

## ADSA Dairy Production Graduate Student Paper Competition & Southern Division Paper Competition

**122 Manipulation of rumen fermentation, microbial population and blood metabolites of Holstein neonatal calves using Yeast Culture as a microbial additive.** Behnam Saremi\* and Abasali Naserian, *Ferdowsi University of Mashhad, Khorasan, Iran.*

Yeasts have synergism effects on some strains of bacteria and antagonism affects on the others. These days, yeasts such as strains of *Saccharomyces cerevisiae* are widely used as additives in ruminant nutrition and could alter end products or substrates, which are used by other microorganisms and subsequently alter the feed digestibility. So the objective of this study was to determine if Bakery's yeast product could affect calves rumen fermentation, microbial population, blood metabolites and feed digestibility. Eighteen female Holstein neonatal calves were used in this study and randomly placed on treatments and fed colostrums at 10% of birth weight and milked until 45 days old. All calves were fed calf starter (NRC 2001) containing high quality alfalfa (15%) from seven days of age and weaned at 45 days. Calf starter was offered until 90 days old and the yeast was added at 0, 0.5 and 1% to the calf starter, which was, used daily. Rumen (pH, Ammoniated nitrogen (N-NH<sub>3</sub>), Microbial population (MP)) and blood samples (Total protein (TP), Glucose (GLS), Blood urinary nitrogen (BUN)) were taken from 0 to 90 days in regular periods. In day 90, feed and feces samples obtained to determine, nutrient digestibility. Data were analyzed using General Linear Model procedures of SAS v6.12 to evaluate differences among experimental groups. The design was completely randomized. Means were compared with Duncan test. Data showed that Yeast culture could not significantly alter protein, NDF, ADF and Ash digestibility, also have no effect on MP, pH, N-NH<sub>3</sub> of the rumen. Indeed it couldn't affect TP and GLS in blood plasma. But BUN, Organic matter and Dry matter digestibility were significantly different between treatments ( $P < 0.05$ ). Results of this experiment showed that addition of yeast culture to calves starter could improve DM and OM digestibility and also reduced BUN. We suggested that better weight gain and reduced DMI (Data not shown) could be result of better digestibility and the less losses of ammonia in the rumen.

**Key Words:** Bakery's yeast, Rumen and blood manipulation, Neonatal calves

**123 The effects of cottonseed hulls added to diets with and without live yeast or mannanoligosaccharide in Holstein calves.** S. R. Hill\*, B. A. Hopkins, S. Davidson, S. M. Bolt, C. Brownie, T. Brown, G. B. Huntington, and L. W. Whitlow, *North Carolina State University.*

The objective of this study was to investigate the effects of fiber from cottonseed hulls (CSH) added to the starter and of live yeast (YST) or mannanoligosaccharide (MOS) added to milk, on growth, intake, rumen development, and health parameters in calves. Bull and heifer calves ( $n=116$ ) were assigned randomly at birth to one of six treatments for 63 d. Calves were dehorned at 42 d. Bulls were elastrated by 14 d. Calves were fed 3.8 L of colostrum once daily for the first 2 d and then 3.8 L of whole milk supplemented with either no additive, 4g YST, or 3g MOS once daily through weaning at 42 d. Treatments included: 1) a corn/soybean meal based starter, 20% CP, 6% ADF (CON), 2) a blend of 85% starter and 15% CSH, 18% CP, 15% ADF (CON + CSH), 3) starter and MOS (CON + MOS), 4) starter with CSH and MOS (CON + CSH + MOS), 5) starter and live yeast (CON + YST), and 6) starter with CSH and live yeast (CON + CSH + YST). Starter diets were offered from 1 d and daily amounts were increased by 0.09 kg when ors were 0 kg. Weekly measurements included body weight (BW), wither height, hip width, and dry matter intake from starters (DMI). Daily measurements included rectal temperatures, fecal, and respiratory scores. Twelve steers (2 per treatment) were sacrificed for rumen tissue samples. Data were analyzed for the main effects of CSH, YST, and MOS. Average DMI was greater for calves consuming CSH diets (0.41 kg) than diets without CSH (0.34 kg). Calves fed CSH treatments (54.9 kg) had greater BW than those fed diets without CSH (53.3 kg) ( $P < 0.05$ ). Average daily gain was greater for calves fed CSH diets (0.58 kg/d) than diets without CSH (0.51 kg/d) ( $P < 0.05$ ). However, calves fed diets without CSH had a greater feed efficiency (0.67 kg feed/kg BW gain) than those fed CSH diets (0.73 kg feed/kg BW gain) ( $P < 0.05$ ).

There were no significant effects of YST or MOS on DMI, gain, or feed efficiency ( $P > 0.05$ ).

