Public Abstract
Name: Matthew Alan Brooks
Adviser: Dr. Monty Kerley
Graduation Term: FS 2010
Department: Animal Sciences
Degree: PhD
Title: Ruminal degradation of protein and carbohydrate in the domestic and wild ruminant

The unique adaptation of ruminant animals to generate microbial biomass in the rumen and use this as their primary protein source is dependent upon the available protein (nitrogen) and energy (carbohydrate) provided from the diet for microbial digestion. One can improve efficiency of nutrient utilization and increase microbial growth thus optimizing growth and health of the animal in a confined setting by formulating diets with balanced levels of these nutrients. Balancing diets requires knowledge of the rate of degradation of the dietary protein and carbohydrate components by the rumen microbes. Our research determined these rates of ruminal degradation for protein, fiber and starch and used these rates to formulate several diets with different ratios of the protein and energy components. We found maximal efficiency in both lab tests and live animal studies with beef cattle when the dietary protein was approximately 80 to 90% of required and energy was sufficiently available. In the live animal, this is likely due to the cattle's ability to salvage nitrogen in the body and recycle it back to the rumen, thus decreasing the dietary requirements. Further, when diets are greatly unbalanced and insufficient dietary nitrogen is available when dietary energy is in excess or vice versa, the inefficiency increases and waste products from the microbes accumulate and can lead to poor animal and eventually death. Our research with mule deer as a model for zoo animals was designed to evaluate three separate diets fed in zoos with health and mortality issues. We found no evidence of excess waste production by microbes fed these three diets with similar protein levels and varying levels of starch and fiber, but we did see production characteristics similar to those seen in the wild where diets are higher in fiber and lower in starch. This indicates formulating diets with higher fiber and lower starch would likely provide a plane of nutrition more similar to a natural diet and would possibly improve animal health in zoos.