animals than for set-stocked animals with a block by pasture interaction ($P<0.001$) due to trees as previously discussed. Contamination by other species (*Ostertagia circumcinta*, 8.2% and *Trichostrongylus colubriformis*, 17.4%) of larvae followed a similar pattern. A short-duration, long-rest-period, rotational grazing system on tallgrass native range can effectively control internal parasites in goats, but the presence of trees in pastures can increase parasite infestation.

Key Words: Internal parasite, Pasture rotation, Goat

772 *In situ* degradability kinetics of the diet consumed by grazing goats in a semiarid region of north Mexico. A.S. Juarez-Reyes[1], R.A. Alvarez-Gamboa[1], G. Nevarez-Carrasco[1], and M.A. Cerrillo-Soto*[1], [1]*Universidad Juarez del Estado de Durango. Durango, Dgo. Mexico.*

The objective of this study was to determine the *in situ* degradability of forage consumed by grazing goats in a thorn scrubland in the north of Mexico. Three goats fitted with rumen and esophageal cannulae belonging to a herd 360 animals were used to obtain diet samples for a period of 24 months. Two seasons were considered; dry season from January to June and rainy season from July to December. The extrusa samples collected from the previous month were placed in nylon bags (5 g DM) and incubated in the rumen of the same animals for 0, 3, 7, 12, 24, 48, 72 and 96 h. The course of DM degradation of the samples was described by using the equation $p = a + b\ (1 - e^{-ct})$. The fractions a, b, a + b, c and ED were analyzed by ANOVA according to a randomized block design. The values obtained for the soluble fraction (a), insoluble but fermentable fraction (b), potential degradability (a + b), degradation rate constant (c) and effective degradability (ED) were higher for the rainy season. The rate of DM degradation (c, %/h)registered in the dry season for both years suggest supplementation practices may be necessary.

	Season		
Fraction	Dry	Wet	sem
a (%)	30.2_a	37.8_b	0.85
b (%)	35.0_a	39.3_b	0.92
c (%)	4.1_a	5.2_b	0.20
a + b (%)	65.2_a	75.1_b	1.20
ED (%)	50.4_a	60.5_b	1.26

$_{ab}$ values with the same letter within rows do not differ (P¡.05) sem standard error of the mean

Key Words: Grazing goats, *in situ* degradability, Diet

773 In vitro maturation of caprine oocytes in different sera. P. Tajik*[1] and M. Hashemi[2], [1]*Faculty of Veterinary medicine, Islamic Azad University, Science and Research Branch,* [2]*Islamic Azad University, Tehran North Branch.*

Different protein supplements such as fetal calf serum (FCS) (Martin-Lunas et al, 1996), calf serum (CS) (Crozet et al, 1993), estrus goat serum (EGS) (Keskitepe et al, 1994) and bovine serum albumin + EGS (Rajikin et al, 1994), have been used for in vitro maturation of caprine oocytes. However, in nearly all experiments, hormones have been added to the tissue culture media. On the other hand, the experiments on in vitro maturation of caprine oocytes using TCM-199 supplemented with 20% estrus goat serum, FSH, LH and estradiol 17β, showed no significant difference between prepubertal and adult goats (Mogas et al, 1997). In a different study we found no significant difference in maturation in vitro of caprine oocytes among different concentrations of EGS in non-breeding season (Tajik and Shams, 1998). In the present study, three different sera, including estrus sheep serum (ESS), have been added to maturation medium and their effect have been reported. Oocytes were aspirated from caprine ovaries, washed and cultured in TCM-199 containing penicillin, streptomycin and 0, 10, 15 or 20% of FCS, ESS or EGS. After 24-26h culture, oocytes were freed from cumulus and corona cells by hyaluronidase and passing through a fine pipette, fixed in aceto alcohol, stained with aceto orcein and observed under a phase-contrast microscope for evidence of maturation. High maturation rates (74% - 94%) were observed in all concentrations of the 3 different sera examined. No significant difference was observed between different concentrations and among different sera. Almost no maturation observed in the medium lacking serum. In conclusion, these sera with the concentration examined can be substituted for one another for in vitro maturation of caprine oocytes.

