Lennoxville, QC, Canada*.

Milk production persistency is a function of mammary epithelial cells number and activity. Therefore, factors that affect these parameters are very important for the determination of lactation persistency. Milk production tends to be higher in multiparous compared to primiparous cows, but, persistency is usually greater in primiparous cows. In this study, we compared the expression of several genes related to metabolic activity, apoptosis and endocrine control of mammary cell growth and development in 8 primiparous and 9 multiparous cows from calving to 250 days in lactation. Mammary gland biopsies were taken at early (d 10), peak (d 50) and late (d 250) lactation for gene expression evaluation. RNA isolation from mammary tissue was performed using Trizol reagent. RNA was converted to cDNA prior to analysis with real-time PCR using SYBR Green reagent. Expression of the 14 genes was normalized with the housekeeping gene GAPDH. As expected, milk production was higher ($P<0.001$) in multiparous cows than in primiparous cows at the early and peak periods of lactation. However, milk production was the same during late lactation (23.9 kg/d). The expression of all genes related to milk synthesis was not significantly affected by the lactation stage. However, gene expression of acetyl-CoA carboxylase ($P<0.05$), β-casein ($P<0.05$), lipoprotein lipase ($P<0.05$), fatty acid synthase ($P<0.05$), and stearoyl CoA desaturase ($P<0.05$) was lower during early lactation in primiparous cows. Expression of both the pro-apoptotic gene *bax* ($P<0.01$) and the anti-apoptotic gene *bcl*-2 ($P<0.05$) were higher in primiparous cows and, therefore, the ratio *bax*/*bcl*-2 was not changed. Expression of the *fos* gene was also higher in primiparous cows. There was no main effect ($P>0.05$) of parity and stage of lactation on gene expression of IGF-1, IGFBP-5, prolactin receptor (long and short isoforms) and TGF-β1. In conclusion, the level of expression of genes related to metabolic activity was lower during early lactation in primiparous cows than in multiparous cows suggesting a lower degree of cell differentiation in these animals. Differences in lactation persistency could not be related to the expression of any of the genes evaluated.

Key Words: Lactation, Persistency

T172 Long days do not alter mammary growth in prepubertal heifers. E. E. Connor*[1], A. G. Rius[2], T. L. Auchtung[2], D. L. Wood[1], P. E. Kendall[2], G. E. Dahl[2], and A. V. Capuco[1], [1]*USDA-ARS, Bovine Functional Genomics Laboratory, Beltsville, MD,* [2]*Department of Animal Sciences, University of Illinois, Urbana.*

Effects of photoperiod on growth and development have been demonstrated in many species. In cattle, long-day photoperiod reduces the age at puberty, increases growth rate and increases milk yield in lactating cows. Reported effects on prepubertal mammary growth are inconsistent. Discrepancies may be the result of separate influences of photoperiod on rate of mammary growth and duration of allometric mammary growth, which terminates peripubertally. Our objective was to evaluate mammary growth after exposure to long-day (16L:8D) or short-day (8L:16D) photoperiods during the prepubertal phase of mammary growth. Calves approximately 3 mo of age were assigned to short- or long-day photoperiods. Three calves were killed prior to treatment and 4 heifers per group were killed after 2 or 4 months of treatment (5 or 7 months of age). Effect of photoperiod on mammary growth measurments was analyzed by t-test. Photoperiod did not affect the mass of mammary parenchyma or mammary fat pad ($P > 0.05$), although both increased with age ($P < 0.05$). Similarly, total parenchymal DNA and parenchymal lipid content were unaffected by photoperiod ($P > 0.05$). These data indicate that mammary growth is not influenced by manipulation of day length during the prepubertal period.

