EXECUTIVE SUMMARY

SHOULD ANIMALS BE FED TO THEIR GENETIC POTENTIAL IF THIS POTENTIAL IS REDUCED BY STRESS?

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Statement of objectives:

The basis on which protein and amino acid requirements for growing and reproducing animals are calculated is to start with the genetic potential of the animal and determine what the nutrient requirements would be in order to ensure that the animal achieves its potential. If no environmental factors constrain the growth or reproductive performance of the animal, then this is a sensible method of determining the requirements of the animal, as the potential will be achieved and there will be no wastage of valuable nutrients. However, if the animals are subjected to stresses, such as high temperatures, high stocking density, disease, low level infection etc., then the potential of the animals will be reduced and it would appear to be sensible to reduce, in turn, the nutrient supply to the animals during the time of stress.

The aim of this research project is to determine to what extent, and how efficiently, animals can make use of dietary amino acids when placed under situations of stress. The hypothesis to be tested is that when performance is reduced by the introduction of a stressor, dietary protein will be used more efficiently if the supply of amino acids to the animal is reduced accordingly. Both broilers and growing pigs will be used in the project to study the effect of stress on the response to dietary amino acids.

When the project was first submitted for consideration, it was mentioned that different stressors could be used to hold back the growth rate of pigs and broilers, and that some of these would be used to answer the question about how animals should best be fed when it is known that they would not be able to achieve their potential, given the environmental conditions imposed on them. A different aspect of the project has been submitted for funding this year.

Instead of applying stocking density as a stressor, as has been done previously, the project now looks at the effect on subsequent performance of nutritional stressors applied during the growing period. These stressors are either feeds that are low in protein or some other nutrient, which causes the pig or broiler to deposit excessive amounts of lipid in the body, or when feed intake is purposely or inadvertently reduced below the *ad libitum* intake, resulting in the animal having less lipid in the carcass than the genetically-determined amount based on the body protein content.

Both of these scenarios are commonplace in the pig and broiler industries, and the consequences of getting the animals into one of these states (over- or under-fat) need to be better understood if we are to design feeding programmes that make most efficient use of the dietary proteins fed to the animals. Many producers believe that pigs and broilers should be taken through a period of underfeeding to

make use of 'compensatory growth' thereafter, but there is doubt as to whether the animals do utilize their feed protein more efficiently during this phase. This part of the project is designed to monitor whether pigs and broilers do utilize dietary protein with different efficiencies depending on the state of their chemical composition.

Results obtained thus far

In the first two trials, with broilers and pigs, results suggest that feeding according to the requirements for maximum protein retention will still produce the best carcass and growth performance irrespective of the level of stress, the stress in both these cases being stocking density. The improvement in lysine retention associated with higher dietary nutrient levels did not completely offset the adverse physiological effects of stress on reducing maximum protein retention, but may partly counteract the reduced nutrient intake associated with a stress-related suppression of appetite. However, there were indications that feeding crowded pigs a lower dietary lysine concentration may not further reduce the already diminished protein (lysine) growth rate. An additional experiment will be performed to test whether the number of feeder bins may have constrained food intake and therefore growth in group-penned animals. The results of this experiment proved that there were no significant differences in FI, ADG or FCR in group-penned pigs provided with 1, 2, 3 or 4 bins per pen, and therefore a single feeder bin was not considered a constraining factor in pigs housed with limited floor space.

In two subsequent trials

In the first, the effect of stocking density on the response to dietary lysine will be measured, and in the second, the effects of group size and space allocation are to be measured in pigs offered choices between a high and a low protein feed. The question is whether protein growth is adversely affected by decreasing the amount of available space per animal or by increasing the number of pigs per pen and if so, should the lysine requirements of growing animals be reduced accordingly. A lower lysine requirement would be commensurate with the reduction in the potential growth rate of the animals caused by the social 'stress' such as grouping or reducing the amount floor space available to an individual pig. A logical sequel to this group size and dietary lysine response trial is to determine more accurately the pig's nutrient requirements, by allowing the animals to choose a combination from two diets that will allow them to express their desire for growth. Given the social stress of grouping animals in high numbers or providing less space, will the animals purposefully select a lower nutrient intake and grow more slowly, or will they attempt to grow to their potential by consuming a greater proportion of the high protein diet? The answer to this question will afford us a better understanding of what the animal desires as well as provide evidence for or against the practice of reducing nutrient supply when it is known that the animals are socially "stressed". This has significant implications for nutritional management of commercial pigs where crowding or high stocking density commonly occur.