Brief report on the conference:

The joint annual ADSA (American Dairy Science Association)-CSAS (Canadian Society of Animal Science)-ASAS (American Society of Animal Science), 2009 which was held in Montreal, Quebec, Canada from July 11 to 16 gave me an opportunity to interact with Scientists across the world especially North America. It was an opportunity to exchange science to develop myself into a professional research scientist and contribute to the agricultural production systems. I presented two abstracts (one poster and one oral) entitled, '**Effect of rumen protozoa on urea-nitrogen recycling in growing lambs fed varying dietary protein concentrations'** and **'Effect of rumen protozoa on urea-nitrogen recycling in growing lambs fed diets varying in ruminally fermentable carbohydrate'.** These conferences are not only meant for scientific sessions, but to gives an opportunity to meet people from different countries with different cultural background. I whole-heartedly thank Agricultural Institute of Canada Foundation for providing me with travel grants through International Union of Nutritional Scientists.

Effect of rumen protozoa on urea-nitrogen recycling in growing lambs fed varying dietary protein concentrations

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In ruminant animals microbial protein (MP) provides high quality absorbable amino acids at small intestine which accounts for about 60 to 80% of metabolizable protein requirement. Therefore understanding the mechanisms of nitrogen (N) metabolism in the rumen and improving MP synthesis by increasing the capture of recycled urea-N in the rumen will improve animal production efficiency. Besides, intensive livestock operations are under increasing public pressure to limit N excretion into the environment. Therefore improving rates of utilization of dietary protein result in decreased excretion of environmentally degradable N in feces and urine. Hence, it may be possible to enhance this process of increasing the capture of ammonia in the rumen and MP synthesis by dietary alterations. One such strategy is to manipulate ruminal MP synthesis by altering ruminal protozoa combined with adapting feeding practises that optimize N retention in milk and meat. The hypothesis for this study was that de-faunation will increase N retention, urea-N recycling to the rumen, microbial protein synthesis and UT-B expression in the rumen epithelium in growing lambs, and these effects will be more pronounced in defaunated lambs fed low N diets compared to those fed high N diets. The objectives were to delineate the effects of defaunation and dietary CP levels on urea-N kinetics, N metabolism, MP synthesis and gene expression in growing lambs.

Four Suffolk ram lambs (43.9 ± 1.4 kg initial BW) were used in a 4 x 4 Latin square design with 28-d periods and a 2 x 2 factorial arrangement of treatments. The treatment factors

were: 1) partially-defaunated vs. faunated lambs; and 2) 10% (LOW) vs. 15% (HIGH) dietary CP (% DM). Linoleic acid-rich sunflower oil was fed (6% of DM) as an anti-protozoal agent. Rumen contents were collected 2-h after feeding daily from each lamb. N balance was measured from d 22 to d 26, with concurrent measurement of urea-N kinetics continuous intra-jugular infusions of [$^{15}N^{15}N$]urea. There were only minor interactions between ruminal protozoa status and level of dietary CP. Feeding sunflower oil decreased ($P < 0.01$) total ruminal protozoa by 85%, associated with decreased ($P < 0.01$) ruminal NH_3-N concentrations. Nitrogen intake was lower ($P = 0.04$), and N retention (as % of N intake) was higher ($P = 0.05$) in partially defaunated lambs. Endogenous production of urea-N (UER; 26.1 vs. 34.6 g/d; $P < 0.01$) and urea-N loss in urine (UUE; 10.1 vs. 15.7 g/d; $P < 0.01$) were lower, and urea-N entering the GIT (GER; 16.0 vs. 18.9 g/d; $P = 0.06$) tended to be lower in partially-defaunated lambs compared to faunated lambs; however, when expressed as a proportion of UER, GER was higher ($P < 0.01$) and its anabolic use tended to be higher ($P = 0.09$) in partially-defaunated lambs. Partial defaunation increased ($P < 0.01$) microbial N supply. Endogenous production of urea-N, GER and UUE were higher ($P < 0.01$) in lambs fed HIGH diet; however, when expressed as a proportion of UER, the GER and its anabolic use were higher ($P < 0.01$) in lambs fed LOW diet. The expression of UT-B mRNA in PDFAUN lambs were 20% higher ($P = 0.15$) as compared to FAUN lambs. In summary, partial defaunation increased microbial N supply which could be attributable to increase in the urea-N transfer to the GIT.