Sera examind Concentrations	FBS (%)	EGS (%)	ESS (%)	Significance
0 (Control)	2/24 (4)	-	-	
10%	49/59 (83)	35/38(86)	34/36 (94)	-
15%	23/29 (79)	14/18 (77)	34/41 (83)	-
20%	26/31 (84)	17/20 (85)	28/38 974)	-

Key Words: In vitro maturation, Caprine oocytes, Different sera

Growth and Development
Somatropic Axis and Leptin in Cows

774 Correlation of circulating IGF-I with IGF-I mRNA and growth hormone receptor (GHR) 1A mRNA expression in calves exposed to long or short day photoperiod. P.E. Kendall*, T.L. Auchtung, and G.E. Dahl, *University of Illinois, Urbana.*

The galactopoietic effect of a long day photoperiod (LDPP) is well known in lactating cattle and is associated with a concomitant rise in circulating IGF-I concentration. However, LDPP has no effect on GH concentrations or hepatic GHR 1A mRNA expression. This study looked at the relationship between blood IGF-I concentration, IGF-I mRNA and GHR 1A mRNA expression in the liver in response to photoperiod. Two groups of Holstein steer calves were maintained indoors and exposed to either a LDPP (16L:8D; n=6) or short day photoperiod (SDPP) (8L:16D; n=6) for 9 weeks. Jugular blood samples were collected at weekly intervals to determine changes in serum IGF-I by radioimmunoassay. Liver biopsies were obtained at 3-week intervals to quantify changes in hepatic GHR 1A mRNA and IGF-I mRNA using real time PCR. IGF-I concentrations displayed a temporal increase in both treatments, with levels being consistently higher ($P<0.05$) in LDPP calves compared to SDPP calves. Both hepatic IGF-I mRNA expression and the amount of GHR 1A mRNA were positively ($P<0.01$) correlated with circulating IGF-I concentrations. Therefore, changes in circulating IGF-I are associated with altered expression of hepatic IGF system genes, and while IGF-I increases in response to LDPP, IGF system gene expression is not affected by photoperiod. It remains possible that net increases of IGFs into circulation in cattle exposed to a LDPP are related to shifts in IGF-binding proteins (IGF-BPs) in circulation. We are currently quantifying the relative abundance of IGF-BP-2, BP-3 and BP-5 to resolve this issue. In summary, galactopoietic effects of LDPP are associated with higher concentrations of IGF-I in circulation, yet the mechanism producing this response remains unknown.

Key Words: Cattle, Photoperiod, IGF system

775 Plasma IGF-I does not reflect growth rate and fattening in finishing-fed dry dairy cows. M Vestergaard*[1], KF Jorgensen[1], HR Andersen[1], HB Bligaard[2], and K Sejrsen[1], [1]*Danish Institute of Agricultural Sciences, Tjele, Denmark,* [2]*Danish Meat Research Institute, Roskilde, Denmark.*

The purpose was to investigate the growth and fattening potential of various categories of culled dairy cows. A total of 126 Danish Friesian cows (60 first and 66 later parity) were purchased from commercial dairy herds. Cows were culled for various typical reasons at different stages of lactation (22 to 395 days post partum). All cows were non-pregnant and milk yield ranged from 1 to 25 kg/d (14.4±0.6 kg). LW varied from 330 to 770 kg (562±6.4 kg). Cows were allocated to 3 treatment groups based on parity, LW, BCS, and culling reason. Cows were housed in tie-stalls. All cows had free access to barley straw and water during a 7-d drying off period in which cows lost 1.3 kg/d of LW on average. A

