

## PREFACE

As a result of the change in editor and numerous other factors, Volume 4 arrived on your desks inexcusably late, for which we make full apologies. In 1992 editorial matters ran more smoothly and we are pleased to present a sizeable volume of interesting and lively reviews.

In the commercial rearing of animals, it is important to have information on the bioavailability and utilization of nutrients, particularly amino acids in heat processed feeds. Growth assays are expensive and time consuming and *Batterham* compares growth assays with the ileal digestibility method for determining bioavailability. He points out that amino acids differ in their susceptibilities to processing conditions. Thus, the ileal digestibility assay is unsuitable for assessing bioavailability of lysine, threonine, methionine and tryptophan in heat damaged feeds, while the branched chain amino acids isoleucine, leucine and valine are less susceptible to the effects of heat. Rapid methods are as elusive as ever but the author brings our attention to the technique of *near infra red spectrophotometry*, which will be useful if mechanisms that reduce bioavailability affect the reflectance characteristics of proteins. There is, however, an urgent need to develop better understanding of the biochemical mechanisms underlying the causes of reduction in amino acid bioavailability.

Grain legumes, because of their high protein and metabolizable energy content, are likely to be particularly useful as supplements for low quality feeds in feeding systems where low levels of management input make it difficult to ensure satisfactory adaptation of animals to supplements based on cereal grains. Many high yielding grain legumes, particularly those of tropical and subtropical origin, contain high levels of antinutritional factors that preclude their use in diets for simple-stomached animals without considerable processing. *Dixon and Hosking* conclude that while ruminants are able to consume appreciable amounts of certain legume species without adverse effects, much more information is required on the content of antinutritional factors in potentially useful species. Genetic manipulation of grain legumes to neutralize antinutritional factors, or reduce their concentrations in the plant, may be a promising way forward in cases where a potentially valuable crop currently has limited usefulness. Other important limitations to the use of grain legumes, namely the high proportion of rumen degradable protein and low content of sulphur amino acids, may also be remedied in due course by genetic manipulation techniques.

Barley is a valuable raw material for the brewing and distilling industries as well as for farm animal feeds especially in Northern Europe. As an ingredient for poultry diets it suffers from being relatively indigestible compared with wheat or maize and this is linked to its high content of  $\beta$ -glucan. *McNab and Smithard* give a comprehensive account of the chemistry of the  $\beta$ -glucans, their determination and methods for treating barley to improve its nutritive value. Although several methods are available, of which enzyme treatment looks most promising, there is as yet no unequivocal evidence that the destruction of  $\beta$ -glucan is entirely responsible for improvements in nutritive value. Clearly there are still many problems to be solved.

The days are long gone since 'dietary fibre' was regarded as a component of food that yielded little or no energy. In a scholarly review, *Livesey* discusses different methods for assessing energy values not only of non-starch polysaccharides but of manufactured bulking carbohydrates, some new to our diets, and sugar alcohols, which are now finding increasing uses in specialized products. Many factors influencing energy values, for which there is little reliable information, have to be considered, including heats of combustion of

individual components, losses of energy to faeces and as a result of fermentation, possible absorption of some components in the small intestine and the efficiency of metabolism of the absorbed compounds. The author concludes that, given current information, it is not possible to establish energy values for all or even many foods but that a general value of 6 kJ net energy per gram unavailable complex polysaccharide can be assigned for mixed diets. Empirical systems now being developed may offer greater accuracy and precision when calculating whole diet energy values than have been offered by the widely used Attwater and McCance & Widdowson energy conversion factor systems.

The human gut is host to a multitude of microbial cells that outnumber the cells in the host's own body. It is hardly surprising that the enormous metabolic capacity of the microflora has a great impact on the substances entering the lower alimentary tract. While their influence on nutrients is well documented, their impact on non-nutrient substances may be no less important to the host's wellbeing and this is succinctly reviewed by *Coates and Walker*. Interest has been aroused since a variety of food additives, contaminants and natural non-nutrient constituents of foods has been implicated in the aetiology of human cancers. The reviewers highlight instances where the oncogenic agent is a microbial metabolite rather than the parent compound but also point out that microbial activity can be beneficial by inactivating potential carcinogens. Where a role for the microflora can be recognized, even if the mechanism is not fully understood, a logical step is to modify the flora to a more benign pattern. While dietary change may not appear to have appreciable effects on the flora of adults, significant changes may be induced in their metabolic activities. Thus, certain fat supplements can inhibit the formation of highly carcinogenic nitrosamines. There is also a future for 'chemical probiotics': the use of plant lectins to reduce salmonella infection in poultry and ensure safer meat.

Advances in medicine frequently provide a challenge to nutrition science. Two important examples are given in this issue in relation to the nutritional care of patients with multiple organ failure (*Lundholm, Hylander and Sandström*) and of low birth weight babies (*Morgan and Kovar*). Nutrition research has taken a giant step forward in contributing to reduced morbidity and improved therapeutic outcome in patients suffering injury and infection with septic complications. While the importance of quality and composition of nutrients, especially amino acids, in combating the progressive starvation suffered by critically ill patients is explored in detail, *Lundholm and his colleagues* also stress the functions of specific amino acids and essential fatty acids as stimulators of the immune system and in counteracting inflammatory responses to injury.

