
Three multiparous ruminally cannulated Holstein cows (DIM 169 ± 34 d) were used in a 3x3 Latin square experiment to determine the effects of feeding raw and roasted sunflower seeds on ruminal fermentation and whole-tract digestibility of dairy cows. Treatments were a control diet with no added sunflower seed, raw sunflower seed diet, and roasted sunflower seed diet. Sunflower diets contained 7.5% (DM basis) raw or roasted sunflower seed. All diets were fed ad libitum as TMR. Ether extract content was 2.5% for the control, 5.5% for the raw sunflower and 5.6% (DM basis) for the roasted sunflower diet. Results showed that dietary treatments had no effect on ruminal pH or ruminal ammonia nitrogen concentrations. Dry matter intake tended (P = 0.07) to be lower for cows fed the sunflower diets than the control diet. Apparent DM (average 75.6%), OM (average 72.6%), CP (average 73.5%), NDF (average 53.1%), starch (average 94.0%) and gross energy (71.2%) digestibilities were similar among dietary treatments. Apparent ether extract digestibility was higher for cows fed the sunflower diet relative to those the control diet. We concluded that the inclusion of raw or roasted sunflower seeds in dairy cow diets up to 7.5% of the diet DM has no adverse effects on ruminal fermentation or total tract nutrient utilization.

Key Words: Sunflower seed, Rumen fermentation, Total tract nutrient utilization

281 Effects of feeding glyphosate-tolerant canola meal on lamb growth, meat quality and apparent feed digestibility. K. Stanford, T. A. McAllister, J. Aalhus, M. Dugan, and R. Sharma. 1 Alberta Agriculture, Food and Rural Development, Lethbridge, AB, 2 Agriculture and Agri-Food Canada, Lethbridge, AB, Agriculture and Agri-Food Canada, Lacombe, AB.

Consumer awareness of transgenic crops in the food chain is increasing. This study evaluated the effects of including meal from glyphosate-tolerant canola (RIP) in barley-based diets (6.5%, DM basis) for lambs. Four diets were prepared, differing only in the type of canola meal they contained (two commercially available sources, COM1 and COM2; the parental line from which the glyphosate-tolerant canola was derived, PAR; or the transgenic RIP). The diets were isonitrogenous and formulated to exceed the lambs’ nutritional requirements. Experiment 1 involved 60 early-weaned Canadian Arcott lambs (30 ewes; 30 wethers; initial age approximately 2 mo; initial weight 21.5 ± 1.0 kg). The lambs were individually penned, blocked by weight and gender for assignment to treatments (n = 15), and fed the diets until reaching or exceeding 45 kg BW. Intake of DM by the lambs was similar among COM1, COM2 and PAR diets, and among COM2, PAR and RIP (COM1 > RIP, P < 0.05). Diet did not affect (P > 0.05) ADG or feed efficiency. Carcasses yield grade was higher (P < 0.05) for COM1 or COM2 diets than for PAR or RIP, although saleable meat yield did not differ (P > 0.05) among treatments. Canola source did not affect (P > 0.05) meat tenderness, as determined by shear force, or intramuscular fat content. Meat color differences were not detected between RIP-fed lambs and those in the other three groups. In Exp. 2, apparent digestibilities of the four diets were determined using eight mature wethers (67.8 ± 2.3 kg) in a replicated Latin square. No aspect of digestibility (DM, fibre, or nitrogen balance) was influenced by canola source. In this study, including canola meal prepared from glyphosate-tolerant canola did not alter diet digestibility, feed efficiency or growth performance of the lambs, carcass characteristics or meat quality.

Key Words: Transgenic Canola, Lamb Growth, Meat Quality

Ruminant Nutrition

Protein

<table>
<thead>
<tr>
<th>Treatment</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>SED</th>
<th>source p&lt;</th>
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</thead>
<tbody>
<tr>
<td>Methionine equivalent g*</td>
<td>50</td>
<td>50</td>
<td>80</td>
<td>50</td>
<td>NS</td>
<td>0.78</td>
</tr>
<tr>
<td>Base line BPMC (mg/100g)</td>
<td>0.29</td>
<td>0.32</td>
<td>0.30</td>
<td>0.30</td>
<td>0.02</td>
<td>0.0002</td>
</tr>
<tr>
<td>Base line AU McC (mg/100g)</td>
<td>25.5b</td>
<td>32.2b</td>
<td>69.6a</td>
<td>59.4a</td>
<td>6.2</td>
<td>0.0001</td>
</tr>
<tr>
<td>Metabolizable methionine g***</td>
<td>24.9b</td>
<td>28.8b</td>
<td>43.9a</td>
<td>40.3a</td>
<td>2.0</td>
<td>0.0002</td>
</tr>
<tr>
<td>Bioavailability ****</td>
<td>50b</td>
<td>58b</td>
<td>55b</td>
<td>81a</td>
<td>3.5</td>
<td>0.0005</td>
</tr>
</tbody>
</table>

