

## The Use of Near Infrared Reflectance Spectroscopy (NIRS) for Broiler Carcass Analysis

HUA HSU<sup>\*1</sup>, MARTIN J. ZUIDHOF<sup>2</sup>, GUILLERMO RECINOS-DIAZ<sup>1</sup>, and ZHIQUAN WANG<sup>2, 1</sup>

Agri-Food Laboratories, Food Safety Division and <sup>2</sup>Animal Industry Division, Alberta Agriculture Food and Rural Development, 6909 – 116 Street, Edmonton, Alberta, Canada, T6H 4P2.

NIRS uses reflectance signals resulting from bending and stretching vibrations in chemical bonds between carbon, nitrogen, hydrogen, sulfur and oxygen. These reflectance signals are used to measure the concentration of major chemical composition and other descriptors of homogenized and freeze-dried whole broiler carcasses. Six strains of chicken were analyzed and the NIRS model predictions compared to reference data. The results of this comparison indicate that NIRS is a rapid tool for predicting dry matter (DM), fat, crude protein (CP) and ash content in the broiler carcass.

Males and females of six commercial strain crosses of broiler chicken (*Gallus domesticus*) were used in this study (6 x 2 factorial design). Each strain was grown to 16 weeks of age, and duplicate serial samples were taken for body composition analysis. Each whole carcass was pressure-cooked, homogenized, and a representative sample was freeze-dried. Body composition determined as follows: DM by oven dried method at 105°C for 3 hours, fat by Mojonnier diethyl ether extraction, CP by measuring nitrogen content using an auto-analyzer with Kjeldhal digest and ash by combustion in a muffle furnace for 24 hour at 550°C.

These homogenized and freeze-dried carcass samples were then scanned with a Foss NIRSystems 6500 visible-NIR spectrophotometer (400-2500nm) (Foss NIRSystems, Silver Spring, MD., US) using Infra-Soft-International, ISI, WinISI software (ISI, Port Matilda, US). The NIRS spectra were analyzed using principal component (PC) analysis. This data was corrected for scatter using standard normal "Variate" and "Detrend" technique. The accuracy of the NIRS calibration equations developed using Partial Least Squares (PLS) for predicting major chemical composition and carcass descriptors— such as body mass (BM), bird dry matter and moisture content was tested using cross validation. Discrimination analysis was also used for sex and strain identification.

According to Dr. John Shenk, the creator of the ISI software, the calibration equations with the correlation coefficient,  $R^2$ , between reference data and NIRS predicted results of above 0.90 is excellent and between 0.70 to 0.89 is a good quantifying guideline. The excellent calibration equations for DM ( $R^2 = 0.99$ ), fat (0.98) and CP (0.92) and a good quantifying guideline equation for ash (0.80) were developed in this study. The results of cross validation statistics for carcass descriptors, body composition using reference methods, inter-correlation between carcass descriptors and NIRS calibration, and the results of discrimination analysis for sex and strain identification will also be presented in the poster. The NIRS predicted daily gain and calculated daily gain from this experiment, and true daily gain ( using data from another experiment with closely related broiler chicken from each of the six strains) will also be discussed in the paper.