Key Words: Photoperiod, Heifer, Mammary Growth

T173 Short term effects of different milking intervals on cisternal and alveolar milk in dairy sheep. V. Castillo*, X. Such, G. Caja, E. Albanell, and R. Casals, *Universitat Autonoma de Barcelona, Bellaterra, Spain.*

Changes in volume and composition of milk stored in the cisternal and alveolar udder compartments at different machine milking intervals (4-, 8-, 12-, 16-, 20- and 24-h) were studied in 24 lactating ewes (Manchega, MN; n = 12; and, Lacaune, LC; n = 12) during mid-lactation. Cisternal milk was obtained by milking after i.v. injection of an oxytocin receptor blocking agent, and alveolar milk was milked removed after i.v. injection of oxytocin. Milk samples from each fraction were analyzed for composition and SCC. Total and cisternal milk accumulated linearly up to 24 h in both breeds. Alveolar milk increased up to 16 h in MN and 20 h in LC and was steady thereafter. Cisternal milk increased from 33 to 65% (MN), and from 47 to 76% (LC) for 4- and 24-h milking interval, respectively. Fat content in cisternal milk decreased from 8.3 to 5.8% (MN), and from 7.5 to 4.9% for 4- and 24-h milking interval, respectively. Alveolar milk fat content did not vary according to milking interval in MN, but increased in LC from 7.5 to 8.8% for 4- and 24-h milking interval. Protein content in cisternal milk increased in MN from 5.7 to 6.8% for 4- and 8-h milking interval, and did not change thereafter; no change was observed in LC (average 5.6%). Protein content in alveolar milk did not significantly vary according to milking interval in both breeds. True protein and casein contents changed in a similar manner as protein contents for both breeds. SCC values in total milk varied quadratically ($P < 0.01$) with milking interval and ranged between 5.26 and 5.10. The greatest logSCC in milk was observed at the 8-h milking interval (5.44; $P < 0.01$). Alveolar milk contained higher logSCC than cisternal milk at 16- (5.03 vs 4.95), 20- (5.09 vs 4.93), and 24-h (5.10 vs 4.85) milking intervals. Our results suggest that the cistern plays an important role in accommodating milk at extended milking intervals in dairy sheep. Milking frequency affected cisternal and alveolar composition and quality.

Key Words: Milking Frequency, Dairy Ewes, Milk Partitioning

T174 The use of ^{13}C labeled fatty acids to study milk fat synthesis in dairy cows. E. E. Mosley* and M. A. McGuire, *University of Idaho, Moscow.*

The objective of this study was to evaluate methodology where ^{13}C labeled fatty acids are utilized to study fatty acid synthesis in lactating dairy cattle. The incorporation of ^{13}C labeled fatty acids into milk lipids was determined. Potassium salts of 5 g myristic-1-^{13}C acid (14:0), 40 g palmitic-1-^{13}C acid (16:0), or 50 g stearic-1-^{13}C acid (18:0) were separately infused into the abomasums of ruminally cannulated primiparous Holstein cows (N=3) during two treatment periods of either bolus administration of the ^{13}C labeled fatty acids over 20 min or continuously over 24 h. Following initial infusion, milk samples were taken by hand every 2 h for 48 h (12 samples each day). During this time, milk samples were also taken every 4 h after complete milking by machine (6 samples each day). Milk fat was extracted using chloroform:methanol. Fatty acids were converted to fatty acid methyl esters (FAME) by base catalyzed transesterification. The FAME were converted to dimethyl disulfide derivatives (DMDS). The FAME and DMDS were analyzed by gas chromatography mass spectrometry. Data obtained from hand and machine milk samples were similar. The ^{13}C enrichments from the bolus infusion were 4.9, 3.0, and 2.9% for 14:0, 16:0, and 18:0, respectively, at 4 h post infusion and peaked at 8 h (5.7, 7.2, and 5.3%, respectively). Enrichments for continuous infusion were 2.0% for 14:0, 1.6% for 16:0 at 4 h and 0.7% for 18:0 at 8 h, and peaked at 28 h for 14:0 (3.8%), from 20 to 28 h for 16:0 (3.5%), and from 20 to 24 h for 18:0 (1.7%). Enrichment was also detected in delta-9 desaturase products for both bolus and continuous infusions. Bolus infusion enrichments of 5.4, 1.7, and 2.1% were detected at 4 h for 14:1, 16:1, and 18:1, respectively, and peaked at 8 h for 16:1 (2.9%) and 18:1 (3.6%), and at 4 h for 14:1 (5.4%). Continuous infusion enrichments were 1.8% for 14:1 and 1.0% for 16:1 at 8 h, and 0.7% for 18:1 at 12 h, and peaked at 28 h for 14:1 (3.2%), and at 20 h for 16:1 (2.4%) and 18:1 (1.0%). Fatty acid synthesis and desaturase activity in the mammary gland can be studied using ^{13}C labeled fatty acids. Funded by the United Dairymen of Idaho and USDA-NRI.