*based on methionine equivalent concentration in HMBi monomers : 0.78
**taking into account base line
***metabolizable methionine/methionine equivalent ingested

Key Words: Ruminants, Dairy cows, Methionine, Bioavailability

283 Effects of metabolizable undegradable protein and methionine and lysine on production parameters and nitrogen efficiency of Holstein cows in early and mid-lactation. Sarah Ivan and Normand St-Pierre, The Ohio State University, Columbus, OH.

Excessive N excretion by dairy cows can have a negative effect on the environment. We hypothesized that targeted dietary changes to the N-intake pools, or the N available in the feed, would improve N efficiency by dairy cows, thus reducing negative environmental impact from milk production. Forty multiparous and 22 primiparous Holstein cows were used in a 2 x 2 factorial arrangements of treatments to determine the effects of 1) metabolizable rumen undegradable protein (M-RUP); 100% (LoM-RUP) or 110% (HiM-RUP) of the requirements stated by the National Research Council (2001), and 2) Met and Lys supplementation: control levels of 6.15% and 1.80% Lys and Met (LoA), respectively, or supplementation at 6.65% and 2.22% Lys and Met (HiA), respectively. The Lys to Met ratio was set at 3.0:1.0 in the HiA diets and 3.4:1.0 in the LoA diets.
in the LoAA diets. Cows were assigned randomly to one of four dietary treatments 14 to 21 d postpartum and continued on their assigned diet for 25 wk. There was no effect (P > 0.05) of treatment on DMI, milk yield, or milk true protein production. Lys and Met supplementation in the HiAA diets significantly (P = 0.042) increased milk true protein concentration from 3.0% to 3.14%, but high M-RUP levels significantly depressed milk fat concentration (P = 0.022) and production (P = 0.036) from 3.35% to 3.03% and 1.45 kg/d to 1.32 kg/d, respectively. Lower levels of M-RUP, combined with lower Lys and Met supplementation, significantly (P < 0.05) decreased MUN and urinary N excretion. Cows were numerically more efficient at converting N to milk in the HiAA diets with higher quality Lys to Met ratio. Dietary manipulation of N fractions can reduce the impact of intensive dairy production on the environment without adversely affecting milk or component production.

**Key Words:** Metabolizable undegradable protein, Methionine, Lysine

**284 Lactational responses of early lactation cows to two crude protein levels in corn silage and alfalfa silage based diets.** K.L. Karg and M.A. Wattiaux, University of Wisconsin-Madison.

Forty eight multiparous Holstein cows were used to evaluate the effects of primary forage source (alfalfa silage (AS) or corn silage (CS)) and CP level (16.5% (LP) or 17.9% (HP)) to test the hypothesis that lower dietary CP may not be detrimental to early lactation cows performance. Cows were blocked on milk yield and assigned to dietary treatments in a 2 x 2 factorial. A covariate diet was fed the first 3 weeks of lactation and treatment effects were measured for the following 11 weeks. Diets were fed as TMRs including 55% forage (DM basis; 14% CS and 41% AS) and differences between forage sources and protein levels were tested across the PDV and the MG while liver removal increased (-8.4 vs -6.9 mmol/h, P = 0.036) and production (7.9 vs 8.0 mmol/h, P = 0.01) during the last 4 h, hourly samples were collected to determine plasma flows plus the isotopic enrichments (IE) and concentrations of HMB (+3C and MET (both +13C and H2) in plasma from the artery, portal, hepatic and mammary veins. The IE of +13C and +13H MET were also determined in milk protein taken over the last 4 h of infusion. HMB-infused cows, whole body plasma flux of MET increased (17.9 vs 24.1 mmol/h, P = 0.03) between casein infusion treatments. Urinary N excretion decreased linearly (P = 0.07; 14.2, 12.6, 12.1, and 11.7 g/d; pooled SEM = 0.9) with decreasing ruminal infusion of casein. Urea-N recycled to the gastrointestinal tract increased (P = 0.01; 16.8, 17.2, 22.6, and 23.1 g/d; pooled SEM = 2.0) with decreasing ruminal infusion of casein. These data indicate that decreasing the rumen degradability of supplemental protein, above that required to maximize N retention, results in decreased urinary excretion of N and increased urea-N recycling to the gastrointestinal tract.

