

PREFACE

This issue begins with an authoritative and comprehensive review of the topic of ‘resistant starch’ (RS). It was only as recently as the early 1970s that the assumption that starch was completely digested and its glucose completely absorbed in the small intestine was seriously challenged. Since then, interest has grown at a remarkable pace and, as *Asp and his colleagues* reveal, it has now been established that this material is one of the main sources of carbohydrate substrates for the colonic microflora and is thereby an important determinant of large bowel function in man. In physiological terms, RS behaves like non-starch polysaccharides (‘dietary fibre’). Current consumption of about 4 g/d thus increases the effective fibre intakes of the population and more detailed knowledge of food processing techniques that give rise to RS opens the possibilities for ‘designer foods’ with potential health benefits. After defining RS, *Asp and colleagues* take us through its chemical and physical characteristics, outline current methods for its analysis and review current knowledge of its physiological effects in the small and large bowels. A thorough characterization of its energy value will clearly be of considerable importance.

Science knows no national boundaries and the tendency towards greater international collaboration becomes ever greater. This is as true of nutrition as the physical sciences and the European Union (EU) has taken many initiatives in funding multicentre collaborative food and nutrition projects. This *Journal* has taken a lead in providing a vehicle for the publication of reviews of several EU funded projects and the work of *Asp and colleagues* essentially surveys the outcome of the work of the EURESTA project: ‘Physiological Implications of the Consumption of Resistant Starch in Man’. As the Appendix shows, the contributors are eminent scientists from 10 European countries and their review will provide valuable reference material for the next generation of nutrition scientists interested in this exciting field of endeavour.

Continuing our series by eminent nutritionists who can look back over a lifetime of involvement in important developments in nutrition science, *Alexander Walker* provides some fascinating insights into the nutritional problems of South Africa. The value of this review is not only that it comes from the pen of a respected nutritionist who has contributed so much to the development of the subject, but that the arena that he surveys is one of rapid change, involving many different ethnic groups, widely contrasting health problems, with vast differences in social structure and economic conditions. Dr Walker’s review will be valuable to many in developed and developing countries alike who are interested in how interactions between nutrition and social conditions are likely to affect future health in their own societies.

Millward and Roberts provide a critical, penetrating and thought provoking review of what we know about the protein requirements of the elderly. Despite its limitations, the balance method remains the main, if not the only, technique with the potential to produce accurate information provided that substantial efforts are made to avoid the known errors. On the basis of their analysis of the limitations of the nitrogen balance method as applied to studies of protein requirements in older subjects, the authors could not identify any studies that unequivocally demonstrated either a change with age in the requirement or a mean requirement value that was higher than the values defined by FAO/WHO/UNU in 1985, namely 0.6 and 0.75 g/kg daily for mean and safe allowances respectively. More research is needed to determine whether intakes identified as being adequate for young

adults (0.6 g/kg) are also adequate for maintaining nitrogen balance in older people. There is a need to focus on long term as well as short term consequences of different protein intakes.

Heinig and Dewey's review of the health advantages of breast feeding for infants provides a useful follow-up to the article of Goedhart and Bindels on human milk and formula feed composition in *NRR Volume 7*. Their starting point is the general acceptance that human breast milk provides the best source of nutrition for young infants but that many claims for its value in enhancing physiological and behavioural development and in protecting against various acute and chronic diseases have not always been well substantiated. They rightly point out that for many practical and ethical reasons it is not possible randomly to assign infants to receive breast milk or infant formula, so that experimental design in this field of nutrition immediately has to be compromised. Another important methodological problem they highlight is the definition of 'breast feeding'. It is not always clear, for example, whether an infant that is described as 'breast fed' has been given exclusively breast milk for a long period or has received supplementary foods as well.

The authors define certain criteria that they regard as essential for a study to be regarded as well designed and throughout the review indicate where studies may have fallen short of the ideal. This will be helpful to readers who may be otherwise uncertain about how much credence they should give to quoted results. It also enables the authors to present their conclusions about the role of breast milk and milk components in, for example, the development of the nervous system and protection against diarrhoeal and respiratory diseases, with a degree of confidence.

