

EXECUTIVE SUMMARY

FACTORS INFLUENCING THE VOLUNTARY FOOD INTAKE OF CHICKENS AND PIGS

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The aim of this project is to improve the accuracy of predicting the voluntary intake of food by broilers, growing pullets, laying hens and pigs. Whereas there are methods for determining the optimum dose of different amino acids in feeds for laying hens, broilers and growing pigs, these intakes have to be converted into dietary concentrations before feeds can be formulated and mixed, and for this calculation a knowledge of the expected voluntary intake of the different classes of animal is essential. Of all the topics in animal nutrition, the quantitative estimation of voluntary food intake is possibly the most poorly researched of all, yet it is one of the most important, considering the economic implications in our country, of incorrectly predicting food intake.

Voluntary food intake can be seen to be related to the concentration of the first limiting nutrient in the feed - the animal attempts to consume sufficient of the first limiting nutrient to meet its requirement for growth or egg output. Three of the major factors influencing food intake have been, and are actively being researched this year. They are the effect of over-fatness on the subsequent food intake of broilers; the effect of diet composition on the voluntary intake of broilers and pigs given a choice of feeds; and the effect of environmental temperature on food intake, growth and carcass composition of broilers and pigs. The facilities for this research programme have only just been completed, so this research has only just begun. However, because the animals need be in these facilities for only a short period, many experiments are possible in a short space of time.

In the environmentally controlled facilities, a serial-slaughter experiment was conducted to estimate the maximum heat loss of growing female broiler chickens. A 3 x 2 factorial design was used, with three dietary treatments and two temperature treatments, over a nine week period. The three dietary treatments formed a summit dilution series designed to be first limiting in lysine. Two rooms were used, one kept at 22°C, the other at 32°C. Nine birds were slaughtered at day old, and at the end of each week thereafter a total of 12 birds was killed, to nine weeks of age. These birds were weighed, plucked and weighed again, giving carcass and feather weights by difference. The carcass and feathers for each individual bird were retained for further analyses. All other birds were weighed at the end of each week. The whole carcasses of the plucked birds were individually minced. The gut contents of the birds were not removed before mincing. After mincing, the carcass mince was mixed thoroughly and placed in sample jars. The carcass samples were freeze dried and the moisture content determined. Crude protein, lipid and ash determinations were then performed on the dry matter samples. The feathers from individual birds were oven-dried to determine moisture content. Pooled samples of dried feathers, respective of treatment, were milled and analyzed for crude protein. These results are being analyzed at present and will be used to determine the amount of heat that chickens can lose, this being a function of feather cover, genotype, state, dietary composition and environmental temperature. A further series of trials of this nature, with both broilers and piglets, is in progress at present.

The amount of food that an animal consumes depends, in part, on its state. It appears that an animal

will attempt to revert to its genetically-determined degree of fatness if given the opportunity of doing so. The rate at which it reverts is likely to be dependent on the environmental temperature to which the animal is subjected; such an experiment is being conducted with broilers at present, and the results will be reported in interim report next year. In attempting to predict voluntary food intake, therefore, it is essential to know not only the genotype and the state of the animal but also the composition of the feed and the environmental temperature, in the same way as it is important to have an accurate description of the genotype.

A choice feeding experiment with pigs demonstrated that these animals discriminate effectively against unbalanced diets, but will choose unbalanced diets based on soybean in preference to balanced diets based on cottonseed meal, indicating that their strategy is first to avoid potentially harmful substances in the feed (gossypol?) and then to choose feeds that have a favourable amino acid balance. The facility in which this experiment was conducted allows a two- and a three-way choice of feeds to be offered, thereby considerably increasing the choice feeding options available to the researcher. This facility proved useful in determining the ranking of preferences exhibited by the animals.

Another choice feeding experiment is being conducted at present, which has been designed to investigate whether pigs discriminate against diets that have a poor amino acid balance, if given the choice to do so, and whether they will eat such a diet when no choice is given. The concept of palatability is also being investigated as part of this trial. Twenty four boars and twenty four gilts have been individually housed in pens containing three self-feeding bins. Feeds were formulated to contain either 100 g crude protein/kg feed (low protein feed) or 280 g protein/kg feed (high protein feed) with a digestible energy content of 13.5 MJ/kg. The high protein feeds were based on one of three protein sources, namely, soybean, fishmeal or 'plant' protein (sunflower oilcake and groundnut oilcake meal). Pigs on the choice-feeding treatments have the choice between two high (280 g protein/kg) feeds and a low (100 g protein/kg) feed. All other pigs have access to only one feed.

A choice feeding trial was conducted with broiler chickens to investigate the response of these birds when offered a choice of a balanced or an unbalanced diet. In addition, the response of broilers to the presence of tannin in these diets was assessed. Two-and-a-half thousand Ross broiler chicks were used in the experiment. The chicks were fed a standard broiler starter diet to seven days of age, whereafter the experimental choice-feeding diets were introduced. The feeds were based on soybean oilcake meal, with the unbalanced treatments being unsupplemented with DL methionine. The birds did not make an obvious distinction between the balanced and unbalanced feeds, but the presence of tannin in the feed caused the birds to actively select against such feeds. Where the birds had no choice but to eat a feed containing tannin they exhibited significantly poorer feed conversion efficiencies than the birds on feeds that did not contain tannin. This again demonstrates that the avoidance of a harmful substance is of greater importance than the avoidance of a marginally deficient or unbalanced food.

Because of the tremendous amount of work that was required to complete the environmental chambers, work on this particularly important aspect of the project was delayed until the first few months of this year. Now that these chambers are in working order the experiments planned for these facilities are under way. The temperature control in the chambers is remarkably good, so the experiments planned for the remainder of this year and for next year are likely to yield very useful results.