

# **Association between Protein Molecular Spectral Profiles and Metabolizable Protein Supply, Protein Rumen Degradation Characteristics and Estimated Intestinal Protein Digestion to Dairy Cattle Before and After Rumen Incubation of Faba Bean Partitions and Faba Bean Silage**

Ming Yan, David Christensen, Herbert (Bart) Lardner, Víctor H. Guevara-Oquendo, and Peiqiang Yu\*

Department of Animal and Poultry Science, College of Agriculture and Bioresources, University of Saskatchewan. \* [peiqiang.yu@usask.ca](mailto:peiqiang.yu@usask.ca)

The primary objectives of this study were to: (1) compare faba bean samples among whole crop, stem, whole pods, leaf, and whole crop faba silage in terms of predicted metabolizable protein supply; protein rumen degradation characteristics, and estimated intestinal protein digestion; (2) determine how protein spectral features of faba bean samples are changed during rumen incubation using ATR-FTIR molecular spectroscopic technique and (3) test the relationship between protein related spectral profiles before and after microbial digestion and protein digestibility and availability. Faba bean samples were firstly determined for chemical compositions and then incubated in the rumen for the determination of CP degradation kinetics and protein intestinal digestibility. Protein related molecular spectral features before and after rumen incubation were also obtained. Results showed that the function of microbial digestion to the change of protein related molecular structure of faba bean samples could be detected by both univariate and multivariate molecular spectral analyses. In addition, the spectral features of rumen incubation residues of faba bean had a strong correlation with the NDICP content, while the relationship between spectral profiles and other nutritional compositions and availability was diminishing during rumen incubation. In conclusion, the protein availability and digestion characteristic are mainly associated with its spectral profiles in original samples; the change of spectral profiles may have minimal effect on facilitating protein enzymatic hydrolysis. Overall, when evaluating nutritional value of feed to dairy cattle using ATR-FTIR spectroscopy, spectral features of original samples should be first considered.