**Key Words:** Dairy calves, Cottonseed hulls, Yeast

**124 Using Controlled Internal Drug Release (CIDR<sup>®</sup>) inserts for estrus synchronization in dairy heifers.** A. K. McLean\*, W. M. Graves, R. C. Smith, B. C. Lance, and L. E. Mckee, *University of Georgia, Athens.*

Two experiments were conducted to evaluate using CIDR<sup>®</sup> inserts for estrus synchronization in dairy heifers. Our objective in Experiment 1 was to compare day 6 versus day 7 prostaglandin F<sub>2α</sub> injections used with CIDR<sup>®</sup> inserts (Eazi-Breed<sup>™</sup>, CIDR<sup>®</sup>, Pharmacia & UpJohn Company, Kalamazoo, MI) placed intravaginally for seven days. A total of 55 heifers were assigned to two treatment groups. All even numbered heifers were assigned to treatment 1 and received PGF<sub>2α</sub> (Lutalyse<sup>®</sup>, Pharmacia & UpJohn Company, Kalamazoo, MI, 5 mg; i.m.) on day 6. Odd numbered heifers were assigned to treatment 2 and received PGF<sub>2α</sub> on day 7 at the time CIDR<sup>®</sup> inserts were removed. In Experiment 1, 98.2% of the 55 heifers exhibited signs of estrus and were bred. Pregnancy was determined by rectal palpation on day 35 and 53.7% of the 54 were pregnant. Fifteen out of 26 heifers (57.6%) injected with PGF<sub>2α</sub> on day 6 and 14 of 28 heifers (50.0%) injected on day 7 were pregnant ( $P > .05$ ). In Experiment 2, our objective was to evaluate using estradiol cypionate (ECP<sup>®</sup>) or gonadotropin releasing hormone (GnRH) in a timed artificial insemination (TAI) protocol using the CIDR<sup>®</sup> insert for 7 days followed by PGF<sub>2α</sub> on day 7. Sixty-nine heifers were randomly assigned to three different treatment groups. In treatment 1, 2 and 3, CIDR<sup>®</sup>'s were inserted for 7 days followed by removal and injection of PGF<sub>2α</sub>. Heifers in treatment 2 were injected with ECP<sup>®</sup> (Pharmacia & UpJohn Company, Kalamazoo, MI, 0.5 mg; i.m.) on day 8. Heifers in treatment 3 were injected with GnRH (Factrel<sup>®</sup>, Fort Dodge Animal Health, Fort Dodge, Iowa, 2 mg; i.m.) on day 9. All heifers were bred by timed artificial insemination (TAI) on day 10. In Experiment 2, 50.7% of the 69 heifers were pregnant on day 39. A total of 56.5% of 23 heifers timed bred with only CIDR<sup>®</sup> inserts and PGF<sub>2α</sub>, 45.5% of the 22 injected with ECP<sup>®</sup>, and 50.0% of the 24 injected with GnRH were pregnant ( $P > .05$ ). In both experiments, a total of 124 CIDR<sup>®</sup> inserts (100.0%) were retained.

**Key Words:** CIDR, Estrus synchronization, Dairy heifers

**125 Implantation of a pellet containing TGF-β increases BrdU-labeling in mammary stromal cells of prepubertal heifers.** S. Musters\*, T. McFadden, T. Mulvey, K. Coughlan, R. Maple, and K. Plaut, *University of Vermont, Burlington, VT USA.*

*In vitro* and *in vivo* studies in mice have shown that transforming growth factor-β (TGF-β) inhibits mammary epithelial cell growth and stimulates proliferation of mammary stromal cells. However no studies have been conducted to measure the effects of exogenous TGF-β1 *in vivo* in cows. Our objective was to determine if TGF-β1 affects mammary epithelial and stromal cell proliferation during mammogenesis in 9 month old heifers (approximately 225 kg body weight). Slow release pellets, containing 5 μg TGF-β1 and 20 mg BSA, were implanted in the parenchyma of the right rear quarter of 4 heifers. A control pellet containing 20 mg of BSA was implanted in the left rear quarter. Bromodeoxyuridine (BrdU), used to measure DNA synthesis, was administered intravenously 4.5, 12 and 22 hours after implantation at a concentration of 2.25 mg/kg body weight. The heifers were slaughtered 24 hours after implantation and the mammary glands were recovered. Tissue samples were taken from an area within 0.6 cm around the pellet, fixed for 4 hours, embedded in paraffin, sectioned and stained for immunohistochemistry with a BrdU monoclonal antibody. Total number of epithelial cells, stromal cells, BrdU-labeled epithelial cells and BrdU-labeled stromal cells was quantified. An average of 3000 epithelial cells and 3000 stromal cells was counted per TGF-β treated and control quarters. Exogenous TGF-β1 increased the percentage of stromal cells in S-phase from 3.3% to 5.8%, approaching significance ( $P \leq 0.11$ ), supporting previous data that TGF-β1 increases DNA synthesis of stromal cells. We observed no significant difference in the percentage of BrdU-labeled epithelial cells for the TGF-β treated tissues in comparison to the control tissues. However the numbers of cells in S-phase were

very low. We conclude that exogenous TGF- $\beta$ 1 increases proliferation of mammary stromal cells in prepubertal heifers.