**Key Words:** Sheep, Nitrogen, Urea Recycling


Four multicatheterized cows (31.3 kg milk/d; 17.7 kg DMI/d) were used in a cross-over design each of 2-week periods to determine the effect of HMB on HMB and methionine (MET) metabolism. Over the last 2 d, cows were infused (intrajugular) with saline or HMB (Aliment® feed supplement, Novus International Inc.) at the rate of 1.5 g/h. During the last 8 h, the HMB infusion was substituted by equimolar [1-13C]HMB plus [methyl-13C]MET (200 mg/h). During the last 4 h, hourly samples were collected to determine plasma flows plus the isotopic enrichments (IE) and concentrations of HMB (+13C and MET (both +13C and H2) in plasma from the artery, portal, hepatic and mammary veins. The IE of +13C and +13H MET were also determined in milk protein taken over the last 4 h of infusion. In HMB-infused cows, whole body plasma flux of MET increased (17.9 vs 24.1 mmol/h, P = 0.03) in comparison with control. HMB infusion decreased (P = 0.05) the post-splanchnic supply of MET from 7.0 to 2.9 mmol/h, compared with needs for milk output of 7.6 and 8.1 mmol/h, respectively. HMB provided the equivalent of 22% of the total MET utilization by the MG (0.9 mmol/h from synthesis within the gland and 2.0 mmol/h from extraction of MET produced in other tissues). Intracellular conversion of HMB in other tissues spared their needs for dietary MET which was then used by the MG to support milk protein output. Absorbed HMB therefore produces and spares MET for use by the MG.

**Key Words:** lactating cows, HMB, methionine


Six lactating Holstein cows were used to measure the effect of a jugular infusion of essential amino acids (AA) on splanchnic metabolism in dairy cows fed a protein deficient diet, according to a cross-over design. A total mixed ration was fed in twelve equal meals per d (mean DMI = 17.0 kg/d). Indwelling catheters had been surgically implanted in the mesenteric artery, the portal and hepatic veins for blood collection, and in two distal branches of the mesenteric vein to allow infusion of p-aminohippurate to determine blood flow. After five days of infusion

**Key Words:** Forage, Environment
of saline or of AA, six hourly blood samples were collected to determine plasma concentrations of AA. Yields of milk (29.2 vs 31.3 ± 0.46 kg/d) and protein (912 vs 1047 ± 21.7 g/d) were increased (p<0.05) with AA infusion. Infusion of AA increased arterial concentrations of infused AA. The net flux across the portal-drained viscera was not affected but the infusion of AA increased hepatic extraction by more than the level of infusion. Why in such a case did milk production increase with AA infusion remains unclear. Although the demand of peripheral tissues has an effect on liver catabolism of AA, the regulation of AA extraction by the liver seems also regulated by factors independent of the demand by the mammary gland and related to high concentrations of AA in peripheral circulation.

Key Words: Amino acid, Splanchnic metabolism, Protein

288 Minimum dietary protein required for lactating dairy cows fed different amounts of alfalfa and corn silage. E. B. Groff* and Z. Wu, Pennsylvania State University, University Park, PA.

The response of lactating dairy cows to dietary protein level under various alfalfa to corn silage programs was determined. Three trials were conducted using 100 : 0, 50 : 50, or 25 : 75 alfalfa to corn silage ratios. Each trial used 16 Holsteins (117± 33 DIM) in a replicated 4 X 4 Latin square design with 3-wk periods (2-wk adjustment followed by 1-wk collection). All diets consisted of 50 : 50 forage : concentrate and 4 Latin square design with 3-wk periods (2-wk adjustment followed by 1-wk collection). No differences were observed in N intake and excretion in dairy cows. Eight cows were offered each of three diets in a randomized cross-over design. Diets consisted of corn silage, mixed grass/legume haylage, alfalfa hay, corn meal, protein, vitamin and mineral supplements and were fed ad libitum. Diets 1, 2, and 3 contained 17.9%, 18.1% and 16.4% crude protein (CP) and 0%, 0.77%, and 0.77% Optigen 1200, respectively. Individual feed intakes were measured, and a total fecal and urine collection was conducted. Cows were milked twice daily and the milk sampled for composition and milk urea N analysis. Dry matter intakes averaged 23.5 ± 0.2 kg/d and were not altered by diet (p>0.05). Also, milk fat and true protein were not altered by diet (p>0.05) and averaged 3.72 ± 0.05% and 3.07 ± 0.02%, respectively. Milk yields were 35.6, 34.8, and 33.8 kg/d for cows consuming diets 1, 2, and 3 respectively (S.E. = 0.44). Significant differences were observed in N intake and excretion in urine, feces, and milk between dietary treatments. Cows fed diet 3 consumed 11% less N than in treatment 1. Cows fed diet 2 showed the highest excretion of N in urine, and together with treatment 3, the lowest N excretion in feces. N excretion in milk was lower for cows fed diet 3. Calculated N balances were not significantly different between treatments, nor were they significantly different from zero. Efficiency of N capture in milk protein as a function of N intake was higher for animals on treatment 3. Urinary excretion of purine derivatives was used to estimate microbial CP flows to the duodenum, which were similar between diets. Optigen 1200 was not effective at reducing nitrogen excretion by dairy cattle.

