ASPECTS OF DIETARY PROTEIN QUALITY FOR THE GROWING PIG

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ABSTRACT

A study of several aspects of dietary protein quality for the growing pig is described. The study was conducted in three parts.

Reservations regarding the interpretation of three recent empirical estimates of the ideal amino acid balance for the growing pig prompted the first part of the study. A diet (basal diet) was formulated in which enzymatically hydrolysed casein supplemented with synthetic amino acids formed the sole protein source. The balance of essential amino acids in the diet approximated the mean of the three published estimates.

Eight entire male pigs (boars) of 28 Kg initial liveweight, confined in metabolism crates, were fed the basal diet for 20 days and thereafter a protein-free diet for a further eight days. Mean daily excretion of urinary urea nitrogen over six-day collection periods was 93 $mg/Kg^{0.75}$ for pigs fed the basal diet and the corresponding value for the protein-free diet was 19 $mg/Kg^{0.75}$. Assuming that the difference between these values was attributable to deamination of amino acids from the basal diet, this corresponds to an efficiency of utilisation of dietary protein of 0.940. It was concluded that the amino acid pattern of the basal diet approximated an ideal balance.

Part two of the study entailed the determination and evaluation of estimates of the apparent ileal digestibility of crude protein and amino acids for the growing pig and included a comparison of protein digestibility in the rat and pig.

Samples of ileal digesta were collected from boars prepared with T-piece cannulae in the terminal ileum. Values for the digestibility of crude protein and amino acids in barley-meal, pea-meal, meat-and-bone-meal, fish-meal and a mixture of enzymatically hydrolysed casein and synthetic amino acids are cited.

In an evaluation of the determined digestibility values ten boars received a barley-, pea-, meat-and-bone-, fish-meal diet and ten a control diet containing enzymatically hydrolysed casein and synthetic amino acids as its sole protein source. The gross amino acid composition

of the latter diet equalled the determined apparent ileal digestible amino acid composition of the barley-based diet. Accepting that the control protein source was completely digestible and that the two feeding regimes were iso-caloric, the similar growth characteristics of pigs on the two diets suggested that apparent ileal amino acid digestibility coefficients are accurate measures of the degree of amino acid digestion and absorption in the growing pig.

Preliminary results showed close agreement between the rat and pig for the apparent ileal digestibility of crude protein in barley-, meat-and-bone- and fish-meal.

In the third part of the study a deterministic computer model which simulates the digestion and metabolism of dietary nitrogen in the growing pig was constructed. The model was based on the concept of a partitioning of daily dietary nitrogen intake in pig growth. Initial validation exercises demonstrated that results obtained from simulation were in close agreement with observations from experimentation with the live animal.

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