**Key Words:** TGF- $\beta$ , Mammary gland, Proliferation

**126 Behaviors of transition dairy cows and heifers.** K. J. Daniels\*, J. R. Townsend, S. S. Donkin, E. A. Pajor, A. G. Fahey, and M. M. Schutz, *Purdue University, West Lafayette, IN.*

Management strategies are critical for a successful transition period and may differ for cows and first calf heifers. The objective of this study was to compare behaviors between transition cows and heifers, emphasizing feeding behaviors and the relationship of these behaviors with DMI and milk yield. Five multiparous Holstein cows (C) and five Holstein heifers approaching first calving (H), were housed in tiestalls from 28d prior to expected calving and provided feed *ad libitum*. The C and H were videotaped 24 h/d, using time-lapse video recording, beginning 15d prior to expected calving until 14d after calving. On d-6, d-2, d2 and d8 relative to actual calving the durations of the following behaviors were measured: standing (S), lying (L), resting (Re), feeding (F), ruminating (R) and ruminating while lying (RL). Daily DMI and postpartum milk yield were recorded. The model selected for analyses included effects of parity group (C and H), day and interactions. There were no significant differences between C and H in L, F or RL. For both parity groups, L ( $P < .01$ ) differed across d and there were d by parity group interactions for F ( $P < .05$ ) and RL ( $P < .01$ ). For all animals, L decreased through d2 and then increased on d8. For C, F decreased through d2 and then increased on d8; while for H, F increased until d-2, decreased at d2 and then increased on d8. Through d2, RL decreased for C and then increased on d8; but for H, RL did not decrease until d2 and then increased on d8. As expected, C had greater milk yield ( $P < .05$ ) and DMI ( $P < .01$ ) than H. Milk yield on d8 was significantly affected by Re on d-6 ( $P < .01$ ). The DMI on d8 was significantly affected by F on d2 ( $P < .01$ ). Behaviors, DMI and milk yield differed for transition C and H, indicating that managing them differently during the transition period may be beneficial.

**Key Words:** Dairy cattle, Transition, Behavior

**127 Relationship of dystocia to dairy cow health and productivity.** J. E. Lombard\*<sup>1</sup>, S. M. Tomlinson<sup>1</sup>, F. B. Garry<sup>1</sup>, and L. P. Garber<sup>2</sup>, <sup>1</sup>*Integrated Livestock Management, Colorado State University, Fort Collins, CO.* <sup>2</sup>*USDA:APHIS:VS, CEAH, Center for Animal Health Monitoring, Fort Collins, CO.*

The objectives of this study were to evaluate dystocia rates on Colorado dairies and the subsequent health and production effects on cows. A total of 6,528 calvings were recorded on 3 well-managed Front Range Colorado dairies from October 2001 to October 2002. Each cow was assigned a dystocia score (standard 1 to 5) based on calving ease. Cows were followed for health events, milk production and reproduction parameters that occurred subsequent to the calving event. Data collection will continue until all cows have completed the current lactation or leave the herd for any reason. Odds ratios were calculated for cow health events for animals with no assistance at calving (score 1) compared to animals with any assistance at calving (scores 2 to 5). Productivity parameters were evaluated using a logistic regression analysis. For the regression analysis, animal with dystocia scores of 4 and 5 were collapsed because of the small number of animals within dystocia score 5. The percent of animals requiring assistance was significantly ( $P < 0.0001$ ) greater for primiparous animals (53%) than multiparous animals (29%). Cows with any assistance at calving were significantly more likely to receive hypocalcemic therapy (OR, 6.2), experience uterine disease (RFM, metritis, pyometra) (OR=1.7), respiratory disease (OR=1.3), digestive disease (OR=1.2) and death within 2 weeks of calving (OR=2.0). Cumulative milk production at 30 days, milk production to 90 days, projected 305 day production and mature equivalent 305 day production were significantly decreased as dystocia score increased except between scores 3 and 4 ( $P < 0.05$ ). Although days in milk at first breeding was significantly increased for dystocia score 4 ( $P < 0.05$ ), the number of days open and number of times bred was not significantly different between any of the dystocia score groups. Dystocia was strongly associated with decreased productivity, increased morbidity and increased mortality.