Key Words: Nitrogen excretion, Nitrogen balance, Urea

289 Amino acid profiles of tropical forages and of their residues after incubation in the rumen, phospho-borate buffer and intestinal digestion. L. F. Miranda*, M. M. Gontijo Neto*, E. S. Pereira2, C. M. Veloso2, and C. M. Gontijo Neto2. 1Universidade Federal de Minas Gerais, Brazil, 2University of California, Davis, USA, 3Universidade Estadual Oeste Paráná, Brazil, 4Universidade Itapetinga, Brazil, 5EMBRAPA Gado de Corte, Brazil.

Amino acid (AA) profiles of several feed protein fractions were determined for foliage from leucaena (Leucaena leucocephala), perennial soybean (Neonotonia wightii), manioc (Manihot esculenta), ramie (Boehmeria nivea), and guandu (Cajanus cajan) using sips in and vitro procedures. Fractions included total feed protein; (rumen) undegradable intake protein (UIP), the residue after an 18 h rumen incubation in nylon bags; phosphate-borate buffer (PBB) insoluble residue; and (intestinal) indigestible protein, the residue after a three-stage procedure. These were analyzed by HPLC after acid hydrolysis or peroxidation followed by acid hydrolysis. There was no difference (P>0.05) in the AA profile of any of the protein fractions of guandu and ramie. For leucaena, several AA (Lys, Met and Thr) contents differed between the total protein and the PBB residue. The same was true for perennial soybean (Iso, Leu, Met, Thr, and Val) and manioc (Arg, Iso, Leu and Lys). The essential AA profile of the total feed protein was similar to the essential AA available for intestinal absorption for guandu and ramie, but not for leucaena, perennial soybean and manioc leaves. The use of the AA profile of the feed to formulate rations must be viewed with caution.

Key Words: amino acids, protein fractions, tropical forages


The purpose of this study was to evaluate the impact of polymer-coated urea (Optigen 1200) on nitrogen retention, rumen microbial growth, and milk production and composition. Slow-release urea has the potential to be incorporated more efficiently than unprotected urea by rumen microorganisms because it is released in synchrony with available carbohydrates. Thus, slow-release urea would be expected to improve efficiency of N utilization and reduce N excretion in dairy cows. Eight cows were offered each of three diets in a randomized cross-over design. Diets consisted of corn silage, mixed grass/legume haylage, alfalfa hay, corn meal, protein, vitamin and mineral supplements and were fed ad libitum. Diets 1, 2, and 3 contained 17.9%, 18.1% and 16.4% crude protein (CP) and 0%, 0.77%, and 0.77% Optigen 1200, respectively. Individual feed intakes were measured, and a total fecal and urine collection was conducted. Cows were milked twice daily and the milk sampled for composition and milk urea N analysis. Dry matter intakes averaged 23.5 ± 0.2 kg/d and were not altered by diet (p>0.05). Also, milk fat and true protein were not altered by diet (p>0.05) and averaged 3.72 ± 0.05% and 3.07 ± 0.02%, respectively. Milk yields were 35.6, 34.8, and 33.8 kg/d for cows consuming diets 1, 2, and 3 respectively (S.E. = 0.44). Significant differences were observed in N intake and excretion in urine, feces, and milk between dietary treatments. Cows fed diet 3 consumed 11% less N than in treatment 1. Cows fed diet 2 showed the highest excretion of N in urine, and together with treatment 3, the lowest N excretion in feces. N excretion in milk was lower for cows fed diet 3. Calculated N balances were not significantly different between treatments, nor were they significantly different from zero. Efficiency of N capture in milk protein as a function of N intake was higher for animals on treatment 3. Urinary excretion of purine derivatives was used to estimate microbial CP flows to the duodenum, which were similar between diets. Optigen 1200 was not effective at reducing nitrogen excretion by dairy cattle.

Key Words: Nitrogen excretion, Nitrogen balance, Urea

291 Effects of protein supplementation during lactation on milk yield of primiparous Holstein cows. L. A. Torbert4, J. G. Linn1, M. L. Raeth-Knight1, and K. S. Davis2. 1University of Minnesota, St. Paul, MN, 2Chippewa Valley Ethanol Company, Benson, MN.

