Comparison of digestibility markers in poultry

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An important feature of protein quality for the animal feed industry is knowledge of the availability of amino acids in feedstuffs. Many attempts have been made to determine amino acid availability (defined as that proportion of dietary amino acids that is in a form suitable for digestion, absorption and utilisation) using in vitro (enzymatic and chemical assays), indirect (microbiological or plasma amino acids) or direct (growth and digestibility assays) methods (1). The digestibility assay has become the most favoured technique for estimating availability. Digestibility assays are applied assuming that the difference between input and output is a valid indicator of bioavailability and that digestibility is likely to be the rate limiting step in amino acid availability. Use of an appropriate digestibility marker is an important aspect of these assays.

Acid insoluble ash (AIA) is used routinely as an indigestible marker in poultry digestibility studies. Accurate gravimetric determination of AIA requires a large sample size (2 g for diet, 1.2 g for digesta). Shortage of the amount of digesta collected in some experiments can limit the number of nutrients analysed. Alkanes which are long-chain hydrocarbons (C_{36}) have been successfully used to estimate digestibility and plant species selection by herbivores (2). Only small amounts of samples (0.2–0.5 g) are required for alkane analysis and quantification is by capillary gas chromatography.

The objective of this study was to compare C_{36} and AIA as markers to estimate nitrogen and amino acid digestibility in different segments of the gastrointestinal tract of meat chickens. Grower diets were used and contained either celite, (as a source of AIA, 20 g/kg) which replaced part of the wheat and sorghum components of the diet (Diet 1) or C_{36} (200 mg/kg; Diet 2). The diets were fed *ad libitum* to 6 pens of broilers (7 birds/pen) from 25 days of age. After 10 days of feeding digesta from the jejunum and upper and lower ileum was collected following lethal injection of the birds with sodium pentobarbitone (3). Diets and digesta samples were analysed for nitrogen, amino acids, AIA and C_{36} and digestibility calculated. The digestibility results (Mean ± SD) for nitrogen in the different gut segments are summarised in the table. Selected amino acid digestibility values from the lower ileum are also shown.

	AIA	C_{36}	Pooled SEM	P value
Jejunum	0.59 ± 0.046	0.61 ± 0.018	0.0129	0.603
Upper ileum	0.72 ± 0.036	0.72 ± 0.029	0.0129	0.986
Lower ileum	0.74 ± 0.035	0.76 ± 0.019	0.0129	0.407
Thr	0.69 ± 0.025	0.70 ± 0.022	0.0129	0.507
Ala	0.73 ± 0.034	0.75 ± 0.025	0.0129	0.319
Val	0.74 ± 0.029	0.76 ± 020	0.0129	0.335
Met	0.92 ± 0.011	0.93 ± 0.009	0.0043	0.191
Lys	0.80 ± 0.022	0.80 ± 0.022	0.009	0.859

There were no significant differences in digestibilities of nitrogen or all amino acids when using AIA or C_{36} as markers in the 3 segments of the gastrointestinal tract examined. It is interesting to note that the variations within treatment tend to be smaller for C_{36} than AIA as indicated by smaller standard deviations in C_{36} than AIA. The results of this study demonstrated that C_{36} is a suitable digestibility marker in poultry.

References

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