control group (C) was slaughtered after drying off (n=43), a group (F2) was finishing-fed for 63 days (n=42), and a group (F4) was finishing-fed for 126 days (n=41). In the finishing period, cows had free access to a TMR (10.6 MJ ME/kg and 130 g CP/kg of DM). At drying off and at slaughter, blood was sampled and analysed for IGF-I , and loin eye area (LDA) and backfat thickness (BT) was evaluated by ultrasound. Cows on treatment F2 and F4 consumed 15.5 kg DM/d and gained 1.16±0.05 kg/d in the finishing period. Compared to C-cows, F2- and F4-cows had 10 and 21% larger LDA and 14 and 70% larger BT, respectively. Plasma IGF-I was not different at drying off (135±4.6 ng/mL) but was 25 and 34% higher (P<0.001) after 2- and 4- months of finishing, respectively. However, IGF-I at 2- and 4-months of finishing was not correlated to ADG in the comparable periods. In first compared with later parity cows, IGF-I was 25% higher (P<0.001) and BT 12% lower (P<0.05), but ADG and LDA was similar despite cows were smaller (583 vs 665 kg, P<0.001). The results show that it is possible to dry-off and finish culled dairy cows with overall ADG of 1.0 kg resulting in larger muscles and improved fatness. However, IGF-I seems to be a weak indicator of daily gain, muscle development, and fatness in growing cows.

Key Words: finishing feeding, dry cows, IGF-I

776 Evaluation of the Use of a Human cDNA Microarray to Profile Hepatic Gene Expression in Transition Dairy Cows. J.R. Townsend*, D.E. Moody, and S.S. Donkin, *Purdue University, West Lafayette, IN.*

DNA microarrays provide a tool to profile the expression of thousands of genes in a single experiment. Bovine specific microarrays are not widely available commercially. The GF211 microarray filter containing 4,000 named human cDNAs or targets (Research Genetics, Huntsville, AL) was tested for suitability in profiling gene expression in liver from transition dairy cows. RNA was extracted from liver samples from 10 Holstein dairy cows on day -28, +1, and +28 relative to calving and pooled within day of calving. A total of 8 ug of each pool was reverse transcribed and labeled with ^{33}P-dCTP. Labeled cDNA was hybridized with one of three microarrays. Pooled samples were hybridized with three microarray filters in a 3 x 3 factorial arrangement of filter x sample combinations. This approach was used to minimize filter and day of hybridization effects. Hybridization was performed at 42C for 15 hours. Microarrays were washed then imaged on phosphor imaging screens. Intensity of target spots was determined using Pathways 3.0 (Research Genetics, Huntsville, AL) and normalized using the mean background intensity of binding to the microarray. A two-fold difference in intensity was used as the criteria for determining differences between sample pools. Using this criteria a total of 56 genes were identified as differentially expressed among liver samples obtained during the transition to lactation. These included: apolipoprotein-C III (ApoCIII), fatty acid binding protein (FABP), phosphoenolpyruvate carboxykinase (PEPCK), glutamate dehydrogenase-1 (GDH-1), and phosphoglycerate kinase-1 (PGK-1). The expression of FABP and Apo-CIII were greater on day +28 vs. day +1. Expression of PEPCK was greater on day -28 than day +28. GDH-1 was more highly expressed on day -28 compared with either day +1 or day +28. Expression of PGK-1 increased on day -28 relative to day +1. The data demonstrate that human gene filter microarrays can be used successfully to identify genes that respond to physiological changes, such as the transition to lactation, in dairy cows.

Key Words: Microarray, Bovine, Liver

777 Effect of insulin on the GH-IGF-I axis in the periparturient dairy cow. R. P. Rhoads*[1], B. J. Leury[2], L. H. Baumgard[1], S. S. Block[1], D. A. Dwyer[1], A. W. Bell[1], D. E. Bauman[1], and Y. R. Boisclair[1], [1]*Cornell University, Ithaca, NY,* [2]*University of Melbourne, Victoria, Australia.*