Corn distillers solubles (CDS) is a liquid byproduct of the dry corn milling process. A commercial liquid supplement, Alcomp®, includes CDS with additions of urea, ethyl alcohol, and minerals being added. Corn distillers solubles and Alcomp® can be used as protein sources in livestock diets. The objective of this study was to compare feeding CDS with ethyl alcohol, Alcomp®, and a control SBM-urea protein mix to primiparous cows from 1 to 727 days in milk. Cows were assigned to 1 of 3 dietary treatments by calving date and housed in a tie-stall barn. Feed intake, health, and milk production data were recorded daily. Milk composition was determined biweekly. The diet composition was: 39% corn silage, 12% chopped alfalfa hay, and 49% concentrate, on a dry matter basis. The protein supplements were added to their respective diet treatment to achieve an isonitrogenous diet (17.2% crude protein). Alcomp® and CDS were included in their respective diets at 2% of the diet dry matter. Nutrient composition of the diets (dry matter basis) was: 32.1% neutral detergent fiber, 18.2% acid detergent fiber, 3.4% ether extract, and 37.7% nonfibrous carbohydrate. Dry matter intake (DMI), body weight (BW), body condition score (BCS), milk production, and milk components were not different (P>0.1) for the 3 dietary treatments. Body weight average was numerically highest for cows fed Alcomp®, but not different (P>0.05) than cows fed CDS or control SBM-urea diets.

292 Effects of replacing soybean meal with secondary protein nutrients in silage-based diets for growing beef steers. S.R. Freeman1, M.H. Poore1, G.B. Huntington2, and T.F. Middleton2. 1North Carolina State University, Raleigh, NC, 2AgPro Visions, LLC, Kenansville, NC.

Because nutrient recycling is a prime concern for the poultry processing industry, the feeding value of secondary protein nutrients (SPN, preliminary analysis: 92.9% DM, 47.4% CP, 11.5% ash, 26.7% EE), a byproduct of wastewater treatment, was examined in an 84-day feeding trial. Sixty Angus steers averaging 255 kg were blocked by weight into groups of 12 and fed individually with Calan gates. Two steers per pen were randomly assigned to one of six corn silage-based diets containing graded levels of SPN, giving ten steers per treatment. One treatment group received no supplemental CP and served as a negative control (NC). The other groups received diets containing 0, 25, 50, 75, or 100% of their supplemental CP as SPN with the remaining portion being supplied by soybean meal. This resulted in SPN being 0, 1.2, 5.0, 7.6, and 10.0% of diet dry matter, respectively. The steers were weighed following the removal of feed and water overnight at the beginning and end of the trial. Blood from each animal was sampled two hours after feeding via jugular venipuncture for determination of blood urea nitrogen. Analysis of diets NC, 0, 25, 50, 75, and 100% SPN showed that they contained 7.6, 10.4, 10.4, 11.0, 10.5, and 11.1% CP, respectively; on a dry basis. DMI, ADG, feed:gain ratio, and BUN were all different (P<0.01) when NC steers were compared to protein-supplemented steers. DMI and ADG responded linearly (P<0.01) and quadratically (P<0.02, respectively) to the replacement of soybean with SPN. LS means and SEM for DMI were 5.31, 6.77, 7.33, 6.89, 6.05, and 5.22 ± 0.20 kg/d, respectively for the NC, 0, 25, 50, 75, and 100% SPN diets. ADG were 0.54, 0.26, 1.21, 1.11, 0.94, and 0.66 ± 0.05 kg/d, respectively. Feed:gain and BUN showed a linear relationship (P<0.01) when SPN replaced soybean meal in the diet. LS means for feed:gain were 10.13, 5.37, 6.12, 6.32, 6.62, and 8.28 ± 0.418 for the respective diets. LS means for BUN levels were 1.12, 5.75, 4.83, 4.24, 3.49, and 3.45 ± 0.363 mM, for the respective diets. These results indicated that SPN shows potential as a protein source in silage-based diets.

Key Words: Protein Supplements, Cattle, Poultry Processing Byproducts

293 Comparative evaluation of the protein values of soybean and rapeseed meals by in vivo, in situ, and laboratory methods. K.-H. Suedekum1*, W.W. Dvorak1, M.L. Bauer, G.P. Lardy, and J.S. Caton. 1North Dakota State University, Fargo, North Dakota, USA.

