Ruminant Nutrition: Feed intake

486 Recently identified signals for feed intake regulation. J. L. Miner*, *University of Nebraska*.

Both gastrointestinal distension and presence of nutrients in the digestive tract exert satiating effects. This has been recognized for many decades. However, our understanding of the specific mechanisms by which these stimuli are communicated and translated remains incomplete. Investigation of feed intake regulation in ruminants has historically been aided by descriptions of this biology in rodent models. Thus the role in intake regulation of absorbed chemicals, gut hormones, the vagus nerve, and specific brain nuclei has been confirmed (or modified) in ruminant species. However, much has remained unknown. For example, despite recognition that the brain peptide, NPY, is an extremely potent stimulant of feeding, and concurrent inhibitor of gonadotropes, we have not understood how undernutrition promoted its activity. The recent characterization of leptin in mice, however, has lead to the demonstration in sheep that this protein secreted from adipocytes is capable of signaling energy status to the brain, and that at least some of its effects on intake and reproductive hormone secretion are mediated via NPY. Other mechanisms of intake regulation in rodent have recently been described. Agouti-related protein and melanocyte concentrating hormone seem key to hypothalamic intake-stimulating mechanisms. Cocaine-amphetamine-related transcript (CART) peptide and malonyl CoA appear to be part of hypothalamic satiety mechanisms. We may also expect that recently described gut peptides that appear to function in determining feed intake in rodents, perform similar functions in ruminants. For example, glucagon-like peptide-1 and ghrelin are inhibitory and stimulatory, respectively, in rodents. In summary, application of modern molecular biology techniques has lead to discovery of several regulatory molecules, some of which have only been characterized in model species. At least one of these, leptin, has significantly contributed to models of how nutritional status is communicated for modulation of feed intake and reproduction in ruminant animals.

Key Words: Cattle, Feed intake, Endocrine

487 Ghrelin, a growth hormone secretagogue, is expressed by bovine rumen. P. C. Gentry*, J. P. Willey, and R. J. Collier, *University of Arizona*.

The growth hormone secretagogue ghrelin is an important regulator of energy metabolism, nutrient partitioning and feeding behavior. Although it has been detected in a variety of tissues, the stomach is the primary source of ghrelin, while receptors are located in the pituitary and hypothalamus. Ghrelin levels peak prior to a meal and subside dramatically immediately after. In addition to stimulating pituitary growth hormone secretion, exogenous ghrelin reduces fat utilization, induces adiposity and provokes food intake in humans and mice. Thus, ghrelin is an important endocrine link between the gastrointestinal tract and brain. To date, the role of ghrelin in ruminants remains unexamined. Our objective was to determine if ghrelin is expressed in preruminant and ruminant calves and to assess distribution of ghrelin mRNA expression throughout the gastrointestinal tract. Expression of ghrelin was assessed by semi-quantitative RT-PCR in Holstein bull calves at 4 (n=6) and 12 (n=5) wk of age. Calves were fed colostrum at birth and for at least three subsequent feedings, followed by a commercial milk replacer. Calves were fed twice daily at 7 AM and 6 PM. Beginning on d 12, calves were offered a corn-based calf starter feed, free choice. Calves were euthanized at 7 AM on the day of slaughter and were not fed. Primers spanning nucleotides 40-488 of the ghrelin coding region were used to amplify ghrelin from total cellular RNA from rumen, reticulum, omasum, abomasum, duodenum, jejunum, ileum and abdominal adipose tissue. Ghrelin was detected in rumen and abomasum but not in other tissues. When corrected for differences in RNA input by normalizing to the housekeeping gene G3PDH, ruminal expression was greater in 12 wk calves than in 4 wk calves, corresponding to the increase in rumen function occurring during this period. Further studies characterizing ghrelin expression in cattle under differing dietary and growth conditions are in currently in progress, as are experiments to determine cellular sites of ghrelin expression.