In transition dairy cows, plasma IGF-I declines rapidly near parturition and remains depressed during the first few weeks of lactation. Reduction in plasma IGF-I parallels exactly the deteriorating energy balance (EB) and is maximal around parturition when abundance of the liver specific mRNA of the growth hormone receptor (GHR1A mRNA) reaches its nadir. Mechanisms responsible for mediating the effects of negative EB on plasma IGF-I, and perhaps on GHR1A mRNA, are not completely understood. In this study, we tested whether insulin is involved by performing hyperinsulinemic-euglycemic clamps on six Holstein cows in late pregnancy (LP, 25 days prepartum) and again in early lactation (EL, 10 days postpartum). Expected changes were observed during the transition from LP to EL: Cows were in positive EB in LP (+12.3 Mcal/d) and in negative EB in EL (-12.2 Mcal/d); EL cows had lower plasma concentrations of glucose (39 vs 49 mg/dL, P<0.001), insulin (0.6 vs 2.0 ng/mL, P<0.001) and IGF-I (79.7 vs 171.8 ng/mL, P<0.001) than LP cows. Reduced plasma IGF-I in EL occurred despite absence of difference in the hepatic levels of IGF-I mRNA between EL and LP cows; EL cows however, had lower hepatic levels of GHR1A mRNA than LP cows. During the clamp, plasma insulin rose 2.3 fold during LP and 3.7 fold during EL. Hyperinsulinemia increased the plasma concentration of IGF-I 2-fold in both physiological states, but the absolute increment was lower in EL than in LP (ΔIGF-I = 78.9 vs 157.3 ng/mL, P<0.001). Insulin increased the levels of IGF-I and GHR1A mRNAs to a similar extent in EL and LP cows. We conclude that insulin mediates a portion of the effects of negative EB on plasma IGF-I by regulating expression of the growth hormone receptor in liver. However, our data indicate that post-transcriptional mechanisms are also involved, and could include cellular (i.e. translational effects) as well as intravascular phenomena (i.e. changes in binary and ternary IGF-containing complexes).

Key Words: GH receptor, Liver, Energy balance

778 Leptin Binding Moieties in Bovine Serum. R. A. Hill*[1], S. Margetic[2], and N. Hughes[1], [1]*University of Idaho,* [2]*Central Queensland University, Australia.*

Leptin has a wide range of roles including direct, peripheral interactions. These are likely to be affected by leptin binding proteins. Previously, leptin has been shown to bind to an abundant site in rat plasma, forming a 66 kDa complex, and similarly in humans forming a 450 kDa complex. The present study characterized bovine serum leptin-binding activity by incubating serum with ^{125}I-labeled leptin, and resolved using Sephadex S300 column chromatography (Table 1). Within 2 h, 220 kDa and 66 kDa complexes had come to equilibrium. However, the 66 kDa complex was more abundant (proportion of radioactivity bound). After addition of excess unlabelled leptin, the first three peaks were reduced (p<0.01), showing that interactions with ^{125}I-leptin were reversible. Peak III, showed the greatest binding reduction, 5-fold (p<0.01). Radioactivity was displaced to the elution position of free ^{125}I-leptin, (17 kDa) which was increased about 2-fold. We speculate that 50, 200 and 650 kDa proteins, represent the bovine leptin binding proteins. Peak II may represent homodimers of the soluble leptin receptor. Peak I may provide evidence of leptin complexed with alpha2-macroglobulin. Thus, there appears to be considerable species variation in plasma leptin binding proteins which are both quantitative and qualitative. Variations in the leptin binding profile and the abundance and affinities of these moieties are likely to account for species differences in leptin pharmacokinetics and leptin interaction in peripheral tissues. Table 1. Percent of total radioactivity in areas under the peaks from Sephacryl S-300 chromatography of bovine serum, in the absence or presence of unlabeled leptin. Values are means + SEM (n= 3).

Incubation period (h)	Peak I (670 kDa)	Peak II (220- kDa)	Peak III (66 kDa)	Free leptin (17 kDa)
0	-	-	-	93.88±1.92
2	1.86±0.08	5.58±0.51	11.81±0.88	71.26±0.87
4	3.33±0.52	4.06±1.21	15.27±3.21	60.80±2.15
8	4.45±1.59	7.17±1.12	15.70±1.63	57.23±2.19
12	6.18±0.93	6.33±1.39	25.72±2.13	47.66±3.21
+ unlabelled leptin				
12	4.51±0.52	2.52±0.32	4.83±1.34	79.27±3.91

779 Role of insulin and growth hormone in regulating the concentration of plasma leptin in lactating dairy cows. S. S. Block*[1], R. P. Rhoads[1], D. E. Bauman[1], R. A. Ehrhardt[1], M. M. McGuire[1], B. A. Crooker[2], J. M. Griinari[1], T. R. Mackle[1], M. E. Van Amburgh[1], and Y. R. Boisclair[1], [1]*Cornell University, Ithaca, NY,* [2]*University of Minnesota, St. Paul, MN.*