The protein values of soybean (SBM) and rapeseed meals (RSM) were compared. Ten samples of RSM were taken from German oil mills and 7 samples of SBM, 4 of which were produced in German oil mills and one each from Brazilian, Argentine and Dutch oil mills. Protein value characteristics (total flow of crude protein [CP] to the duodenum and ruminally undegraded CP [RUP]) were estimated for all 17 meals using the following methods: in situ; in vitro with ruminal fluid using either the ammonia concentration and gas production or a modification of the first stage of the Tilley and Terry procedure; in vitro with a protease from Streptomyces griseus; and chemically, using fractionation of the CP based on the Cornell Net Carbohydrate and Protein System. Two samples each of RSM and SBM, which after the first in vitro findings displayed the highest and lowest extent of CP degradation in the rumen, were selected for in vivo experiments on dairy cows with duodenal cannula in Braunschweig. The CP contents of RSM ranged from 37.6 to 42.9% of dry matter and those of SBM from 47.5 to 51.8%. The methods used to estimate the RUP content produced uniform results to the effect that the average RUP content of RSM was higher (35% of CP at 0.05 h−1 ruminal outflow rate) and that of SBM lower (23%) than previously reported. The experiments performed in vivo to determine the total CP flow to the duodenum and the RUP proportions of the four meals yielded hardly plausible values. There was a high compliance with the other methods to the extent that in vivo too, the RSM samples displayed a RUP content of the CP at least as high as that of the SBM samples, the classification of ‘higher’ and ‘lower’ RUP contents within RSM and SBM could be confirmed, and the overall protein value confirmed the smaller difference between RSM and SBM derived from the laboratory methods. In conclusion, current commodities of RSM are a better protein feed than previously reported.

Key Words: Protein, Degradation, Rumen

294 Estimating the protein value of protected protein feeds by in situ and laboratory methods. K.-H. Suedekum*, University of Kiel, Germany.

Several chemical and physical methods have been identified as being efficient in increasing the proportion (% of total crude protein [CP]) of ruminally undegraded feed protein (RUP) of a feedstuff, yet there is a continuing need for methods to be established that allow degree of protein protection from ruminal degradation to be estimated with acceptable expenditure of labor and other costs. In this study, 12 protein feeds (number of samples in brackets: soybean meal [5], soybeans [1], rapeseed meal [4], rapeseed expeller [1], fishmeal [1]), eight of which had been processed by different technical treatments to elevate the proportion of RUP of total CP, were subjected to standardized ruminal incubations and four different laboratory methods to estimate the proportion of RUP as one of the key variables that determine the overall protein value of feedstuffs. Laboratory methods included those with and without the use of rumen fluid as an inoculum. As intestinal digestibilities of the CP and RUP of each feedstuff were estimated using a mobile bag technique. As a general observation, all treated feeds contained more RUP as a proportion of total CP than the four feeds that were only subjected to standard treatments, i.e., extraction of oil and drying (‘toasting’). The in situ RUP values (0.05 h−1 ruminal outflow rate) of the protected protein feeds ranged from 62 to 80% of CP, whereas those of the conventionally treated feeds ranged from 39 to 55%. All laboratory methods were capable to distinguish treated and untreated feeds. Moreover, ranking of feeds in terms of RUP content was similar among laboratory and in situ treatments. There is a choice of laboratory methods available which appear similarly useful for estimating the RUP of differently treated soybean and rapeseed (meal, seeds, expeller) commodities. Intestinal digestibilities of all but two feedstuffs were greater than 80%, indicating that no major impairment of post-ruminal CP digestion had occurred due to technical treatments of the feedstuffs.

Key Words: Protein, Degradation, Rumen

295 Effects of degradable intake protein on plasma hormone and metabolite concentrations in periparturient beef cows fed native prairie hay. W.W. Dvorak*, M.L. Bauer, G.P. Lardy, and J.S. Caton. North Dakota State University, Fargo, North Dakota, USA.

