Nutrition Research Reviews (2004), **17**, 1–3
DOI: 10.1079/NRR200483

Editorial

One of the persistent problems of human nutrition is finding out what individuals actually eat. The gold standard is the weighed intake survey, and even these are well known to yield misleading results; there is clear evidence of underreporting in a number of studies, especially when blood and urine samples have been analysed to assess the intake of individual nutrients. Furthermore, such studies cover a relatively short time (often less than 1 week), and individuals may change their food intake to match their perception of the investigator's motives. Food-frequency questionnaires have become a major tool of nutritional epidemiology; they provide more valid data than 24 h recall, and are considerably less difficult to perform than weighed intake studies. Cade *et al*. (2004) have undertaken a systematic review of the methodology of food-frequency questionnaires. They identified 227 validation studies, only 19 % of which compared a questionnaire with a biomarker to validate information for individual nutrients. They conclude their review with a consensus statement of recommendations for the design and implementation of food-frequency questionnaires.

In Western countries we take it for granted that food will be available. By contrast, in developing countries, food insecurity is a major problem, with perhaps 840 million individuals chronically undernourished, with under 8·4 MJ/d, and as many as 3 billion suffering from deficiency. Christou & Twyman (2004) review the potential of GM crops to alleviate the problem by providing higher yields, resistance to pests and diseases (so increasing the effective yield very considerably), the ability to grow under adverse conditions (so increasing the land available for crops) and improved nutritional quality. They discuss the science and technology involved, and the potential benefits, but then conclude with the observation that genetic modification of crops is highly politically sensitive. Within the European Union environmental concerns have led to a trade war with the USA, and several southern African countries have refused US food aid that included GM cereals and soya beans.

We are all aware of the importance of teeth in nutrition, and the effects of diet on teeth; it is perhaps noteworthy that traditionally dental students have received more training in nutrition than have medical students. Mioche *et al*. (2004) review the processes involved in chewing and swallowing food, and the ways in which age-related changes in dentition, salivary secretion and muscle function may affect the nutrition of the elderly. They conclude that advances in the understanding of food choice by the elderly, which has a significant impact on their health and well-being, will require collaborative research between sensory physiologists, nutritionists and food scientists.

Older individuals are at risk of vitamin deficiency as a result of dietary inadequacy, changes in absorption and metabolism with ageing and the effects of medication and chronic disease. At the same time, functional vitamin deficiency may be a factor in the aetiology of chronic degenerative diseases. Brachet *et al*. (2004) discuss the epidemiological data that suggest functional deficiency of B vitamins in elderly individuals, and the relationship to degenerative diseases. Inadequate intakes of folate, vitamins B_6 and B_{12}, thiamin and riboflavin have been implicated in hyperhomocysteinaemia, and hence CVD, as well as cognitive and neurological disorders and some cancers; both impaired methylation reactions and the pro-oxidant actions of homocysteine may be involved. They conclude that while intervention studies with vitamin supplements may provide some useful information, there is a need for long-term prospective studies to determine whether improved vitamin nutritional status will be protective against degenerative diseases.

Fujita & Volpi (2004) continue the theme of concern for the nutrition of the elderly with a review of the factors involved in the loss of muscle mass and function (sarcopenia) with ageing. Inadequate intakes of both protein and energy may be important. They discuss experimental data showing improved muscle protein synthesis in response to intravenous infusion of amino acids, and the various studies that have shown increased or unchanged net protein synthesis in response to oral amino acids, with or without glucose. Amino acids alone seem to increase protein synthesis, but given with glucose they do not; this seems to be due to an age-related blunting of the anabolic response to insulin in muscle, even in subjects who have normal glucose tolerance. They note that a number of studies have shown that when elderly individuals are provided with nutritional supplements they reduce their intake of food, to maintain a more or less constant energy intake. This suggests that increased protein intake alone may be less effective than supplements of essential amino acids, but such supplements are expensive compared with protein-rich foods, and are relatively unpalatable. Like Brachet *et al*. (2004) they conclude by noting that there is a need for long-term clinical trials of amino acid and protein supplementation (and also exercise training and perhaps supplements of testosterone or growth hormone) to improve muscle protein synthesis in elderly individuals.