Key Words: ^{13}C Labeled Fatty Acids, Milk Fat Synthesis, Desaturase

T175 Duration of starvation required to decrease milk production in the high-producing dairy cow. C. A. Toerien* and J. P. Cant, *University of Guelph, Guelph, ON, Canada.*

Milk synthesis can be decreased through feed removal. Our objective was to determine the length of starvation required to decrease milk production in the high-producing dairy cow without inducing detrimental metabolic effects. Holstein cows (n=3; 49±2 kg milk/d; 45±2 DIM) consuming TMR with ad lib intake were starved for a 24-h period, and refed for 18 h. Cows were milked and milk, blood and urine samples were collected at 0 h relative to the start of starvation, and every 6 h thereafter. During the starvation period, each cow received alfalfa hay (kg DM) at 6 h (3.4) and 18 h (2.8) to minimize the possible occurrence of ketosis. Compared to baseline values, milk production and its components were maintained for 18 h, possibly in part through the role of cortisol in mobilizing body reserves, thereby maintaining milk precursor availability. Cortisol levels increased during starvation and at peak were 7.5 times that at baseline. However, between 18 and 24 h of starvation, cortisol (-79%) and milk production (-31%) decreased sharply. Milk production remained at the same level ($P>0.1$) for 6 h before responding to refeeding. No clinical signs of ketosis were observed and cows consumed feed readily upon refeeding. Mean milk production (kg/d) during 3 d prior to and 3 d after the experiment, were similar (47.2±2.1 vs 46.6±2.6; $P>0.1$). In conclusion, in the high-producing dairy cow, 42% decrease in milk production can be achieved through a 24-h starvation period.

	Time (h)								
Item	0	6	12	18	24	30	36	42	SE[1]
Milk, kg	12.7	10.9	12	10.7	7.4*	7*	10.5*	14.6	0.88
Milk protein, g	339	280	299	276	201*	200*	279	365	30
Milk fat, g	676	604	536	555	470*	418*	483	511	40
Lactose, g	614	517	565	496	330*	324*	512	705	70
Plasma cortisol, pg/mL	50	53	224*	375*	81	31	41	121	30
Urinary ketones, mM	0.95	0.95	0.95	2.8	4.4	5.4	5.8	4.2	1.8

* Values differ ($P<0.05$) from baseline (0 h).
[1] Pooled SE of the lsmeans.

Key Words: Starvation, Milk Yield, Dairy Cow

T176 Lactational response to annual or biannual kidding in dairy goats. A. A. K. salama*, G. Caja, X. Such, R. Casals, and E. Albanell, *Universitat Autònoma de Barcelona, Bellaterra, Spain.*