In lactating dairy cows, the onset of negative energy balance (EB) at parturition causes a reduction in plasma leptin and is also associated with increased concentration of growth hormone (GH) and decreased concentration of insulin. These observations raise the possibility that opposite changes in plasma insulin and GH are partly responsible for

reduced leptin synthesis in adipose tissue. To test this hypothesis without the confounding influence of parturition, we first examined the effects of undernutrition by using late lactating dairy cows fed 120 % of their nutrient requirements or restricted to 33 % of maintenance energy requirements. Plasma leptin was reduced within 24 h of feed restriction (fed vs restricted, 2.8 vs 2.2 ng/ml, $P < 0.001$), and was associated with increased plasma GH and decreased plasma insulin; complete food deprivation for a period of 48 h did not accentuate the reduction in the plasma concentration of leptin (fed vs fasted, 2.7 vs 2.0 ng/ml, $P < 0.05$). To determine if an elevation in GH is responsible for the fall in plasma leptin, late lactating cows in positive EB were treated for 4 consecutive days with excipient or recombinant bovine somatotropin (rbST, 40 mg/d), rbST treatment increased milk yield by 26 % ($P < 0.01$) but had no effect on plasma leptin. rbST also failed to alter plasma leptin when a similar experiment was performed during the third week of lactation when EB was negative. Finally, the effects of insulin were studied by performing euglycemic hyperinsulinemic clamps in mid-lactating dairy cows in positive EB. After 96 h of hyperinsulinemia, plasma leptin was increased significantly (basal vs hyperinsulinemia, 2.5 vs 3.4 ng/ml, $P < 0.001$). These data indicate that, in undernourished lactating dairy cows, reduced plasma insulin is partly responsible for the fall in plasma leptin, and that elevated plasma GH plays no role in this effect.

Key Words: Leptin, Growth Hormone, Insulin

780 Effect of sunflower seed inclusion on conjugated linoleic acid concentrations in milk fat of Holstein cows. D. B. Carlson*[1], M. S. Laubach[1], W. L. Keller[1], J. W. Schroeder[1], J. H. Herbein[2], and C. S. Park[1], [1]*North Dakota State University, Fargo, ND,* [2]*Virginia Polytechnic and State University, Blacksburg, VA.*

The objectives of this study were to investigate the effect of sunflower seed supplementation on conjugated linoleic acid (CLA) concentration in milk fat and to determine the level of sunflower seed supplementation that maximizes CLA concentration without negatively impacting milk yield. Lactating Holstein cows (n = 4) were stratified by parity, milk yield, and days in milk, and assigned to one of three dietary treatments in a completely randomized design. Treatments were: 1) 1% of dry matter (DM) as sunflower seeds (CON), 2) 6.5% of DM as sunflower seeds (MID), and 3) 11.4% of DM as sunflower seeds (HIGH). Sunflower seeds were rolled and directly blended into total mixed rations. The predominant fatty acids present in sunflower seeds were linoleic acid (74.04% of total oil) and oleic acid (15.45% of total oil). Cows were fed individually for a period of twelve wk following a one-wk adaptation period. Dry matter intake (DMI) and milk yield were measured daily. Milk and blood samples were collected, and body weight (BW) and a body condition score (BCS) were determined on d 0, 21, 42, 63, and 84. Data were analyzed using GLM procedures of SAS. Differences were considered significant at $P < 0.05$. DMI, milk yield, BW, BCS, and serum non-esterified fatty acids were not altered by treatment ($P > 0.05$). Serum glucose was higher ($P < 0.01$) in cows fed CON compared to those consuming MID and HIGH. *Cis-9*, *trans*-11 CLA concentration in milk fat was significantly increased ($P < 0.01$) in cows consuming MID and HIGH (8.0 and 7.0 mg/g of milk fat, respectively) compared to CON (4.3 mg/g of milk fat). Sunflower seed supplementation can increase CLA concentration in milk fat without affecting milk components and yield.