Infection and trauma have a dramatic effect on whole-body protein turnover; 40 years ago Cuthbertson (1964) reported a net loss of some 6–7 % of total body protein over 10 d after surgery, trauma or infection. Older physiology textbooks suggest that this reflects the mobilisation of protein reserves for tissue repair; this is clearly not so, since the amino acids released by protein catabolism are oxidised and there is negative N balance. Rather, the increased utilisation of some amino acids for synthesis of acute phase proteins, and the increased catabolism of others in response to cortisol and various cytokines, leaves a pool of unbalanced amino acids that cannot be used for protein synthesis; the

catabolic drive proposed by Millward & Rivers (1988) to explain the basis for essential amino acid requirements. Vary (2004) reviews the mechanisms involved in the catabolic response to sepsis, and notes that muscle protein loss (the result of both increased catabolism and decreased synthesis) continues to be a problem, despite intensive nutritional support. Historically, leucine has not been considered to be a nutritional problem; it is the most abundant of the essential amino acids in dietary proteins. However, it acts as a signal to stimulate protein synthesis postprandially; unlike other amino acids, which can be deaminated in the liver, the branched-chain amino acids only undergo transamination in muscle, so their blood concentration rises considerably after a meal. Dardevet *et al*. (2003) reviewed the role of leucine in the sarcopenia of ageing, and Vary (2004) the recent information on how leucine acts in cell signalling, and the effects of providing supplements of leucine, glutamine and arginine to minimise catabolism in sepsis.

The term 'prebiotics' was introduced a decade ago by Gibson & Roberfroid (1995) for non-digestible components of food that confer a health benefit by stimulating the growth of beneficial intestinal bacteria. Three criteria must be fulfilled for a food ingredient to be considered to be a prebiotic: it must not be digested by human enzymes; it must be a substrate for intestinal bacterial fermentation; most importantly, it must be selective in its actions, and not be available to all the intestinal microflora. Van Loo (2004) discusses the specificity of a group of established prebiotics, the inulins (i.e. β(1–2) fructans), linear polymers of fructose with varying chain length. Short-chain fructose oligosaccharides (up to ten monomers) are very soluble, and highly active in promoting the growth of bifidobacteria; longer-chain oligosaccharides (ten to sixty-five monomers) are less soluble, more slowly fermented and less bifidogenic. His conclusion is that a mixture of both has a greater physiological effect (especially enhancing mineral absorption and suppressing carcinogenesis) than either fraction alone; short-chain oligosaccharides provide a rapid substrate for bifidobacterial growth, while long-chain oligosaccharides provide a sustained substrate to maintain the flora.

The 11th century Persian mathematician and poet, Omar Khayyam, wrote in his *Rubaiyat* number 12: 'A book of verses underneath the bough, a jug of wine, a loaf of bread and thou beside me singing in the wilderness – oh, wilderness were paradise enow!'. While *Nutrition Research Reviews* is not a book of verse, I hope it can indeed be read with pleasure, and this issue concludes with two reviews that consider the physiological, rather than hedonistic, benefits of a loaf of bread and a jug of wine. Slavin (2004) reviews the epidemiological evidence that wholegrain cereals provide protection against cancer, CVD, diabetes and obesity. Intuitively, we might think that the benefits come from the NSP and resistant starch in wholegrain cereals, which reduce the energy density of food (hence protective against obesity), provide substrates for intestinal bacterial fermentation (and hence have prebiotic and potentially anti-carcinogenic actions) and slow the absorption of nutrients, so providing benefits for the control of diabetes. However, other compounds may also be protective, including lignan and other phyto-oestrogens, plant sterols and stanols that reduce cholesterol absorption, and a variety of nutrients and non-nutrient antioxidants. Slavin (2004) concludes that it is difficult to separate the effects of dietary fibre and other constituents, and the benefit from wholegrain cereals in prospective studies exceeds that from isolated nutrients and phytochemicals.