**Key Words:** Dystocia, Cow health, Cow productivity

**128 Effects of grazing fresh forages on milk fat CLA.** S. J. Freeman\*<sup>1</sup>, J. A. Bertrand<sup>1</sup>, T. C. Jenkins<sup>1</sup>, B. W. Pinkerton<sup>1</sup>, and D. L. Palmquist<sup>2</sup>, <sup>1</sup>*Clemson University, Clemson SC / USA,* <sup>2</sup>*Ohio State University, Columbus OH / USA.*

The objective was to determine effects of grazing different forages on concentrations of *cis*-9, *trans*-11 conjugated linoleic acid (CLA) in milk fat of Jersey and Holstein cows. Two treatment groups were utilized for each of three studies: control (C) or pasture (P). Cows on C were fed a total mixed ration (TMR) *ad libitum*, and P cows were fed pasture and supplemental feed, which was limited to 60% of *ad libitum* dry matter intake (DMI). In Experiment 1, Holstein and Jersey cows on P grazed ryegrass pasture. Milk samples from each cow were taken at the end of two three-week periods for four consecutive milkings. In Experiment 2, Holstein and Jersey cows on P grazed dwarf hybrid pearl millet pasture. Weekly milk samples were taken at four consecutive milkings for the six-week study. In Experiment 3, Jersey cows on P grazed rye pasture. Weekly milk samples were taken at four consecutive milkings during two five-week periods. Linolenic acid (C18:3) content was higher in P diets compared to C (31% and 4%, respectively). Saturated fatty acid content (C16:0 and C18:0) was higher in C diets than P (51% and 30%, respectively). For all three forages, C18:3 was the fatty acid in highest concentration, ranging from 48% of total fatty acids (TFA) in dwarf hybrid pearl millet, 49% in ryegrass, to 57% in rye. Palmitic (C16:0) and linoleic (C18:2) acids concentrations were each approximately 11% of TFA. DMI from pasture ranged from 54% to 77%. Milk fat CLA as a percentage of TFA were significantly higher for P cows in all experiments. In Experiment 1, milk fat CLA for cows on P was 0.47% of TFA for Holsteins and 0.42% for Jerseys. In Experiment 2, milk fat CLA for cows on P was 0.57% of TFA for Holsteins and 0.45% for Jerseys. In Experiment 3, milk fat CLA for cows on P was 0.44% of TFA. Substitution of fresh forage for a portion of TMR in dairy cows significantly increases CLA concentrations to twice that of the control, as well as differences between Jersey and Holstein breeds. Cows responded similarly to all three forages.

**Key Words:** Pasture, CLA, Dairy cows

**129 Lactation performance and milk fatty acid composition of Holstein cows fed various forms of oleic acid.** J. E. Delahoy\*, L. D. Muller, F. Bargo, T. W. Cassidy, and G. F. Schroeder, *The Pennsylvania State University.*

The objective of this study was to evaluate the effects of feeding various forms of oleic acid on dry matter intake, milk yield, and milk fatty acid (FA) content. Twenty-five Holstein cows were paired according to milk yield (50 kg/d), and DIM (85d), and used in a 5 x 5 Latin square design. A control group (CON) was fed a total mixed ration (TMR) with no added fat (17.5% CP, 39% NSC, 33% NDF, 2.9% fat). Four forms of oleic acid were mixed into a TMR to target 400 grams of oleic acid intake/cow/d (18.2% CP, 36% NSC, 32.5% NDF, 5.3% Fat). Fat treatments included canola oil (CO), hydrogenated fat (HF), calcium salts of oleic acid (CAO), and oleamide (OM). Dry matter intake was lower for OM than all other treatments, and CAO was lower than for CON, CO and HF. Milk yield was lowest for OM compared to all other treatments. Milk fat percentage was reduced for CO and CAO compared to CON and HF and was depressed in cows fed oleamide. Saturated fatty acids in milk were reduced by 22% and 13% for OM and CAO, compared to CON. Milk C18:1 was increased 33% and 16% for OM and CAO respectively compared to CON. Milk CLA was increased in CO and CAO compared to CON with an intermediate increase with OM. Feeding CAO and OM decreased saturated fatty acids and increased CLA in milk, however DMI and milk yield were reduced.

Item	CON	CO	HF	CAO	OM	SEM
DMI, kg/d	27.3 <sup>c</sup>	27.8 <sup>cd</sup>	28.4 <sup>d</sup>	26.4 <sup>b</sup>	23.8 <sup>a</sup>	0.32
Milk yield, kg/d	42.6 <sup>a</sup>	45.2 <sup>b</sup>	45.3 <sup>b</sup>	43.1 <sup>a</sup>	42.3 <sup>a</sup>	0.97
Milk fat, %	3.53 <sup>c</sup>	3.11 <sup>b</sup>	3.51 <sup>c</sup>	3.01 <sup>b</sup>	2.85 <sup>a</sup>	0.119
Milk Protein, %	3.13 <sup>b</sup>	3.11 <sup>b</sup>	3.09 <sup>ab</sup>	3.03 <sup>a</sup>	3.04 <sup>a</sup>	0.028
Saturated FA,						
g/100g milk fat	68.1 <sup>c</sup>	61.3 <sup>b</sup>	67.7 <sup>c</sup>	60.1 <sup>b</sup>	53.1 <sup>a</sup>	0.91
C 18:1,						
g/100g milk fat	21.2 <sup>a</sup>	25.8 <sup>c</sup>	22.3 <sup>b</sup>	25.3 <sup>c</sup>	31.9 <sup>d</sup>	0.57
Milk CLA,						
g/100g milk fat	0.47 <sup>a</sup>	0.84 <sup>c</sup>	0.41 <sup>a</sup>	0.87 <sup>c</sup>	0.65 <sup>b</sup>	0.058

**Key Words:** Oleic acid, Oleamide, Calcium salts

**130 Effect of cereal grain characteristics on production performance of lactating dairy cattle.** J.A. Meier\*<sup>1</sup>, P. Yu<sup>1</sup>, J.J. McKinnon<sup>1</sup>, and D.A. Christensen<sup>1</sup>, <sup>1</sup>University of Saskatchewan.