Key Words: Conjugated linoleic acid, Sunflower, Oilseed

Nonruminant Nutrition
Young Pig Nutrition and Management

781 Baby pig nutrition and management. V. W. Hays*, *University of Kentucky, Lexington.*

Producers and researchers knew about feeding young pigs before early weaning was introduced as a part of the management system. Death of the sow shortly after farrowing or failure to produce milk necessitated transfer of pigs to another sow or finding an alternative food supply. If the pigs did not receive colostral milk, mortality was very high. Those producers that had access to milk cows had found that cow's milk is a quite adequate diet for very young pigs. "Harris On the Pig" (1985) includes a trial by Miles of the Michigan Station in which pigs 2 weeks of age and 4.0 lb. body weight did very well on cow's milk. They gained 3.5 lb/pig during the first week. In the mid to late 1940s, researchers began using early weaned pigs (1 day of age and older) to study vitamin and other nutrient requirements. Serious interest in weaning at a very young age as a management system began in the early 1950s. In early studies, liquid or dry diets were based on the composition of sow's or cow's milk based on our knowledge of the performance of pigs on those diets. Much of the early work was published in Station publications, producer magazines or applied journals. "Baby Pigs Don't Need Their Mommies Any More", "Baby Pigs Have A Sweet Tooth" and "Pre-Starter 75" were among the titles. The age or weight at weaning still varies and should be determined by the degree of sanitation, the control of the environment, the complexity of the diet and the desired productivity level of the sow. As we changed the diets for economic reasons (less dependent on milk), we learned more and more about the quality and nutrient limitations of feed ingredients and the development of the pig's digestive system. Our knowledge of the nutrient requirements and utilization of various feedstuffs has been expanded greatly through the use of younger pigs.

Key Words: Baby pigs, Early weaning, Management

782 Dipeptide transport in the small intestinal brush broder membrane vesicles of the weaned pigs. J.G. Dai[1], D.F. Li*[1], X.S. Piao[1], J.R. Pan[1], H.L. Chen[1], and G.F. Yi[2], [1]*China Agricultural University,* [2]*University of Missouri-Columbia.*

Six crossbred Landrace x Large White x Beijing Black weaned pigs (age = 35d) were used in a series of experiments to investigate the transport of glycyl-L-proline (Gly-Pro) into brush border membrane vesicles (BBMV) of the small intestine. The BBMV were prepared from the small intestine using a magnesium chloride aggregation method. The membrane purity of the BBMV was determined routinely by assay of alkaline phosphatase, a marker enzyme for BBMV, and Na^+-K^+-ATPase, a marker enzyme for the basolateral membrane used to monitor the contamination of this membrane in BBMV. Results from the seven experiments indicated the following: Gly-Pro was not hydrolyzed in the small intestinal BBMV (P=0.25); transport of Gly-Pro in BBMV was optimized at an external pH of 4.5-5.5; Gly-Pro transport (20 min period) was greater at an external pH of 5.0 compared to that of a pH of 7.5 (P<0.05); at an external pH of 5.0, the presence of an inward proton gradient stimulated Gly-Pro transport (P<0.05); in the absence of a transmembrane proton gradient Gly-Pro transport was not different at an external pH of 5.0 as compared to a pH of 7.5; the K^+ diffusion potential (interior-negative) produced by valinomycin resulted in an increase in Gly-Pro transport both in the presence and absence of Na^+ (P<0.05); the H^+ diffusion potential (interior-positive) generated by protonophore Carbonyl cyanide p-(Tri-fluoromethoxy) phenylhydrazone (FCCP) decreased Gly-Pro transport (P<0.05); and that the uptake of Gly-Pro was due to transport directly into the intravesicular space rather than binding to BBMV. Collectively, these results suggest that dipeptide transport into the weaned pig small intestine is different from the transport of amino acids and glucose, in that Gly-Pro transport may be proton gradient-dependent and Na^+-independent.

Key Words: Pigs, Dipeptide, Small intestine

783 Effects of feeding supplemental milk replacer to piglets on pre-and post-weaning performance. M. E. Davis*[1], C. V. Maxwell[1], D. C. Brown[1], Z. B. Johnson[1], K. J. Touchette[2], and J. A. Coalson[2], [1]*University of Arkansas, Fayetteville,* [2]*Merrick's, Inc., Middleton, WI.*

Nineteen litters from two farrowing groups were allotted to two milk replacer treatments to assess the effects of milk replacer supplementation on pre- and post-weaning piglet performance. Litters were allotted to