THE USE OF FAECAL NEAR INFRA-RED SPECTROSCOPY TO PREDICT MICROBIAL PROTEIN PRODUCTION IN CATTLE

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Faecal near infra-red spectroscopy (FNIRS) is a recent technology that has been demonstrated to predict dietary crude protein (CP) content and dry matter digestibility (DMD) of ruminant feeds from faecal samples (Stuth *et al.* 1999). Microbial protein production (MCP) is an important parameter in evaluating ruminant nutrition, but conventional methods of obtaining predictions are difficult, costly, and subject to potentially large laboratory errors. It was hypothesised that, as MCP is dependent on the physical structure and chemical composition of the feed (which includes, but is not limited to, DMD and CP content), and FNIRS has been demonstrated to deliver specific information on the structure and content of the diet, then a FNIRS model could be constructed to predict MCP from faecal samples. Such a model would be valuable in contemporary production decision support systems. This work sought to develop a preliminary pilot model to assess this.

Groups of 10 *Bos indicus* x *Bos taurus* steers (mean liveweight (LW) 310 kg) were used at the University of Queensland Mt Cotton Research Facility in an extended series of *in vivo* DMD trials, each with a 7 d total faecal and urinary collection period after a preliminary feeding period. Pairs of steers were randomly assigned to 1 of 10 forages (8 tropical and 2 temperate), and 1 of 4 supplements (barley, sorghum, cottonseed meal and urea) was fed exclusively across all forage diets through a consecutive series of 4 inclusion rates (0, 1, 1.5, 2% LW). This pattern was repeated for all 4 supplement types. During 400 *in vivo* DMD collection periods, urinary purine derivative (PD) excretion was measured (Chen and Gomes 1995). Data were also obtained from simultaneous *in vivo* DMD trials in independent experiments where steers were fed 1 of 3 forages (2 tropical and 1 temperate) with 3 inclusion levels of either copra, palm kernel cake, whole cottonseed, molasses, or mixed cereal supplements, and urinary PD excretion was again measured. Faecal NIRS spectra of corresponding faecal samples obtained from each steer in each collection period were paired with the urinary PD excretion (mmol PD/kg W/d) using InfraSoft WINISI (ed. 1.5) NIRS software. From this, MCP was calculated by formulae using urinary PD excretion (Chen and Gomes 1995).

There was a strong correlation (r^2= 0.80-0.85) between faecal spectra and urinary PD excretion, with a standard error of calibration of 0.040-0.045. These results demonstrate that FNIRS could be developed as a method to predict MCP of grazing ruminants. Contemporary understanding of the specific requirements (size, diversity, source) of FNIRS models, gained in recent Australian studies (Coates 1998; Gibbs *et al.* 2002) would satisfactorily guide this development.

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