The objective of the study was to evaluate the effect of feeding two different cultivars of barley (cv. Harrington and Valier) and oat (cv. Derby and Assiniboia) grain on feed intake, milk yield and milk constituents. As secondary objective was to investigate particle size and starch characteristics of the Harrington and Valier barley. Eight lactating cows (86 17 DIM) were assigned one of four treatments using a double 4x4 Latin square design. Dietary treatments consisted of Valier Barley (VB), Harrington Barley (HB), Derby Oats (DO) or Assiniboia Oats (AO). The treatment grains constituted 50% of the cereal grain in the concentrate of the TMR. Data was analyzed for significance ( $P < 0.05$ ) using the Mixed Procedure of SAS. Milk yield for the DO and AO were significantly higher than VB. Milk fat was significantly decreased in the Assiniboia treatment compared to all other treatments. In general, it appears that oats may be a suitable replacement for barley grain in the concentrate of dairy diets. Bushel weights of the HB and VB were similar (56 lb/bu and 57 lb/bu respectively) and of the kernel size did not appear different. Particle size analysis was conducted on dry rolled (0.533 mm gap) on HB and VB using the ASAE Ro-tap method (Screen gap sizes of 4.00, 2.362, 1.70, 1.40, 1.19, and 0.84 mm). Particle size data was analyzed using a completely randomized design using the GLM of SAS. Significant differences ( $P < 0.05$ ) were noted between treatments for all screenings. VB had the highest percentage (77%) of particles on the 2.362 mm screen, indicating that VB is much more resistance to processing than HB. The difference in shattering under identical processing conditions may be of concern when milling different cultivars and bushel weights of a single cereal grain. Subsequent to particle size analysis, scanning electron micrographs were prepared. Scanning electron microscopy revealed that VB had starch granules more tightly embedding into the protein matrix than HB. This difference in starch structure may lead to decreased availability for digestion and nutrient assimilation.

**Key Words:** Barley, Grain, Dairy

**131 Tight junction (TJ) protein expression during engorgement of rat and bovine mammary glands.** C. V. Cooper\*<sup>1,2,3</sup>, K. Stelwagen<sup>2</sup>, C. D. McMahon<sup>2</sup>, K. Singh<sup>2</sup>, V. C. Farr<sup>2</sup>, and S. R. Davis<sup>2</sup>, <sup>1</sup>Dexcel Ltd., Hamilton, New Zealand, <sup>2</sup>AgResearch, Hamilton, New Zealand, <sup>3</sup>Massey University, Palmerston North, New Zealand.

The pattern of expression of TJ proteins was investigated during engorgement of rat and bovine mammary glands. An increase in mammary TJ permeability was previously shown to occur within 24 h of milk accumulation. The expression of occludin and claudin-1, the major integral transmembrane components of TJ, was determined in two experiments. In experiment 1, Sprague-Dawley rats at peak lactation (d 16) had three abdominal inguinal glands on one side sealed to induce mammary engorgement, the remaining glands were not sealed and acted as suckled controls. Mammary tissue was collected post-mortem at 0, 6, 12, 18, 24 and 36 h after teat sealing (n = 6 rats per time point). In experiment 2, alveolar mammary tissue was collected post-mortem from 42 mid-lactation Holstein Friesian dairy cows at 0, 6, 12, 18, 24, 36 and 72 h following the last milking (n = 6 cows per time point). Immunoblotting showed a characteristic multiple banding pattern for occludin between 60 and 80 kDa. The higher molecular weight (MW) bands were highly phosphorylated and resistant to NP-40 detergent extraction, suggesting they predominantly derive from the tight junction complex. Occludin expression declined during mammary engorgement in rat and bovine glands ( $P < 0.05$ ). Claudin-1 migrated in SDS-PAGE as two bands at 22 and 28 kDa. In rats, expression of the 28 kDa band declined within 12 h of mammary engorgement ( $P < 0.05$ ), while that of the 22 kDa band, along with lower MW degradation products, increased ( $P < 0.05$ ). Both bands were expressed at low levels by 36 h of mammary engorgement. In contrast, claudin-1 protein expression did not alter with engorgement in bovine mammary glands ( $P > 0.05$ ). Occludin and claudin-1 expression showed large individual animal to animal variation. Furthermore, the response to mammary engorgement was locally regulated as no changes were detected in suckled control rat mammary

glands. Between species variation in the pattern of TJ protein expression suggest that the increase in TJ permeability during milk accumulation is regulated differently between rats and dairy cows.

