Editorial

Editors: L. R. Ferguson
and P. J. Harris

L. R. Ferguson (above) and P. J. Harris (left)

Dietary Fibres and Human Health

A long tradition has associated dietary fibres (DFs) as being beneficial to human health and protective against a range of diseases that are common in the Western world, including colon cancer. However, their effects on protecting against the latter disease have been controversial since the publication in the early 2000s of some large epidemiologic studies that were interpreted as indicating that higher intakes of DFs did not protect against colon cancer. We have previously challenged such an interpretation, and have suggested that part of the problem is that the term "dietary fibre"encompasses such a large and heterogenous groups of material that one would not expect them all to protect against diseases such as cancer. This special issue comprises a snapshot view of some current thinking on DFs, their potential use in industry, and their role in protection against human disease.

As emphasised by Redgwell and Fischer, food companies are responding to the need for foods with enhanced satiety and lower energy density by allocating more resources to the development of DF-enriched products. The challenge for industry is to ensure that such foods are both palatable and attractive to the consumer, while maintaining nutritional benefits. The authors claim that such food company requirements can be met through basic research on the physicochemical basis for functionality of DF, and by developing a broad spectrum of novel products. This type of research is illustrated in the paper by Harris et al., who describe a large-scale method for fractionating wheat bran into aleurone-rich and a pericarp-rich fractions. The DFs in these fractions were characterized and found to have very different characteristics, with differences in the types and amounts of non-starch polysaccharides (NSPs), and phenolic components. If indeed both the types and amounts of NSPs are critical to health properties, then near infrared reflectance spectroscopy as described by Blakeney and Flinn could provide a rapid and widely applicable method of quantitative analysis. However, the phenolic component may also be important, and the methods used by Bunzel and coworkers, and their conclusions about amaranth, may be also of interest.

The utility of DF-enhanced and modified food products for weight control is echoed by Brennan, who reviews the current impact of obesity and diabetes in the UK, USA and New Zealand. New DF-enhanced foods have the potential to enhance satiety, and aid the regulation of blood glucose for diabetic patients. Certain viscous soluble DF (including guar gum and locust bean gum) have the potential to alter the rate of carbohydrate degradation during digestion by their effects on food structure, viscosity and composition. This is likely to have beneficial flow-on effects for the regulation of postprandial blood sugar and insulin levels, key events in the prevention and treatment of obesity and diabetes.

As indicated above, the role of DFs in preventing colorectal cancer has become controversial. Young and co-workers review the evidence from both animal and human intervention studies, and develop a model for environmentgene interactions that may help explain some of the apparently contradictory data. As they point out, all studies claiming to measure a protective effect by DFs have used biomarkers, rather than cancer per se, as an endpoint. They review the biological and molecular events involved in initiation and progression of colorectal cancer, and suggest that effects of fermentable DF-carbohydrates on genomic instability, apoptosis and cell cycle arrest occur through effects on gene expression by both epigenetic and direct effects. Although such changes may well be triggered by fermentable DF-carbohydrates, Ferguson et al. present some new data showing the abilities of two hydroxycinnamic acids to modulate DNA damage and gene expression in mammalian cells. These compounds are important components of DFs in certain plant foods, and can be released from the DF by the action of certain microbial esterases in the colon. If the events described by either Young and coworkers or Ferguson et al. can occur at physiological levels of DF that actually occur in the colon, such activities may provide an alternative mechanism by which certain types of DFs could protect against cancer.

Some of the most intriguing recent data on DFs have centred on their potential role in controlling inflammation. King reviews the recent cohort studies that show a protective effect of DFs on cardiovascular disease. Although this mechanism has been debated, new evidence has shown that the protective effect of DFs is associated with a concomitant lowering of concentrations of C-reactive protein (CRP), a clinical indicator of inflammation. King suggests that inflammation may be an important mediator in the association between DFs and cardiovascular disease, an area requiring further clinical studies. An independent review by Galvez also supports the idea that increased intake of certain DFs can be beneficial in reducing inflammation. This review focuses more specifically on the potential benefits and mechanisms of DF action in the chronic idiopathic inflammatory bowel diseases, Crohn's disease and ulcerative colitis.

The final manuscript in this collection re-examines the concepts behind prebiotics. Although an increasing literature develops the concept that non-digestible oligosaccharides such as oligofructoses may have a range of beneficial effects on human health, Lim et al. point to the much earlier observations that a range of fermentable DF-carbohydrates can also modulate the activity of the microbial flora through a range of different mechanisms. It is of interest that these effects may occur, at least in part, through effects on the expression of colonic genes, and effects on immune response.

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