Thirty-two Angus crossbred cows (670 ± 60 kg initial wt) were used to evaluate effects of degradable intake protein (DIP) supplementation on plasma hormone and metabolite concentrations in beef cows fed native prairie hay. Treatments were control (C; corn-based supplement), urea (U), steep liquor (L), and sunflower meal (S) based supplements. Supplements were fed at 0.280, 0.283, 0.296, and 0.296% of BW during gestation, and 0.589, 0.598, 0.625, and 0.633% of BW during lactation, for C, U, L, and S, respectively. Supplements provided similar NEcon during gestation (5.85 Kcal/kg BW) and lactation (12.31 Kcal/kg BW). Control supplements provided 44.0 g DIP/kg DM during gestation and 44.9 g DIP/kg DM during lactation. Protein supplements were formulated to provide 131.6 g DIP/kg DM during gestation and 116.2 g DIP/kg DM during lactation. Prairie hay (7.2% CP) was offered daily in Calan gates for ad libitum consumption. Jugular plasma samples were obtained daily during six 7-d collection periods, for mo 7, 8, and 9
of gestation and mo 1, 2, and 3 of lactation. Samples were composited for each cow within period. Glucose was similar among treatments (P > 0.10) and greater (P < 0.001) during gestation compared with lactation (4.33 vs 3.88 ± 0.09 mM). NEFA was unaffected by treatment (P > 0.10), however NEFA was greater (P = 0.001) during gestation compared with lactation (641.51 vs 534.98 ± 40.93 µg/L). There was a period × treatment interaction (P = 0.01) for plasma urea nitrogen (PUN). PUN was higher (P < 0.05) for U, L, and S compared to C for mo 8, 9, 1, 2, and 3. Insulin was similar among treatments and tended to be greater (P = 0.07) during lactation compared with gestation (1.51 vs 1.33 ± 0.13 µU/mL). These data suggest that DIP supplementation had no effect on blood metabolites, with the exception of PUN which was higher for U, L, and S, and insulin in cows consuming native prairie hay.

Key Words: Degradable Intake Protein, Beef Cows, Plasma Metabolites

Sheep Species

296 Pregnancy rates in sheep after traversing the cervix with a new transcervical artificial insemination instrument. M. C. Wulster-Radcliffe and G. S. Lewis. 1 Fort Dodge Animal Health, 2 USDA, ARS, U.S. Sheep Experiment Station.

The difficulty of traversing the cervix limits the use of transcervical (TC) AI in sheep. So we developed a new TC AI instrument to help remedy this. The instrument does not affect pregnancy rates through d 3 of pregnancy, but its effects on pregnancy rates after d 3 are not known. Thus, we determined whether the TC AI instrument or using the instrument for TC AI affects pregnancy rate. At 48 to 52 h after removal of progestogenated pessaries and eCG injection, estrus ewes were artificially inseminated with fresh, diluted semen, or each ewe was mated with one of several rams. Experiment 1 had three groups: 1) TC intrauterine AI using the new TC AI instrument + sham intrauterine AI via laparotomy (n = 29 ewes); 2) sham TC AI + intrauterine AI via laparotomy using a laparoscopic AI instrument (n = 29); and 3) sham TC AI + intrauterine AI via laparotomy using the new TC AI instrument (n = 30). Within each treatment, rams were allowed to breed ewes. Experiment 1 had two groups: 1) TC intrauterine AI using the new TC AI instrument + sham intrauterine AI via laparotomy (n = 29 ewes); 2) sham TC AI + intrauterine AI via laparotomy using a laparoscopic AI instrument (n = 29). Immediately after treatment, rams were allowed to breed ewes. Experiment 3 had two groups: 1) TC AI (n = 99) and 2) laparoscopic AI (n = 99). On the day before d 25 and 56 in Exp. 2 and 3, pregnancy was diagnosed ultrasonically. In Exp. 2, the TC AI instrument did not affect pregnancy rate (overall mean = 66%). In Exp. 3, pregnancy rate was lower after TC AI (5 vs 45%; P < 0.01). In summary, summarized TC AI before natural service, when large numbers of undiluted sperm cells are deposited, did not affect pregnancy rate, but TC intrauterine AI, with diluted sperm, reduced pregnancy rate. Thus, TC AI with our new TC AI instrument seems to increase sperm numbers required for acceptable pregnancy rates.

Key Words: Artificial Insemination, Cervix, Sheep

297 Reproductive performance of anestrous ewes treated with used-CIDR devices and estrogen. M. Knights, Q. S. Baptiste, and P. E. Lewis, West Virginia University, Morgantown, West Virginia.