**Key Words:** Tight junction, Lactation, Mammary engorgement

**132 Effects of glucose concentration and presence of EGF and hormones on bovine oocyte maturation.** D. J. Walker\*, J. F. De La Torre-Sanchez, and G. E. Seidel, Jr., Colorado State University Fort Collins, CO 80523.

The purpose of this study was to examine effects of glucose concentration, epidermal growth factor (EGF), and hormones (FSH, LH, and estradiol 17  $\beta$ ) during bovine oocyte maturation on in vitro production of blastocysts. Oocytes from slaughterhouse ovaries were divided among the 12 factorial combinations of 3 glucose concentrations (0.5, 2.0, and 5.5 mM), presence or absence of 50 ng/ml of EGF, and presence or absence of LH, FSH, and E<sub>2</sub> in CDM-1, a chemically defined medium similar to SOF. Oocytes were matured at 38.5C in 5% CO<sub>2</sub> in air for 23 h. After maturation, oocytes were fertilized at 1 X 10<sup>6</sup> sperm/ml in 6 replicates in F-CDM (0.5 mM glucose), and then cultured 2 days in CDM-1 (0.5 mM glucose) and 4 days in CDM-2 (2 mM glucose). Glucose concentration in maturation medium at 0.5, 2.0, and 5.5 mM had no effect on blastocyst rates per oocyte, 33%, 32%, and 31% respectively. However, 0.5 mM glucose resulted in a cleavage rate of 87%, higher than 81% seen for both 2 and 5.5 mM glucose ( $P = .004$ ). EGF and hormones independently enhanced cumulus expansion, but there was no synergism between them, and they had no effect on cleavage or blastocyst rates. Both cleavage ( $P = .0003$ ) and blastocyst rates ( $P = .02$ ) were affected by which of 3 bulls was used for fertilization.

**Key Words:** Bovine, Embryo, Oocyte

**133 The effects of cottonseed hulls added to diets with and without live yeast or mannanoligosaccharide in Jersey calves.** S. R. Hill\*, B. A. Hopkins, S. Davidson, S. M. Bolt, C. Brownie, T. Brown, G. B. Huntington, and L. W. Whitlow, North Carolina State University.

The objective of this study is to investigate the effects of fiber in the form of cottonseed hulls (CSH) added to the starter and of live yeast (YST) or mannanoligosaccharide (MOS) added to milk, on growth, intake, rumen development, and health parameters in neonatal Jersey calves. Newborn Jersey bull and heifer calves (n=46) were assigned randomly at birth to one of six treatments and continued through 63 d. Bulls were elastrated at 14 d. Calves were fed 3.8 L of colostrum for the first 2 d once daily and then 2.8 L of whole milk supplemented with either no additive, 4g YST, or 3g MOS once daily through weaning at 42 d. Treatments included: 1) a corn/soybean meal based starter, 20% CP, 6% ADF (CON), 2) a blend of 85% starter and 15% CSH, 18% CP, 15% ADF (CON + CSH), 3) starter and MOS (CON + MOS), 4) starter with CSH and MOS (CON + CSH + MOS), 5) starter and live yeast (CON + YST), and 6) starter with CSH and live yeast (CON + CSH + YST). Starter diets were offered from 1 d and daily amounts were increased by 0.09 kg when orts were 0 kg. Weekly measurements included body weight (BW), wither height (WH), hip width (HW), and dry matter intake from starters (DMI). Daily measurements included rectal temperatures, fecal, and respiratory scores. Calves fed either YST or MOS had greater BW (37 kg) than calves fed no supplement (35 kg) ( $P < 0.05$ ). There were no significant effects of CSH, YST, or MOS on DMI, WH, or HW ( $P > 0.05$ ).

**Key Words:** Jersey calves, Cottonseed hulls, Yeast

**134 Leptin, body condition, and intake regulation of lactating dairy cows in the transition phase.** D. Kumar\*<sup>1</sup>, M. A. Froetschel<sup>1</sup>, T. D. Pringle<sup>1</sup>, D. Keisler<sup>2</sup>, and J. K. Bernard<sup>1</sup>, <sup>1</sup>The University of Georgia, <sup>2</sup>The University of Missouri.

