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A simple laboratory method to estimate standardised precaecally digestible amino acids for pigs

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German headline

Eine einfache Labormethode zur Schätzung der standardisiert praecaecal verdaulichen Aminosäuren beim Schwein

Introduction

The adequate protein supply to pigs to ensure performance and animal health and to reduce nitrogen losses, which are harmful to the animal and to the environment, can be achieved by a precise protein evaluation of the feed. Protein evaluation of pig feeds is based on the standardised precaecally digestible crude protein (spcdCP) [1]. The *in vivo* spcdCP values are determined using an invasive method using ileal cannulae. *In vitro*, spcdCP has been determined using a time-consuming multi-enzyme method [2]. Therefore, the objective was to develop a rapid and cost-effective laboratory method for the estimation of spcdCP and spcd amino acids (spcdAA) in pig feeds. Analogous to the protein fractionation of ruminant feeds [3], spcdCP and spcdAA were determined based on neutral (NDICP) or acid detergent insoluble crude protein (ADICP) and AA (NDIAA/ADIAA), respectively. Based on analysed fractions, the ND or AD soluble CP (NDSCP/ADSCP) or AA (NDSAA/ADSAA) fractions were estimated and used to estimate *in vivo* values. Below, the focus is laid on scpAA.

Methods

The laboratory method is based on the knowledge that pigs degrade and ferment cell-wall material only in the large intestine. This means that NDIAA and ADIAA are virtually indigestible in the small intestine. In contrast, the NDSAA and ADSAA fractions are available to the animal in the small intestine. This results in the following relationships:

$NDSAA = AA_{feed} - NDIAA$

$ADSAA = AA_{feed} - ADIAA$

A unique, large sample pool of more than 80 straight feedingstuffs (protein sources, e.g., differently heat-treated rapeseed and soybean products, fava beans, lupines, field peas, and cereal grains such as wheat, barley, triticale and rye) was available for which *in vivo* spcdCP and spcdAA values were determined in pigs. Isolation of NDIAA and ADIAA were carried out using established methods for fibre analyses of feeds. Amino acid concentrations in the detergent residues (NDIAA, ADIAA) were determined by HPLC. The concentrations of NDSAA and ADSAA were calculated by difference, using the above relationship. These values were then used to estimate *in vivo* spcdAA concentrations (g/kg dry matter [DM]). Linear regression analysis was performed on this data and an ANOVA and subsequent Tukey test were performed to determine the differences between the cereal grain types.

Results

In general, laboratory values (NDSAA or ADSAA, x) showed a good performance to estimate in vivo pcdAA (y) . Here examples for lysine, methionine and threonine are presented. Cereal grains were divided into two groups: wheat/triticale and rye/barley.

Lysine:
Wheat/Triticale: $y = 0.8709 x – 0.1299$ $R^2 = 0.938$
Barley/Rye: $y = 0.5318 x + 0.6784$ $R^2 = 0.681$
Protein supplements: $y = 0.9017 x – 3.8303$ $R^2 = 0.995$

Methionine:
Wheat/Triticale: $y = 0.8661 x + 0.0951$ $R^2 = 0.963$
Barley/Rye: $y = 0.7554 x + 0.1508$ $R^2 = 0.975$
Protein supplements: $y = 0.8997 x – 0.0855$ $R^2 = 0.999$

Threonine:
Wheat/Triticale: $y = 0.7272 x + 0.4809$ $R^2 = 0.865$
Barley/Rye: $y = 0.6956 x + 0.2023$ $R^2 = 0.902$
Protein supplements: $y = 0.8236 x – 1.2778$ $R^2 =0.996$

Conclusion

Determination of NDIAA and ADIAA can be performed as a routine analysis for AA evaluation. Therefore, the rapid and cost-effective laboratory method is an alternative to the *in vitro* multienzyme method to estimate spcdAA values from routinely available chemical feedstuff characteristics.

Affix

Bibliographical references

[1] GfE (2008): Recommendations for the supply of energy and nutrients to pigs. DLG-Verlag, Frankfurt am Main
[2] BOISEN S., FERNANDEZ J.A. (1995): Anim. Feed Sci. Technol. 51: 29-43
[3] LICITRA G., HERNANDEZ T.M., VAN SOEST P.J. (1996). Anim. Feed Sci. Technol. 57: 347-358