Extended lactation may reduce the number of days dry within the animal lifetime and metabolic stress. The effects of an annual lactation cycle vs a two-year extended lactation were evaluated in 30 multiparous Murciano-Granadina dairy goats milked once-a-day throughout lactation. Goats were assigned to treatments at wk 29 of lactation and mated (**M**, n = 14) or kept open (**O**, n = 16). Milk yield (weekly from wk 2) and milk composition (biweekly from wk 30) were recorded up to wk 72. Cisternal and alveolar milk were evaluated at wk 39 (wk 10 of pregnancy) and 55 (wk 5 of subsequent lactation) by using an oxytocin receptor blocking agent (Tractocile, Ferring S.A., Madrid, Spain). Average milk yield during the first 29 wk was 2.28 L/d. Pregnancy reduced ($P < 0.05$) milk yield at wk 39 (1.19 vs 1.51), 40 (1.02 vs 1.53), 41 (0.55 vs 1.40), and 42 (0.30 vs 1.41) of lactation for M and O goats, respectively. From wk 43 to 50, M goats were in dry-off, whereas, O goats yielded 1.43 L/d. After kidding (wk 51 to 72), M goats produced 40% more milk than O goats (2.50 vs 1.51 L/d; $P < 0.001$). Milk of M goats contained lower ($P < 0.05$) log SCC (5.99 vs 6.49) than O goats. No significant changes were detected for fat, protein or lactose contents. Cisternal milk at wk 39 was lower for M than O goats (638 vs 1560 ml; $P < 0.01$), whereas, alveolar milk did not differ (345 ml). In the following lactation (wk 55) cisternal milk in M goats tripled (2063 ml) and was higher ($P < 0.01$) than in O goats (1218 ml). Similarly, alveolar milk doubled in M goats (680 ml) and was higher ($P < 0.01$) than in O goats (355 ml). Fat content was higher ($P < 0.05$) for alveolar milk (6.18%) than cisternal milk (3.74%) except for M goats at wk 39. No differences in percentages of protein and lactose, or in log SCC were detected between cisternal and alveolar milk, although cisternal milk of M goats contained lower SCC than alveolar milk at wk 55 (5.84 vs 6.09; $P < 0.05$). In conclusion, differences in milk yield between groups were clear in the last third of pregnancy and at the peak of the following lactation. Throughout 72 wk, extended lactation slightly decreased milk yield (6.9%) in our conditions.

Key Words: Pregnancy, Extended Lactation, Dairy Goats

Ruminant Nutrition II

T177 Feed intake, nutrient digestibility and nitrogen retention in beef steers fed a total mixed ration supplemented with monensin or different doses of essential oils. C. Benchaar*[1,2], E. Charmley[3], and J. Duynisveld[3], [1]*Dairy and Swine R&D Centre, Agriculture and Agri-Food Canada, Lennoxville, QC, Canada,* [2]*Nova Scotia Agricultural College, Truro, NS, Canada,* [3]*Crop and Livestock Research Centre, Agriculture and Agri-Food Canada, Nappan, NS, Canada.*

Five steers (Angus x Herford, initial BW = 244 ± 21 kg) were used in a 5 x 5 Latin square design to study the effect of dietary addition of monensin (Rumensin®; MO) or a commercial mixture of essential oils (Vertan®; EO) on feed intake, nutrient digestibility and nitrogen retention. The mixture of EO consisted of thymol, eugenol, vanillin and limonene. Steers were fed once daily for *ad libitum* intake a total mixed ration consisting of 75% of grass/legume silage and 25% of rolled barley (dry matter basis), unsupplemented (Control, CO), or supplemented with MO (220 mg/d) or with different dose levels of EO (2, 3, and 4 g/d). Each experimental period consisted of three weeks of adaptation to the experimental treatment and one week for data recording and sample collection. Data were statistically analyzed as a 5 x 5 Latin square design using the PROC MIXED procedure of SAS. Specific prior contrasts were used to test differences between CO and diets supplemented with MO and EO, and to determine the linear or quadratic response to EO dose level. Dry matter intake was not affected by the addition of MO (5.8 kg/d; $P > 0.05$). However, it was higher for steers fed EO compared to those fed CO (6.3 vs 5.8 kg/d; $P < 0.05$), and linearly increased ($P < 0.05$) with increased dietary levels of EO. Apparent digestibility of dry matter was not changed by the addition of EO or MO to the diet (70.1%; $P > 0.05$). Nitrogen digestibility was not affected by feed additives (63.3%; $P > 0.05$). However, a quadratic tendency ($P = 0.08$) was observed for EO levels in the diet. Nitrogen digestibility was increased by the addition of 2 or 3 g of EO/d, but it was decreased with the highest dose of EO. Nitrogen retention was not different ($P > 0.05$) between steers fed CO and steers receiving MO or EO. Results from this study indicate that the addition a commercial mixture of EO increased DM intake and improved nitrogen utilization in beef cattle.