Most women are only too aware of seemingly strange changes in food preferences during their monthly cycle. It is unusual to see these changes analysed scientifically with an attempt to understand their meaning and origins. *Vlitos and Davies* have given us a thorough insight into linkages between cyclic hormonal changes and changes in bowel function and eating patterns during the human menstrual cycle. Dietary surveys confirm women's impressions of increased appetite premenstrually, with a significantly higher energy consumption during the luteal phase of ovulatory cycles. These alternations in energy intake, following a sine wave pattern, seem to be in response to complementary changes in basal metabolic rate. Whereas the proportion of macronutrients to energy intakes seems to be unaffected by these changes, there is evidence for an alteration in the types of carbohydrate consumed prior to, or possibly during, menses. More detailed studies are needed to be sure of the extent of other changes (e.g. micronutrients). An important message from this work is that planned nutritional surveys that involve women should take into account the phase of the menstrual cycle of female subjects during such studies.

Recent interest in the close relationship between birth weight and mortality and the concept that perinatal development can have a profound influence on the long term health of both mother and fetus was the driving force for *Symonds and Clarke's* review of interactions between nutritional and other environmental factors during pregnancy. The authors survey the influence of maternal nutrition on reproductive performance and then examine how maternal environment affects the growth of the placenta. The mother's ability to supply glucose to the fetus is a key factor regulating fetal growth. Environmental temperature, amount of physical activity, obesity and the presence of diabetes all interact to influence glucose availability to the fetus and fetal development. The authors are well known for their work with sheep and a notable contribution of this review is their linking of concepts derived from research in sheep to current issues of human health.

In recent years there has been much interest in the interactions between human nutrition and physical activity and in the special nutritional needs of athletes. *Hiney and Potter's* review in this issue is concerned with the nutrition and metabolism of a superlative athlete

– the racehorse. Their article provides a wealth of basic information about the nutritional needs of racehorses and strategies for feeding them and also discusses the important question of the metabolic basis of fatigue. Despite a great deal of research, few studies have apparently shown statistically significant improvements in race times or increased time to fatigue as a result of nutritional modifications. However, as the authors point out, races may be won by fractions of seconds and it may be unrealistic to expect to be able to relate such fine performance differences to nutrition. Studies of racehorse nutrition can nevertheless make a valuable contribution to the more general understanding of nutrition–exercise interactions.

Mathews presents an overview of present knowledge of the effect on pregnancy outcome of several nutrients which share the property of being involved in antioxidant systems. It is now common for many women to take nutrient supplements of various kinds during pregnancy, no doubt encouraged by the popular belief that nutrient supplements, even if not therapeutic, must be benign since their constituents normally occur in food. However, because of potential dangers inherent in overdosing of a number of essential nutrients, it behoves us to look closely at the quality of the evidence for claimed beneficial effects of any particular supplement. *Mathews*' review is noteworthy for the care she has taken to search the literature comprehensively and then to formulate quite strict criteria for methodological quality before accepting the results of any particular publication. Her system for classifying publications to be reviewed according to the quality of the methods used could well be adopted by many more reviewers in future.

The author concludes that, with the exception of Zn and Fe supplements, the present state of knowledge about associations between micronutrient status and pregnancy outcome is very poor. Large well designed cohort studies are needed particularly involving women at risk of poor pregnancy outcome, to identify nutrients of most importance.

Colorectal cancer is the second most common cancer in Western societies, affecting up to 6% of men and women by the age of 75. The strong evidence that most large bowel cancers are attributable to environmental factors means that it is a potentially preventable disease. *Bingham* reviews the evidence for an influence of diet on the risk of colon cancer. Once again the author reminds us of the shortcomings of the various methods that are employed to study such potential associations and helps the reader by indicating the relative reliability of different studies. Although cross-sectional comparisons, case-control studies and trends in food intake tend to show high rates of colorectal cancer in populations consuming diets high in meat and fat and low in starch, non-starch polysaccharide and vegetables, results from prospective cohort studies (which are generally recognized as employing a stronger design) show only weak associations of these dietary factors with colorectal cancer. A major problem in epidemiological studies of large bowel cancer is the absence of an easily accessible intermediate risk marker, known to alter in response to diet in metabolic studies, that can be used to link dietary intake to presence of the disease in either intervention or prospective studies. Despite these reservations, there is ample support for a view that general increases in consumption of complex polysaccharides would benefit the population's health in many ways and this may well include a reduction in the current relatively high incidence of colorectal cancer.

