

**Near infrared reflectance spectroscopy of feces to determine dietary crude protein and digestible organic matter in sheep: A joint project between universities in Beijing and College Station.**

Hong Li, Jerry Stuth, and Doug Tolleson  
Grazingland Animal Nutrition Lab  
Department of Rangeland Ecology and Management  
Texas A&M University  
408B Animal Industries Building  
2126 TAMU,  
College Station, TX 77843-2126  
(979) 845-5838  
jwstuth@cnrit.tamu.edu

The senior author is a graduate student in animal nutrition from the China Academy of Agriculture Sciences in Beijing, on leave while his wife attended Tx A&M. His research was conducted in collaboration with the Grazingland Animal Nutrition Lab and was applied toward completion of a masters degree in China. Determination of diet quality in pen-fed animals is relatively simple. One need only obtain a representative sample of the diet on offer and conduct routine chemical analyses. The same task in grazing animals is much more difficult. These animals may choose their diet from a variety of vegetation types, various plant species at different times of the year, and different parts within a given plant species. Fecal near infrared reflectance spectroscopy (NIRS) is a non-invasive method to determine diet quality in herbivores. The technique has been used world-wide but has not been reported for sheep in the US or China. A diet chemistry / fecal spectra calibration ( $n = 78$ ) was developed to determine if fecal NIRS can predict diet quality of forage-fed sheep. In 2002 ( $n = 15$ ) and 2003 ( $n = 20$ ) mature ewes ( $55 \nabla 2.4$  kg) were fed individual diets for 7 days, with feces collected on day 6 and 7. Diets ranged from 4.3 to 23.5 % crude protein (CP) and 52.4 to 75.8 % digestible organic matter (DOM) and were composed of various grasses, forbs, and browse. CP was determined by micro-Kjeldahl and DOM by an *in vivo* corrected *in sacco* technique. Predictive equations for dietary CP (RSQ = 0.95, SE calibration (SEC) = 1.08) and DOM (RSQ = 0.80, SEC = 1.51) were developed. Results from an independent CP validation set of 12 ewes were: RSQ = 0.81, SE prediction (SEP) = 1.51, slope = 0.89. Effect of individual animal variation ( $n = 5$ , 2 trials) on fecal NIRS predictions was determined by feeding the same forage *ad libitum* for 7 days. Predicted CP values were:  $10.9 \nabla 0.28$  % and  $21.4 \nabla 0.55$  %. Predicted DOM values were:  $62.0 \nabla 0.23$  % and  $64.4 \nabla 0.36$  %. Individual animal variation accounted for approximately 25-30% of measurement error in this study. Diet quality of sheep can be effectively predicted by fecal NIRS technology. The senior author acquired technical training in NIRS and ruminant nutrition laboratory methods. Training of students and transfer of fecal NIRS equations to labs in other locations has been accomplished (East Africa, South America). The equations developed here could also be transferred to cooperating labs in China.