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DEVELOPMENT OF AN ASSAY FOR THE DETERMINATION
OF DIETARY APPARENT ILEAL NITROGEN AND
AMINO ACID DIGESTIBILITIES IN THE MEAT CHICKEN

A THESIS PRESENTED IN PARTIAL FULFILMENT OF
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KEE HOR YAP

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ABSTRACT

Biological procedures which quantify protein value are expected to beneficially influence efficiency of nutrient provision in dietary formulations for the livestock industry. This thesis provides a review of two widely employed quantitative assessments, "Digestibility" and "Availability" and in the experimental section describes a series of experiments undertaken on meat chicken to refine assay procedures involved in the determination of protein and amino acid apparent ileal digestibility values.

Five experiments were undertaken.

- (1a) A comparison of two feeding procedures with three diets differing in particle size with a view to evaluating the effect of feeding behaviour on the final composition of the test diet in the crop.
- (1b) Determination of crop residue composition associated with time following feeding with two feeding procedures and two diets differing in particle size.
- (2) A comparison of the effects of two slaughter procedures and two flushing solutions on ileal N digestibility of meat and bone meal.
- (3) A comparison of the effect of time of slaughter following feeding on ileal N values of two diets.
- (4) Determination of the effect of length of ileum on ileal N digestibility values of two diets.
- (5) Determination of the effect of age on ileal N and AA digestibilities of two diets.

In 1a there was clear evidence that bird eating behaviour and particle size of the test diet influenced crop content proportions of a number of criteria, more notably chromium and nitrogen. For coarse particle diets an intubation feeding procedure produced a closer match of material in the crop with that of the untouched diet than a free access provision of food procedure.

In 1b the results of the study were inconclusive and no satisfactory cause for inconsistencies that developed between treatments could be found.

In 2, two slaughter procedures, euthanasia by sodium pentobarbitone and asphyxiation by carbon dioxide, resulted in significantly different ($P < 0.05$) apparent ileal nitrogen (N) digestibility. Differences between flushing solutions, distilled water and physiological saline were small and not significant ($P < 0.05$).

In 3, for two diet types, N and dry matter (DM) digestibilities were relatively constant over sampling times of 2 to 5 hours following the start of feeding. Ileal digesta sampled quantities tended to be greatest at the 4 hour sampling interval.

In 4, differences in N and DM digestibilities of digesta samples drawn from sections of the ileum up to 30 cm in length as measured from the ileo-caecal junction were generally small and non significant.

In 5, bird age had no significant effect on N and DM digestibilities.

The main conclusions drawn were that intubation better retained the integrity of food reaching the crop. Sodium pentobarbitone was a preferable method of slaughter. Ileal length sampled needed to be kept as short as consistent with providing adequate sample material and largest sample sizes were obtainable around 4 hours following the start of feeding.

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LIST OF ABBREVIATIONS

AA(s)	Amino acid(s)
AAAD	Apparent amino acid digestibility
ADF	Acid detergent fibre
AME	Apparent metabolizable energy
BV	Biological value
CO ₂	Carbon dioxide
Cr ₂ O ₃	Chromic oxide
DM	Dry matter
FA	Free access
FDNB	1-fluoro-2,4-dinitrobenzene
I	Intubation
LSD	Least significant difference
MBM	Meat and bone meal
N	Nitrogen
NDF	Neutral detergent fibre
NPR	Net protein retention
NPU	Net protein utilization
PER	Protein efficiency ratio
PFAA	Plasma free amino acid
PRC	Poultry Research Centre
TAAD	True amino acid digestibility
TME	True metabolizable energy