Key Words: Ghrelin, Energy metabolism, Ruminant

488 Evaluation of the DMI predictions of the Cornell Net Carbohydrate and Protein System model with Holstein and dual-purpose lactating cattle in the tropics. D. O. Molina*[1], I. Matamoros[2], Z. Almeida[2], L. O. Tedeschi[1], and A. N. Pell[1], [1]*Cornell University. Ithaca, NY, USA,* [2]*Escuela Agrcola Panamericana Zamorano. Honduras*.

Data from three experiments were used to evaluate the DMI predictions of version 5.0 of the Cornell Net Carbohydrate and Protein System (CNCPS) in tropical conditions in 3 production settings in Honduras. Experiment 1 was conducted with 12 lactating Holstein cows in individual stalls at a research farm. The cows received known amounts of supplements and fresh, chopped *Panicum maximum* cv Tobiatá grass and intake was measured daily. Intake of grazing cattle was evaluated in Experiments 2 and 3 using the alkane technique over 8-d periods. Experiments 2 (commercial farm) and 3 (research farm) included 12 and 13 crossbreed dual-purpose cows rotationally grazing *Cynodon nlemfuensis* cv Alicia and *Panicum maximum* cv Tobiatá grass, respectively, with appropriate supplementation. Model predictions were evaluated by regressing the observed (obs) values (Y variable) on the predicted (pred) values (X variable). Mean bias and mean square prediction error (MSPE) were calculated. Differences between obs and pred values were evaluated using a 2-tailed t-test. Model-predicted DMI (18.2 kg/d)was close to the observed values (18.0 kg/d), with a mean bias of - 0.19 kg DM/d, suggesting that the CNCPS accurately predicted intake of confined lactating animals in tropical conditions. The intake predictions by the CNCPS for the grazing dual-purpose lactating cows were not as accurate. The CNCPS model underpredicted DMI in experiment 2 (10.7 kg/d obs versus 12.8 kg/d pred), with a mean bias of - 2.04 kg DM/d, and DMI was overpredicted in experiment 3 (12.5 kg/d obs versus 12.2 kg/d pred), with a mean bias of 0.45 kg DM/d. For the three experiments, the slope of the regression between observed and predicted DMI did not differ from unity, but the intercept differed ($P < 0.05$) from zero, indicating a prediction bias. Accurate intake data from grazing animals is difficult to obtain and errors in the estimation of herbage intake using the alkane method may have contributed to the bias in the predictions by the CNCPS model.

Key Words: CNCPS, Dry mater intake, Tropical pasture

Sheep: Sheep production and management

489 Out-of-season breeding in hair sheep using Melengestrol Acetate (MGA). N. C. Whitley[1], D. J. Jackson*[1], and S. Schoenian[2], [1]*University of Maryland Eastern Shore,* [2]*Maryland Cooperative Extension, WMREC*.

Thirty-two Katahdin and crossbred Katahdin ewes were group-fed one of two diets, a commercial diet containing MGA (n=16; MGA) or a commercial diet with no MGA (n=16; CON) for a period of 10 d after being removed from rams for 21 days prior to the start of treatment. The MGA group was fed to provide approximately .25 mg/ewe of MGA/day while the CON group was fed an equivalent amount of a control diet. Following the treatment period, ewes were grouped for mating (=d0) with two rams wearing marking harnesses for 14 days. Ewes were checked twice daily for estrus and numbers mated was recorded to determine days to first mating and percentage mated. Blood samples were collected for serum estrone sulfate (ES) radioimmunoassay at approximately 52.1±.5 and 112.2±.5 days after mating for pregnancy detection. Days to first mating tended ($p<.08$) to be lower for MGA-treated ewes compared to CON ewes, averaging 2.3±.6 and 4.3±.9, respectively. The percentage of ewes mated was higher ($p<.01$) for MGA-treated ewes (100±8.8%) compared to CON ewes (37.5±8.8%). Pregnancy rates could not be determined based on serum ES concentrations in this study and concentrations were not influenced by treatment, averaging .7±.1 and 5.9±1.1 ng/ml for days 52 and 112, respectively. Lambing rate per ewe exposed and per ewe mated were both higher ($p<.01$) for MGA-