CHD mortality in France is close to the low levels seen in Japan and China, yet the French consume as much saturated fat (and cholesterol) as in the UK and USA. One possible answer to this so-called French paradox is that the consumption of red wine in France is some four-fold greater than in the UK, and considerably greater than in the USA. There is ample epidemiological evidence of the benefits of modest alcohol consumption (Buemann *et al*. 2002). Cooper *et al*. (2004) discuss the effects of the various polyphenols in red wine, noting that while they have little effect on plasma lipoprotein concentrations, they do indeed reduce the susceptibility of LDL to oxidation. Some also enhance NO production (and hence vaso-relaxation), and may reduce platelet ability to coagulate; two further cardiovascular protective actions. While this might suggest that wine drinking could be replaced by supplements of concentrated grape polyphenols, they note that alcohol has a positive synergistic effect with polyphenols, so a glass of wine is likely to be more beneficial than a tablet.

David A. Bender
Editor-in-Chief
Department of Biochemistry and Molecular Biology
University College London
Darwin Building
Gower Street
London WC1E 6BT
UK
d.bender@ucl.ac.uk

References

Brachet P, Chanson A, Demigné C, Batifoulier F, Alexandre-Gouabau M-C, Tyssandier V & Rock E (2004) Age-associated B vitamin deficiency as a determinant of chronic diseases. *Nutrition Research Reviews* **17**, 55–68.

Buemann B, Dyerberg J & Astrup A (2002) Alcohol drinking and cardiac risk. *Nutrition Research Reviews* **15**, 91–121.

Cade JE, Burley VJ, Warm DL, Thompson RL & Margetts BM (2004) Food-frequency questionnaires: a review of their design, validation and utilisation. *Nutrition Research Reviews* **17**, 5–22.

Christou P & Twyman RM (2004) The potential of genetically enhanced plants to address food insecurity. *Nutrition Research Reviews* **17**, 23–42.

Cooper KA, Chopra M & Thurnham DI (2004) Wine polyphenols and promotion of cardiac health. *Nutrition Research Reviews* **17**, 111–129.

Cuthbertson DP (1964) Physical injury and its effects on protein metabolism. In *Human Protein Metabolism*, vol. II, chapter 19, pp. 373–414 [HN Munro and JB Allison, editors]. New York: Academic Press.

Dardevet D, Rieu I, Fafournoux P, Sornet C, Combaret L, Bruhat A, Mordier S, Mosoni L & Grizard J (2003) Leucine: a key amino acid in ageing-associated sarcopenia? *Nutrition Research Reviews* **16**, 61–70.

https://doi.org/10.1079/NRR200483 Published online by Cambridge University Press

Fujita S & Volpi E (2004) Nutrition and sarcopenia of ageing. *Nutrition Research Reviews* **17**, 69–76.
Gibson GR & Roberfroid MB (1995) Dietary modulation of the human colonic microbiota: introducing the concept of prebiotics. *Journal of Nutrition* **125**, 1401–1412.
Millward DJ & Rivers JPW (1988) The nutritional role for indispensable amino acids and the metabolic basis for their requirements. *European Journal of Clinical Nutrition* **42**, 367–393.
Mioche L, Bourdiol P & Peyron M-A (2004) Influence of age on mastication: effects on eating behaviour. *Nutrition Research Reviews* **17**, 43–54.
Slavin J (2004) Whole grains and human health. *Nutrition Research Reviews* **17**, 99–110.
Van Loo J (2004) The specificity of the interaction with intestinal bacterial fermentation by prebiotics determines their physiological efficacy. *Nutrition Research Reviews* **17**, 89–98.
Vary TC (2004) Biochemical approaches for nutritional support of skeletal muscle protein metabolism during sepsis. *Nutrition Research Reviews* **17**, 77–88.