Key Words: Monensin, Essential Oils, Steers

T178 Effects of phase feeding of protein on performance, blood urea N, manure N:P ratio, and carcass characteristics of feedlot cattle. J. T. Vasconcelos*[1], L. W. Greene[1], N. A. Cole[2], and F. T. McCollum, III[1], [1]*Agricultural Research and Extension Center, Texas A&M University, College Station,* [2]*USDA-ARS, Bushland, TX.*

One hundred eighty four steers (BW = 406 kg) were used in a randomized block design to determine the effects of phase feeding protein on performance, blood urea N (BUN), manure N:P ratio, and USDA carcass characteristics. Steers were assigned to 22 pens and fed ad libitum a finishing diet formulated to contain 10% roughage and 13% CP (DM basis). When steers reached 477 kg the diets were either maintained at 13% CP or reduced to 11.5% CP or no supplemental CP (approximately 10% CP). Steers were harvested when they had approximately 25 mm of external fat. Reducing the CP to 11.5% or no supplemental CP did not affect (P = 0.21) ADG of steers (1.62, 1.71 and 1.53 kg/d for 13%, 11.5% or no supplemental CP, respectively) from day of diet change to day of harvest. The ADG of steers was similar (P = 0.09) throughout the finishing period regardless of level of CP treatment (1.69, 1.86, and 1.74 for approximately 10% CP, 11.5% CP and 13% CP, respectively). Similarly, dry matter intake and feed efficiency did not differ (P > 0.05) among treatments. BUN concentrations were determined (mg/dL) on d 1, day of the diet change, and immediately before harvest. Differences (P < .0001) in BUN were observed only immediately before the harvest. Steers fed the 13% CP diet had greater (P < .0001) BUN concentration (13.85 mg/dL) than Steers fed the 11.5 % and no supplemental CP (12.08 and 10.04 mg/dL, respectively). Manure from the pen surface was collected and analyzed for N and P. No differences (P > 0.05) were observed in N (P = 0.60) and P (P = 0.93) concentrations among the different dietary treatments. The N:P ratio, however, was different (P = 0.038). The N:P ratio was influenced by treatment (P = 0.04), and was greater (3.87) for manure from 10% CP diets than for 11.5% or 13.0% diets (3.45 and 3.56, respectively). Carcass characteristics of steers did not differ (P > 0.1). Data indicate that under the condition of this study CP levels can be reduced during the final stages of finishing without effects on feedlot performance.

Key Words: Feedlot, Nitrogen, Environment

T179 Influence of sodium caseinte infusion on voluntary feed intake and digestive function in steer calves fed a Sudangrass-based growing diet. E. G. Alvarez*[1] and R. A. Zinn[2], [1]*Universidad Autonoma de Baja California, Mexicali, Mexico,* [2]*University of California, Davis.*

Four medium-frame steer calves (269 kg BW) were used in a 4 4 Latin square experiment. Treatments consisted of infusing 300 g/d of Sodium Caseinate into: 1) the rumen (Rmn), via the rumen cannula; 2) the abomasum (AbR), via rumen cannula; 3) the abomasum (Abm), via the abomasal cannula and 4) the proximal duodenum (Ddn), via the duodenal cannula. Steers were allowed ad libitum access to the basal forage-diet (sudan grass, 87.6%). There were no treatment effects (P > .20) on dry matter intake (DMI; 97 g/kg BW.75), and flow of OM, and NDF to the small intestine. Casein infusion did not affect (P > .20) ruminal degradability of dietary N. There were no treatment effects (P > .20) on ruminal NDF digestion. However, ruminal ADF digestion was greater (5%, P < .05) when casein was infused postruminally then when it was infused ruminally. There were no treatment effects (P > .20) on total tract digestion of OM, N, ADF, NDF, and GE. Casein infusion did not influence (P > .20) flow of chyme to the small intestine or ruminal turnover. Postruminal casein infusion increased (75%, P < .01) the soluble N content of duodenal chyme, but it did not affect (P > .20) its tonicity, averaging 264 mOsm. The relationship between tonicity and passage rate of chyme from the abomasum was small (R2 = .05). Casein infusion did not affect (P > .20) ruminal DM content or