Leptin may be responsible for decreased intake and milk production of lactating dairy cows fed fat during transition. Experimentation was conducted to correlate leptin with body fat and stage of lactation in dairy cattle, and investigate the role of leptin in intake regulation during transition. In the first experiment, jugular blood samples were obtained from, and body fat measured with ultrasonography, in 16 lactating dairy cows that varied in body condition score (n=8 < 2.5 BCS and n=8 > 3.5 BCS), and days in milk (range d 88 to d 725). Backfat ( $r^2 = 0.64$ ,

$P < 0.01$ ), rumpfat ( $r^2=0.60$ ,  $P < 0.01$ ), and days in milk ( $r^2= 0.48$ ,  $P < 0.01$ ) were positively related to serum leptin. In the second experiment, twelve Holstein cows, fed anionic salts 2 weeks before calving were given three levels of supplemental fat (0, 3, and 6% added fat using MEGALAC-R<sup>®</sup>) post-calving. Dry matter intake and milk production were measured for 4 weeks post-calving. Leptin was analyzed on jugular blood samples taken two days before calving, two days after calving and at weekly intervals 1h before and 2h after feeding. Serum leptin increased ( $P < 0.01$ ), 7.2% (4.54 vs. 4.87 0.07 ng/ml) in cows post-calving as compared to pre-calving. Leptin was negatively related to level of dietary fat (linear and quadratic,  $P < 0.01$ ), decreasing 16.2 - 28.4% (4.75, 3.33, and 3.98 0.41 ng/ml). In the first four weeks after calving, milk production decreased (linear,  $P < 0.01$ ) 8.6 to 21.6% due to fat in the diet. Dry matter intake increased (quadratic,  $P < 0.05$ ) from 1.5 to 7.0% and leptin tended to follow a similar trend ( $P < 0.14$ ). DMI increased (linear,  $P < 0.01$ ) from 18.1 to 23.6 kg/d and milk production increased (linear,  $P < 0.01$ ) from 27.3 to 43.1 kg/d during the first four weeks of lactation. Serum leptin did not change during this period. Although serum leptin is correlated with body condition of dairy cattle, it remains to be identified as a major determinant of intake regulation in transition cows fed dietary fat.

**Key Words:** Leptin, Intake, Transition cow

**135 The ability of amide versus calcium salts of soybean oil to increase unsaturated fatty acid concentration in omasal and continuous culture samples.** F. P. Lundy III\*, T. C. Jenkins, W. C. Bridges Jr, and J. A. Bertrand, *Clemson University, Clemson, SC, 29634.*

Two studies were conducted to determine the ability of two forms of soybean oil to resist biohydrogenation by mixed ruminal microorganisms in vivo and in continuous culture. Four TMR consisting of forage and concentrate (1:1 DM basis) contained either; 1) soybean oil (SBO) added at 2.45% of DM, 2) amide of soybean oil (AMD) added at 2.75% of DM, 3) calcium salt of soybean oil (CAS) added at 2.75% of DM, and 4) a mixture (20:80, w/w) of the amide and calcium salts of soybean oil (MIX) added at 2.75% of DM. The four diets were fed ad-libitum to four multiparous lactating (103 DIM, SD 38) Holstein cows (fitted with ruminal cannulae) in expt 1, and were fed (30 g/d) in expt 2 to four dual flow continuous culture systems in a 4X4 Latin square design. The ability of the fat supplements to resist biohydrogenation was expressed as C18:1 or C18:2 concentrations (mg/g DM) in omasal (expt 1) or fermenter outflow samples (expt 2) divided by their concentrations (mg/g DM) in the feed. For C18:2, the omasal/feed concentrations in expt. 1 were 0.078, 0.098, 0.108, and 0.125 and in expt. 2 were 0.187, 0.261, 0.283, and 0.337 for the SBO, MIX, CAS, and AMD diets, respectively. Similar results for C18:1 were 0.296, 0.32, 0.321 and 0.67 in expt. 1 and 0.458, 0.52, 0.507, and 0.592 in expt 2. Concentrations of C18:1 and C18:2 were higher for the CAS and AMD diets when

compared to SBO. In expt 2, the AMD diet had higher ( $P=0.016$ ) concentrations of C18:2 in overflow contents than CAS (8.99 vs 6.62). The concentration of C18:1 was higher ( $P=0.018$ ) in the omasum in expt. 1 and higher in the fermenter outflow ( $P=0.016$ ) in expt. 2 for AMD vs CAS. These experiments demonstrate greater ability of fatty amides and calcium salts to increase the delivery and concentration of unsaturated fatty acids post-rotationally compared to triacylglycerols. Fatty amides generally provided greater protection of unsaturated fatty acids from biohydrogenation compared to calcium salts, which was more prevalent for oleic acid than for linoleic acid.

**Key Words:** Biohydrogenation, Amide, Calcium Salt

**136 Comparison of three estrus detection systems during summer heat stress in a large commercial dairy herd.** O. A. Peralta\*, R. E. Pearson, and R. L. Nebel, *Virginia Polytechnic Institute and State University, Blacksburg.*