Keywords: dietary protein, ruminal protozoa, urea-N recycling

Effect of rumen protozoa on urea-nitrogen recycling in growing lambs fed diets varying in ruminally fermentable carbohydrate

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Removal of protozoa (i.e., defaunation) improves N utilization, mainly by decreasing the ruminal ammonia (NH_3)-N pool, coupled with a greater sequestration of NH_3-N into bacterial protein, decreasing intra-ruminal N recycling and increasing bacterial N flow to the duodenum by 20 to 60%. Protozoa degrade dietary AA and bacterial proteins, thus elevating ruminal NH_3-N level; consequently, defaunation consistently decreases ruminal NH_3-N level. Ruminal NH_3-N concentration is negatively correlated with diffusion of urea-N from blood into the rumen and its sequestration into microbial protein. Hence, it is possible that the decreased ruminal NH_3-N level in defaunated ruminants may increase urea-N recycling by increasing both urease activity and the ruminal epithelium's permeability to urea-N. Shifting carbohydrate digestion from the small intestine to the rumen via steam-flaking compared to dry-rolling of sorghum grain tended to increase urea-N transfer to the rumen in beef steers, and potentially resulting in a greater incorporation of recycled urea-N into microbial protein by providing more ATP. Therefore, our hypothesis was that defaunation increases urea-N recycling to the rumen, microbial protein synthesis and urea transporter B (UT-B) expression in the rumen epithelium in lambs, and that these effects will be more pronounced in defaunated lambs fed pelleted barley compared to dry-rolled barley.

We examined how interactions between ruminal protozoa and ruminally-fermentable carbohydrate (RFC) alter urea-N recycling to the gastrointestinal tract (GIT). Four Suffolk ram lambs (61.5 ± 4.0 kg initial BW) were used in a 4 x 4 Latin square design with 28-d periods and a 2 x 2 factorial arrangement of treatments. The treatment factors were: 1) partially defaunated vs. faunated lambs; and 2) dry-rolled vs. pelleted barley as the principle sources of RFC. Linoleic acid-rich sunflower oil was fed (6% of DM) as an anti-protozoal agent. Rumen contents were collected 2-h after feeding from each lamb to monitor ruminal protozoal populations. N balance was measured from d 22 to d 26, with concurrent measurement of urea-N kinetics continuous intra-jugular infusions of [$^{15}N^{15}N$]urea.. Only minor interactions between ruminal protozoal status and RFC were detected. Feeding sunflower oil decreased ($P = 0.001$) total ruminal protozoal counts by 92%, and this was accompanied by a decrease ($P = 0.001$) in ruminal NH_3-N concentrations. Intake of N was unaffected ($P \geq 0.12$) by dietary treatments; however, urinary N excretions was lower ($P = 0.003$) and, consequently retained N was higher ($P = 0.002$) in partially defaunated lambs compared to faunated lambs. Endogenous production of urea-N (UER) was similar across treatments (22.6 to 24.6 g/d); urea-N transfer to GIT (GER), when expressed as absolute amounts (16.4 vs. 13.1 g/d; $P = 0.008$) or as a proportion of UER (0.69 vs. 0.57 g/d; $P = 0.001$) and its anabolic use (9.0 vs. 6.0 g/d; $P = 0.008$) were higher in partially-defaunated compared to faunated lambs. Partial defaunation increased ($P = 0.001$) microbial N supply determined using purine derivatives excretions in urine. Sources of RFC did not alter UER; however, urea-N loss in urine expressed in absolute amounts (9.5 vs. 7.5 g/d; $P = 0.001$) or as proportion of UER (0.40 vs. 0.34 g/d; $P = 0.01$) were higher, whereas GER as a proportion of UER was lower (0.60 vs. 0.66 g/d; $P = 0.01$) in lambs fed dry-rolled barley compared to those fed pelleted barley. Feeding pelleted barley tended ($P = 0.09$) to increase microbial N supply

compared to feeding dry-rolled barley. In summary, partial defaunation or increasing RFC via feeding pelleted barley increased the proportion of endogenous urea-N production that was recycled to the GIT, while also increasing microbial N supply.

Keywords: ruminally fermentable carbohydrate, ruminal protozoa, urea-N recycling