Salter and White review current knowledge of the effects of dietary fat on cholesterol metabolism. They begin with a useful summary of the effects of individual dietary fatty acids on human plasma lipoproteins. An important development in recent years has been the emphasis on the markedly different effects of individual fatty acids within the broad classes of 'saturates', 'cis-monounsaturates' 'polyunsaturates' and 'trans-unsaturated fatty acids' on different lipoprotein subclasses and these finer points are well brought out in *Salter and White*'s review. The second part explores the regulation of metabolism of low

density lipoproteins (the main carriers of cholesterol in human plasma) with considerable emphasis on the role of different fatty acids in the expression of genes for several regulatory enzymes. Nutritionists without a strong background in molecular biology, its techniques and its jargon, may find this section challenging. But it is worthwhile persevering, because one of the principal ways in which fundamental nutrition science must develop in the next few decades is by exploring the genetic basis of enzyme regulation by dietary factors.

The more specific question of *trans* fatty acids is the subject of *Gurr's* review. This class of dietary fatty acids has attracted great interest recently as a result of several metabolic studies indicating their adverse influence on plasma lipoprotein profiles, suggesting an increased risk of coronary heart disease. One particular epidemiological study also indicated a higher rate of coronary heart disease in people with the highest intakes of *trans* acids derived from industrially hydrogenated fats. Concern has also been expressed as a result of research showing an influence of these fatty acids on essential fatty acid metabolism in infants, with implications on early development, particularly of the nervous system. The author summarizes the chemistry of *trans* fatty acids and their formation in industrial processes and in the ruminant. Their analysis, presence in the food supply and metabolism are also outlined. The author concludes that at present average levels of intake, there are unlikely to be adverse health consequences but that caution about higher intakes is warranted. This conclusion runs counter to a widespread belief that any level may be harmful and more strenuous efforts to reduce intakes should be adopted. Readers must decide for themselves from the evidence presented here and in other cited reviews.

As judged by the prevalence of anaemia, iron deficiency is the most prevalent nutritional disorder worldwide. Concerned that the situation obtaining in the early 1980s has not improved substantially in the intervening years, *Schultink and Gross* have been interested in surveying various options for alleviating iron deficiency, particularly in developing countries. They discuss in turn the prospects for dietary improvement, food fortification and supplementation with iron. Recognizing that even with recent improved knowledge of the use of these different options, many practical problems remain, the authors examine the effectiveness of intermittent supplementation with a smaller dose compared with daily supplementation. They conclude that weekly supplementation may be as effective as daily supplementation in improving iron status. This has the advantages that it would reduce the cost, make distribution easier and may improve compliance. Such a scheme is less likely to result in negative influences on the absorption of other micronutrients and would limit the chances of iron overload.

In the long term, the authors think that a policy to improve the iron status of the diet is quite sustainable. However, the dietary changes that would be needed require improved socioeconomic status and an understanding and willingness to comply on the part of the consumer. Selected foods can also be fortified. But the type of intervention that can be implemented quickly and targeted easily is supplementation, preferably on a weekly basis for the reasons discussed. Populations differ widely and no single strategy can be relied upon universally. A mix of approaches is needed to suit the needs of different communities.

Fairweather-Tait and Hurrell have compiled a review of the bioavailability of minerals and trace elements, based on the work of their colleagues in the EC FLAIR Concerted Action programme No. 10: Measurement of micronutrient absorption and status. This has brought together experts from seven different countries and, like the Resistant Starches Programme, can be regarded as a truly authoritative summary of current knowledge. The authors deal with the nine minerals and trace elements that are regarded as nutritionally most important: Ca, Cr, Cu, I, Fe, Mg, Mn, Se and Zn. Each section devoted to a different mineral provides a brief summary of the salient features of food sources, absorption and excretion. An important feature is the focus given to crucial nutritional interactions

between the individual nutrients. Whereas a review of this length cannot possibly be exhaustive, its merit is in focusing on the most important aspects of the subject. An ample reference list provides access to a wide range of original publications when more detail is required.