TRYPTOPHAN DEFICIENCY AND FOOD INTAKE DEPRESSION IN PIGS

A thesis presented in partial
fulfilment of the requirements for
the Degree of Doctor of Philosophy
in Animal Science at
Massey University

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1976

ABSTRACT

Two experiments are described, in which the effects of feeding pigs on a tryptophan deficient diet or supplemented diet were investigated.

The feeding patterns of 10 cross-bred pigs were measured by continuous recordings of feed-bin weights, in a double reversal design experiment. The pigs, fed ad libitum, ate an average of 9 "meals" per day (range 5 - 16) with an average meal size of 170 g. There was a distinct diurnal pattern of food intake; most meals were eaten in the light phase of the day with peaks in the early morning and at midday and a large peak mid afternoon. Pigs fed the deficient diet showed some depression in food intake on the first day and the depression had reached maximal levels by the third day. On the deficient diet pigs ate 17 - 20% less than on the supplemented diet and most of the depression in intake was accounted for by reduced meal size.

In the second experiment 4 pigs were trained to eat their daily ration in a 2 h period (0900 - 1100 h) and catheters were placed in the jugular veins. A double reversal experimental design was employed, with 3 periods of 5 days, and blood samples were taken over the feeding time on the second and fifth day in each period. The levels of plasma Glucose, Urea, Amino acids, Cortisol, Insulin, and Growth Hormone were measured. There were no significant differences between diets in levels of Growth Hormone or Cortisol. On day 2, Urea levels were higher in pigs fed the supplemented diet, while on day 5 there were no significant differences between diets. The lowered food intake

on the deficient diet meant that both protein quality and protein intake were altered, which may explain the differences in Urea levels.

The most consistent differences in plasma Amino acids levels occurred with tryptophan, the limiting amino acid, for which the levels were lower in pigs fed the deficient diet, although the differences were not statistically significant. Glucose rose higher in pigs fed the deficient diet and the differences could not be attributed to an altered Insulin response to feeding the deficient diet.

It was concluded that the early changes in glucose and tryptophan may be associated with the food intake depression on the deficient diet, but further studies would be required before the relative importance of either relationship could be established.

PREFACE

The relationships between growth and the quantity and quality of dietary protein have been extensively studied and a depression of growth on diets of poor protein quality is well documented. However, the relationships between food intake depression and protein quality are not well understood and much of the work has been carried out with a single species, the laboratory rat. In studies at the Pig Research Centre, Massey University, comparing the nutritional quality of opaque-2 and normal maize varieties, Stables and Carr (in press) observed increased feed refusals on some diets, which they attributed to amino acid imbalance.

With the demonstration of food intake depression on diets based on maize grain and a commercial protein source, it became of interest to study the relationship between protein quality and food intake in pigs. Experiments were designed to study:

(i) the depression of food intake on a diet of low protein quality,

(ii) the pattern of intake in ad libitum fed pigs including any changes in the pattern related to protein quality,

(iii) the effects of the diet on the responses of some metabolites and hormones related to protein and carbohydrate metabolism, to throw some light on the underlying causes of the depression in intake.

ACKNOWLEDGEMENTS

I am indebted to my supervisors Prof. D.S. Flux, Dr. R.M. Greenway and J.R. Carr for their invaluable guidance and encouragement.

I would also like to thank the following:

Prof. R.E. Munford and Dr. D.D.S. Mackenzie for helpful discussion and advice.

Dr. G.G. Midwinter for generous assistance with the plasma amino acid analysis.

P.C. Evans for generous assistance with the plasma cortisol analysis.

Jan for her understanding, support and assistance with typing and drawing graphs.

Jenny Parry for typing the final manuscript.

Mary Balfour for assistance with the proof reading.

The staff of the Dairy Husbandry Department and Pig Production Centre who helped in numerous ways, and all those who helped with computing problems.

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