Infants born significantly preterm have limited energy and nutrient reserves, greater susceptibility to infection and are also born at a time that is critical to brain development. *Morgan and Kovar* make a well argued case for the provision of parenteral nutrition for low birth weight infants. While stressing that in principle it is safe and efficacious, they do not underestimate the complications which, however, should be greatly reduced by better fundamental understanding of the nutrient requirements of these children. The clinical judgement about when and how to make the transition to enteral and finally to natural feeding is crucial to a successful outcome and will be aided in time by better understanding of the underlying physiology.

Smoking is well recognized as an important contributor to increased morbidity and mortality especially in regard to CHD. It cannot, however, be divorced from nutritional considerations since smoking cigarettes may be associated with changes in dietary habit and nutrient intakes. *Thompson and her colleagues* provide a detailed examination of the interrelationships between smoking and nutrient intakes from a background of both epidemiological and experimental studies. They conclude that while smoking clearly alters nutrient intakes in a direction that, according to conventional wisdom, increases CHD risk,

cigarette smoking may also contribute in other ways, for example by increasing the free radical load and affecting components of the haemostatic system. A limitation of many studies contributing to knowledge of interactions between smoking and nutrition is that they are cross-sectional in nature. There is a need for longer term follow-up studies of smokers who stop smoking, to clarify whether they change their diets, in what way and how quickly.

Alcohol, though not a nutrient in the generally accepted sense, is a component of many people's diets, contributing to energy intake. It interacts with people's nutrition and influences attitudes to food and to life. *Simpson* reviews the benefits and hazards of alcohol with particular reference to the elderly, who are forming an ever larger part of the population. She concludes that the damaging effects of alcohol have been given greater weight in the scientific literature than their benefits as a social lubricant, a reducer of anxiety, a means of increased energy intake, or other less well defined therapeutic effects. There is a need for more studies to identify clearly and with confidence what level of alcohol is safe in the elderly population. The author also perceptively points out the need continuously to redefine 'elderly', since as life expectancy increases, different age sub-groups having different reactions to alcohol may be identified. This, of course, may hold true for many other aspects of nutrition.

Recent intense interest in nutrition and bone health has focused almost entirely on calcium, bone's main mineral constituent. *Beattie and Avenell*, in a thorough yet far ranging review, remind us of a host of trace elements that may be equally important. Deficiencies of essential minerals such as copper, or excessive intakes of toxic elements like cadmium, cause debilitating bone diseases. The authors point to an ever increasing list of these elements, some quite obscure. Assessment of their importance is made more difficult by lack of food composition data for most of them. An important conclusion is that it is more important to study multiple interactions of these elements than individual elements in isolation.

The vital role of iron in nutrition cannot be overemphasized. Much of the nutrition literature has been devoted to the liabilities of deficiency whereas the clinical literature tends to have focused on the effects of iron overload. The thin line dividing deficiency and excess of this element provides a supreme challenge to nutrition science. After a brief discussion along these lines, *Cook, Baynes and Skikne* bring us up to date on the methods for assessing iron status. Many different measurements can give insights into diverse aspects of iron status and identify deficiencies, including measures of iron stores, iron transport components, erythrocyte parameters and the needs of tissues for iron as determined by receptor activity. None is sufficient alone and the ideal choice of tests depends on the circumstances and the purpose of the work, for example whether screening specific groups for deficiency or assessing the iron status of populations. The use of a battery of parameters demands careful statistical analysis of the data. In this way, the specificity of prevalence estimates can be enhanced and different stages of iron deficiency can be defined.

Few areas of nutritional interest can have generated more emotional response than the relationship of diet to behaviour disorders, particularly hyperactivity. Views become polarized, some workers claiming widespread improvements in such conditions through aggressive dietary measures, others dismissing these ideas as unscientific make-believe. It is, therefore, welcome to read a cool scientific appraisal of the current status of the subject from a well respected department. *Robinson and Ferguson* define hyperkinetic disorders, discuss diagnostic criteria and estimates of prevalence. They trace the history of the development of dietary hypotheses and, most importantly, present a critical analysis of the techniques and approaches used. While concluding that there is indeed scientifically sound

evidence to support an association between foods and abnormal behaviour in children, they firmly state that the frequency is less than that claimed by some psychologists, psychiatrists and allergists.

Such reviews as this reveal a dilemma in nutrition science that is less apparent in the more rigorous scientific disciplines. While it is important in the biological sciences to assess behaviour of large groups and the variability within groups so that general biological principles relating to populations can be established on a statistical basis, nutrition and behaviour have to do with individuals, each one of whom is different. Although individuals can undoubtedly be placed within general biological patterns, so complex is modern human life and so diverse are the influences on each one of us, that any scientific appraisal has of necessity also to examine individuals as well as groups. Coming to terms with this concept provides, perhaps, the greatest challenge to nutritionists.