Protein Research Trust

1999

PROGRESS REPORT

The response of growing pigs to dietary lysine and threonine under different environmental temperatures

N S Ferguson and R M Gous

Department of Animal Science and Poultry Science

University of Natal

Pietermaritzburg

Executive Summary

This project has gone a long way in addressing the problems inherent in previous amino acid response experiments with pigs. The use of a summit-dilution technique to produce a range of feeds limiting in the amino acids under test, and the use of controlled-environment chambers kept at fixed temperatures has ensured that the responses measured are to the amino acid under test, and that the nutrient x environment interaction is measured. This ensures that the responses measured can be applied in practice in the formulation of feeds for pigs being kept at different environmental temperatures, and that the dietary amino acid contents used in pig feeding are those that are most economical for the genotype and the environment being used.

As the University of Natal has only four controlled-environment chambers for pigs, each of the lysine and threonine trials has had to be duplicated to ensure that there were enough replications per dietary and temperature treatment (n=4). An additional lysine experiment was conducted because of the large differences in response between the first two experiments. To date 240 entire male Large White x Landrace pigs have been bought and slaughtered for carcass analyses. We are currently conducting carcass analyses on the last of the lysine and threonine trials.

The results thus far obtained indicate that pigs do attempt to overcome a marginal deficiency in amino acid supply by consuming larger amounts of such a feed, thereby becoming obese in the process. Generally, the response to a limiting amino acid supply was dependent on the environmental temperature especially at low dietary lysine concentrations and low environmental temperatures. On low and marginally-deficient amino acid diets young pigs increased their food intake to maintain potential protein growth until a point is reached where the animal can no longer compensate and food intake will decline. The extent of the compensation will depend on the amount of heat the animal can lose which in turn is dependent on the environmental temperature. Better average live weight and protein deposition rates were exhibited by pigs on diets deficient in lysine and threonine when grown at lower temperatures because of the increased food intake and the ability to lose the subsequent extra heat. Although feed conversion efficiency did not appear to be influenced by the amino acid x temperature interaction, carcass leanness was improved in warm environments by increasing the dietary content of the limiting amino acid.

In most cases the dietary treatment with the highest total heat loss also had the highest food intake indicating that one of the most important factors regulating voluntary food intake is the amount of heat that an animal can dissipate. It was also apparent that pigs would be able to compensate better for a deficiency in lysine (first limiting nutrient) at cooler temperatures ($\leq$ 22 °C). This was largely due to the animals being able to increase feed intakes of diets deficient in lysine (and hence nutrient intakes) at the lower temperatures because the lower the environmental temperature the more heat the animal could dissipate. The optimum balance of amino acids to energy depends not only on the genotype but also on the environmental temperature, with the first limiting amino acid:DE ratio for maximum growth being lower as the temperature decreases.

These results, when complete, will be published in two separate papers in the British journal od Animal Science.