Our objective was to compare the efficiency and accuracy of three estrus detection systems on a large commercial dairy (1000 lactating cows) during the summer of 2002. At ~45 DIM, 282 cows were fitted with a HeatWatch (HW) device (HeatWatch<sup>®</sup>; DDx Inc., Boulder, CO), an activity (A) sensor (ALPRO<sup>™</sup>; DeLaval Inc., Kansas City, MO), and observed visually (V) twice daily. Indicators of estrus included three standing events within 4 h for HW an activity level of 3 for A, and observed standing to be mounted for V. Onset of estrus was the first standing event both for HW and V. For A, onset of estrus was the hour after 3 consecutive h of twice baseline activity for that cow during the previous 10-d period. Pregnancy status was determined by uterine palpation 35 to 49 d following AI. The effects of DIM, parity, physical activity, standing events, months, AI technician, and interval from onset of estrus and AI on % pregnant were determined using linear contrast and logistic regression. Efficiencies for detection of estrus, determined by comparing detected periods of estrus with a theoretical total of 694, were 49.9% (V), 34.4% (A) and 41.6% (HW). Efficiency for the combination of all three methods was 76.4%. Percentage of inseminations resulting in a pregnancy ( $\pm$ SE) by method of detection was 20.6 $\pm$ 4.9 for HW, 20.0 $\pm$ 5.6 for A, 9.8 $\pm$ 2.6 for V, 16.0 $\pm$ 5.6 for V & A, 30.3 $\pm$ 5.3 for V & HW, and 23.4 $\pm$ 5.4 for A & HW. For estrus periods detected by HW, the probability of pregnancy increased as DIM and standing events increased ( $P<0.05$ ). Estrus periods having 4 to 9 standing events recorded by HW had a lower ( $P<0.05$ ) pregnancy outcome (19.8 $\pm$ 2.8) compared with cows with estrus periods consisting of >10 standing events (34.0 $\pm$ 5.0%). For estrus periods detected by A, the interval from the onset of estrus to AI had a direct effect on the probability of pregnancy ( $P<0.05$ ); the highest % pregnant occurred between 13 and 18 h after the onset of estrus (38.5 $\pm$ 7.9). The combination of all three systems resulted in ~75% efficiency and the highest % pregnant occurred with the combination of V & HW, which confirms that multiple systems enhance both the efficiency and accuracy of detection.

**Key Words:** Detection of estrus, Estrous detection efficiency, Heat stress

## WSASAS Graduate Student Paper Competition

**137 Evaluation of perennial ryegrass straw as a forage source for ruminants.** M. J. Fisher<sup>1</sup>, D. W. Bohnert<sup>1</sup>, C. J. Ackerman<sup>2</sup>, C. S. Schauer<sup>1</sup>, T. DelCurto<sup>1</sup>, A. M. Craig<sup>2</sup>, D. L. Harmon<sup>3</sup>, and N. F. Schrick<sup>4</sup>, <sup>1</sup>Eastern Oregon Agriculture Research Center, Burns, <sup>2</sup>Oregon State University, Corvallis, <sup>3</sup>University of Kentucky, Lexington, <sup>4</sup>The University of Tennessee, Knoxville.

We conducted a 25-d metabolism trial to evaluate digestion and physiological variables in steers offered perennial ryegrass straw containing increasing levels of lolitrem B. Sixteen ruminally cannulated Angus  $\times$  Hereford steers (231  $\pm$  2 kg BW) were blocked by weight and assigned randomly to one of four treatments (TRT). Steers were provided perennial ryegrass straw at 120% of the previous 5-d average intake at 0730. Prior to straw feeding (0700), soybean meal was provided to meet the estimated requirement for degradable intake protein (0.1% BW; CP basis). Mixtures of a low (L) and high (H) lolitrem B straw (<100 and 1550 ppb, respectively) were used to formulate TRT diets. The TRT were Low (100% L), Low Mix (67% L:33% H), High Mix (33% L:67% H), and High (100% H). Intake and digestibility of DM and OM, along with ruminal pH and NH<sub>3</sub>, were not affected by increasing lolitrem B concentration ( $P > 0.10$ ). Ruminal indigestible ADF (IADF) fill increased

linearly ( $P = 0.02$ ) and IADF passage rate (%/hr) decreased linearly ( $P = 0.04$ ) as lolitrem B level increased. Alkaloid concentration did not influence serum prolactin or heart rate ( $P > 0.31$ ); however, a quadratic effect ( $P = 0.03$ ) was noted for respiration rate, with the greatest values occurring with the Low Mix and High Mix diets. These data suggest that feeding perennial ryegrass straw containing up to 1550 ppb lolitrem B does not adversely affect nutrient digestion or physiological response variables.

**Key Words:** Lolitrem B, Perennial ryegrass, Straw

**138 Risk factors associated with culling females in a composite beef herd.** P. Rogers<sup>1</sup>, C. Gaskins<sup>1</sup>, K. Johnson<sup>1</sup>, and M. MacNeil<sup>2</sup>, <sup>1</sup>Washington State University, <sup>2</sup>USDA-ARS LARRL.

Our goal was to identify factors affecting risk of a beef female being culled. Data were from the CGC composite herd (Red Angus, Charolais, Tarentaise) at Miles City, MT in which heifers were exposed as yearlings. Binary logistic regression was used to assess factors affecting probability of calving as a two-yr-old (**P(C2)**), including heifer (n =