

***Total Nutrition: Feeding Animals for Health and Growth***

C Adams (2002). Published by Nottingham University Press, Manor Farm, Main Street, Thrumpton, Nottingham NG11 0AX, UK. 244 pp. Paperback (ISBN 1 897676 94 8). Price £29.50.

The central theme of this short book is both topical and important. 'Total Nutrition', as defined by the author, is not merely concerned with conventional animal nutrition (ie the nutritive value of foods and the nutrient requirements of animals) but embraces a much broader range of issues relating to the production and consumption of food from animals. These include the impact of nutrition on the health of animals, the quality and safety of food from animals, and effects on human health and on the overall health of the environment.

Once this is understood, the title *Total Nutrition* can be seen to be entirely apt. It considers the effects of animal nutrition, especially the nutrition of intensively reared pigs and poultry, not just in terms of animal performance but in relation to all steps within the food chain. Thus it tackles head-on some of the most powerful consumer concerns relating to problems of human and environmental health that are (or are perceived to be) linked to the consumption of food of animal origin. These include problems associated with food-borne bacteria, naturally occurring toxic substances, environmental contaminants, antibiotic residues and food additives. The book gives special emphasis to what the author calls 'nutricines', namely natural components of food that are not conventionally defined as nutrients but that have 'valuable and beneficial effects in relating health to nutrition'. These include antioxidants, non-digestible oligosaccharides and plant flavonoids that are currently attracting much attention from scientists seeking mechanisms to explain the apparent health-promoting properties of certain foods for man in terms of specific biochemical or immunological effects on the integrity of body cells and cell membranes.

The author, Clifford Adams, is Scientific Director of a major company manufacturing feed additives for livestock rations. He is thus well qualified to review the impact of both nutrients and 'nutricines' on the health of animals. The sections dealing with nutrition and health in pigs and poultry carry real authority. Those dealing with ruminants are rather more sketchy.

The first main topic to be addressed in depth is 'Feed Quality and Hygiene' (the use of the word 'feed' implying food for animals). This deals with spoilage and contamination due to autooxidation, mould and insects, mycotoxins and bacteria, and outlines practical methods of control through application of HACCP principles (Hazard Analysis at Critical Control Points).

Subsequent chapters deal with the impact of specific food components on voluntary food intake, digestion and the overall health of the digestive tract. The chapter on voluntary food intake does not attempt any serious review of the physiology of appetite control but concentrates on practical ways to improve the palatability and presentation of feeds to farm animals. Chapter 4 is entitled 'Raw Material Processing: Digestion and Absorption of Nutrients'. This is the most novel and scientifically thorough section of the entire book. It reviews the principles that underpin the commercial processing of raw materials for pig and poultry rations, especially with in-feed enzymes, to enhance the availability of feed categories such as non-starch polysaccharides.

The next section, which bears the intriguing title: 'Struggle for Supremacy: Management of the Gastrointestinal Tract', deals with some of the most fascinating themes in modern nutrition science. Within the gut of any vertebrate animal a complex drama is continuously in play, involving three powerful biological forces: the nutrients and anti-nutrients in food, pathogenic, commensal and beneficial bacteria, and the physical, chemical and

immunological processes in the gut wall of the host animal which have to interpret all this complexity, distinguish the good from the harmful and process it accordingly. This section is written simply but well. It will not satisfy an immunologist but it will give a conventional nutritionist or digestive physiologist a good feeling for what else goes on in the gut.

Chapter 7 deals with the possible impact of nutrition, especially nutraceuticals, on cellular integrity — particularly the role of dietary antioxidants in protecting cells from damage due to oxidative stress and the sequelae thereof, namely cancers and cardiac diseases. This too is a 'hot' area in nutrition science. However, and perhaps inevitably at this stage, the scientific evidence is still remarkably equivocal. There is good epidemiological evidence that certain foods rich in, for example, antioxidants or flavonoids are 'good for you'. There are also plenty of mechanistic hypotheses as to why this might be so but, as yet, the evidence in support of these hypotheses is not strong. In practical terms this means that while some natural foods can enhance the health of animals and man, we are not yet in a position to conclude which component(s) of the food is/are directly responsible so which component(s) should be incorporated into a feed additive for animals or dietary supplement for man. This section of the book is not cautious enough for my taste.

The emphasis throughout the review of science is on the impact of total nutrition on the performance and health of the food animals (especially pigs and poultry) and the quality, safety and health- (or disease)-giving properties of food of animal origin when eaten by man. The last section seeks to put these things into the broader context of consumer demand for safe food at low cost, and discusses ethical issues including environmental impact (eg nitrogen and phosphorus pollution) and (very briefly!) animal welfare. Although these issues are not reviewed in depth they are given proper concern and this is very welcome from an author who is operating from a position within the animal feed industry.

My general impression of this book is that it deals in a balanced and unsensational way with some of the most contentious issues relating to the production and consumption of food from animals. It is short and may appear superficial to scientists reading about their own particular areas of expertise. Where it will be of most value is in persuading scientists and others involved in the animal feed industry to consider the broader issues embraced by the author's definition of 'Total Nutrition'. It will, I predict, be far too sensible and unsensational to satisfy those for whom food scares have become a way of life, whether through paranoia or mere self-indulgence.

My only real concern is with the title: 'Total Nutrition: Feeding Animals for Health and Growth'. This sounds horribly conventional. I assumed, when first I picked it up, that it would be yet another textbook on animal nutrition aimed at the university student market. In fact, it is both less and more than that. It is certainly not a comprehensive book on animal nutrition. However, it is particularly good on the important bits that conventional books on nutrition leave out, namely the overall impact of nutrition on the health and safety of food from animals, consumer perceptions of these things, and how to goad a very conservative industry into an improved perception of these things. If this book runs to a second edition, may I suggest a catchier (and more accurate) title, namely: 'Total Nutrition of the Food Animals: What the text books don't tell you but what you must know'.

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