Inadequate amounts or duration of progestogen pre-treatment increase the amount or estrogen required for inducing estrous behavior. Two experiments were conducted to evaluate the effects of estrogen (E) and weaning (W) on reproductive performance of ewes during the non-breeding season (early July) pre-treated with a used-controlled internal drug releasing (CIDR) device. In experiment 1, used CIDR devices (5 days) were applied to ewes for five days before introduction to rams (15:1 ewe to ram ratio). Weaned (n =305) and lactating (2-3 months; n = 53) received either 0 (corn oil) or 30 µg estrogen (estradiol benzoate) 1 day after insert removal/ram introduction (IRRI). Pregnancy diagnosis was conducted by transrectal ultrasonography on d 25-30 after IRRI. Pregnancy rate to the first (PR1; 59.5 and 38.7 %) and second (PR2; 74.7 and 44.8 %) service period, percentage of ewes lambing (81.4 and 44.8 %) service period, percentage of ewes lambing and LR was significantly higher in weaned (P < 0.05) than in lactating ewes (P < 0.05) than in lactating ewes, respectively. LR was higher (P < 0.05) in estrogen treated than ewes treated with corn oil only, 1.1 0.1 and 0.8 0.1, respectively. Experiment 2 was similar to experiment 1 except weaned ewes (N =106) were treated with 0, 15 or 30 µg of E and lactating ewes (N = 44) were treated with either 0, 15 or 30 µg of E. The estrous responses, PR1 and percent ewes lambing and LR significantly higher in weaned (P < 0.05) than in lactating ewes 95.5 and 73.6 %; 76.8 and 27.9 %; 82 and 27.9 %; 1.25 ± 0.14 and 0.31 ± 0.06, respectively. Dose of E did not modify any of the variables measured in lactating ewes. In weaned ewes E increased PR1 and percent of ewes lambing (P < 0.05). Weaning, and the use of small doses of estrogen can improve reproductive performance of ewes bred out-of-season.

Key Words: Anestrous Ewe, CIDR, Estrogen

298 Effect of dosage of Follicle Stimulating Hormone (FSH), vehicle and time of injection on ovulation rate and prolificacy in anestrous ewes. M. Knights*, Q. S. Baptiste, A. B. Dixon, E. K. Inskeep, and P. E. Lewis, West Virginia University, Morgantown, W.V.

The effects of dosage of FSH, vehicle and time of injection on ovulation rate and prolificacy in ewes bred during the anestrous period was evaluated. During May to July 2000, ewes (N = 155) raising on 4 farms were treated with a CIDR-G device for 5 days and exposed to raddled rams upon removal of the insert. A 3 X 2 X 2 factorial arrangement of treatments was used to test the main effects of dosage of FSH (Folltropin; 0, 42 or 68 mg NIH-FSH-P1), vehicle (saline/propylene glycol 1:4, v:v (PG), or 50 % polyvinylpyrrolidone K 29-32, (FIVP)) and time of injection (12 or 36 h before CIDR withdrawal/ram introduction, IRRI, d0). Growth and development of follicles were monitored by transrectal ultrasonography in a randomly selected group of ewes (n = 4/treatment group) at injection of FSH, at IRRI, and on days 1, 2, and 3 post IRRI. All ewes marked by rams were examined by transrectal ultrasonography on Days 10 to 14 and 26 to 31 to determine ovulation rate and pregnancy, respectively. Ewes were reexamined 20 to 25 days later (Days 46 to 51 after IRRI) to detect pregnancies from the second service period. The number of small follicles (4 mm) did not change over the scanning period and was not affected by any treatment. The number of medium follicles (5 mm) declined (P < 0.05) between FSH injection (1.5 0.2) and Days 1 (0.8 0.2), 2 (0.9 0.2) and 3 (0.5 0.2). The number of large follicles (> 5mm) increased from FSH injection (0.6 0.3) to IRRI (1.4 0.3; P < 0.05), and increased further between IRRI and Day1 (2.3 0.3; P < 0.05) or declined between Days 1 and 3 (0.6 0.3; P < 0.05). The number of large follicles was greater in ewes given 68 (1.9 0.2; P < 0.01) or 42 (1.5 0.2; P < 0.05) mg of FSH than in ewes not receiving FSH (0.8 0.3). Mean ovulation rate was (2.12 ± 0.05) and was increased by increasing dosages of FSH when given 12 but not 36 h before CIDR removal (Dosage X Time, P < 0.05). Fertility variables (estrous response, conception rate, percentage of ewes lambing or prolificacy) was not affected by treatment. Dosages of FSH previously shown to induce superovulation in a portion of ewes during the breeding season failed to increase ovulation rate in different time and vehicle combinations during anestrous.

Key Words: Ovulation rate, Anestrous, FSH

299 Libido and biological parameters of mature Awassi, Awassi x Charollais and Awassi x Romanov rams. R. T. Kridli, M. Momani Shaker, A. Y. Abdullah, I. Sada, 1 Jordan University of Science and Technology, Irbid/Jordan, 2 Czech University of Agriculture, Prague/Czech Republic.

This study was conducted in September to compare sexual performance and biological parameters of 2-yr-old, sexually naive rams of different genotypes. Charollais and Romanov rams were imported to Jordan to improve meat production and fertility of Awassi sheep. Four rams of each Awassi (A), F1 Awassi x Charollais (AC) and F1 Awassi x Romanov (AR) genotype were subjected to sexual performance tests by being individually exposed to two estrous Awassi ewes for five 20-min periods, each 2 d apart. Body weight, body condition score (BCS) and