

## BOOK REVIEW

### **DNA and Free Radicals**

Halliwell B. and Aruoma O.I. (Eds).  
*Ellis Harwood: London*, 1993, p. 332  
ISBN 0132220350.

The conception and timely appearance of this attractive looking book owes much to the farsightedness of its editors who realised that a gap for a reference text on DNA and free radicals existed in the market.

Twenty six international experts concerned with specialised aspects of DNA science and free radical chemistry have contributed sixteen chapters covering the topics:- inorganic, organic and photochemical damage to DNA, cancer and ageing, calcium homeostasis, enzyme repair mechanisms, sexual reproduction, cell proliferation, tumour promotion, redox cycling xenobiotics, plant biochemistry, mineral fibres, cigarette smoke, and food additives. The format of presentation is uniform and pleasing with almost no overlap between the contributions, making reading and reference seeking a simple and enjoyable task.

It is widely appreciated by scientists working on aspects of free radicals in biology and medicine that DNA is a critical target molecule for free radical attack, and that in the process free radicals become both initiators and promoters of cancer development. A favoured biological mechanism of radical damage to DNA appears to involve a pivotal role for hydrogen peroxide approaching nuclear DNA. Here it seems to meet redox active transition metal ions; but why such metal ions are located so close to DNA remains an enigma.

A novel use of DNA as a probe for pro-oxidant properties of food additives is described in the last chapter. Based on molecular recognition assays, developed by the reviewer several years ago for measurement of reactive iron and copper, phenolic antioxidants with reducing properties are tested for their ability to redox cycle iron or copper as ternary complexes (DNA-chelator-metal ion). The redox cycling properties of these ternary complexes are, however, especially unique (hence their adaption to molecular recognition assays), and it remains of interest whether similar reactive complexes can be formed in foodstuffs which allow some food additives to express their pro-oxidant properties.

I strongly recommended the purchase of this excellent book.

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**Lipids: The Continuing Challenge**  
**American Journal of Clinical Nutrition**  
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This volume encapsulates the presentations made at a meeting on Lipid Biochemistry in 1992. Perhaps appropriately, the meeting was held in Maastricht, a town famous for another conference held that year and which engendered much discussion and heat. I would like to think that the Lipids meeting produced more light than heat.

Faced with the explosion in molecular biology, it was necessary for lipidologists (who have been defined occasionally and patronisingly as "classical" biochemists) to demonstrate that the study of lipids still has much to offer modern biology.

In some respects the conference dealt both with what was old and what was new in lipids. The section by Michael Crawford covered some familiar ground concerning the role of essential fatty acids, particularly the long chain variety, and maternal nutrition and brain development, but included philosophical asides on the origin of life that would rival a David Attenborough programme. Special pleas were made by David Horrobin for  $\gamma$  - linolenic acid supplementation on the grounds that in conditions such as diabetes that  $w - 6$  desaturase activity may be impaired. However, this may not be appropriate to Type II diabetes, as was pointed out in the discussion.

The concentrations in serum of phospholipid eicosapentaenoic acid (EPA) and docosahexaenoic acids (DHA) were related to the dietary intake of these long chain polyunsaturated fatty acids. Bjerve and coworkers had earlier provided evidence that these  $w - 3$  fatty acids were essential dietary requirements, independent of the  $w 6$  series. The precise requirements for newborn and pre-term children are still unknown. It was found that a negative relationship existed between EPA and the Bayley Mental Development Index in pre-term and low birth weight infants, whereas the index correlated positively with DHA as did the Psychomotor Development Index. This suggests that pre-term infants may have a reduced ability to convert EPA to DHA. Infant feed formulae should reflect this and caution should be applied to the inclusion of too much EPA.

Continuing on the subject of fatty acids, the key role of dietary fats in relation to cardiovascular disease and serum lipoproteins was expounded ably by Ronald Mensinck, adding the further complication that not all saturated fatty acids are equally menacing and that those with 12 to 16 carbons bear the bulk of the blame.

The volume contains an excellent section by Eric Newsholme which begins with the familiar one concerning the interactions between body fuels, helping those of us who have to translate Biochemistry into digestible material for medical students enormously. However, he went on to discuss how fatty acids may influence central fatigue through their actions on 5-hydroxytryptamine in the brain. The effects of fatty acids on the immune system were also considered. These may be linked with the very interesting sections on exercise and energy balance by Saltin and Astrand, and by Klaus Westertep, who stressed the fact that high carbohydrate/ low fat diets lead to a reduction in obesity. The relative insignificance of lipogenesis in man was discussed. The fact that dietary fat does not enhance fatty acid oxidation, in addition to poor appetite control, appears to lead to obesity (Swinburn and Ravussin). John Blundell disputes earlier assertions that fat has a strong effect on satiety.

The section by Barry Halliwell and Susanna Chirico introduced an area which impinges on lipid biochemistry and which has recently seen an explosion of interest, namely free radical research. The basic mechanisms of lipid peroxidation were expounded and the problems in making meaningful measurements of this process

clearly described. This is followed by an article by Hermann Esterhauer which relates to the current interest in the oxidation of low density lipoproteins in the development of atherosclerosis. The main point of this contribution concerns the cytotoxic and genotoxic effects of the products of lipid oxidation. The logic of these observations was extended by a discussion of the role of dietary antioxidants on the protective agents against cardiovascular disease. Fred Gey reported on the WHO-MONICA Study and other studies which revealed an increased risk of heart disease with decreasing plasma concentrations of antioxidants, the prime place being given to Vitamin E:  $\beta$ -carotene and vitamin C apparently offering lesser protection. However, it seemed necessary to exclude the Finns from these considerations because they did not fit the data found in other European countries, because of confounding genetic peculiarities which increase coronary risk.

Enormous strides have been made in relation to the role of lipids in post-receptor signal transduction mechanisms, but this was poorly reflected in this volume except for the contribution of Stefan Enders who outlined the interactions between lipids, eicosanoids and cytokines. Other contributions related to newer methodological developments, particularly the use of stable isotopes in the study of human apolipoprotein metabolism by Halliday and colleagues. There are a number of other smaller studies.

In general, the volume indicates that progress is still slow, particularly in relation to the long chain polyunsaturated fatty acids in human nutrition. Since dietary fats are a subject of popular interest, this lack of clarity continues to confuse the public and encourage disenchantment with expert advice. Although all the subjects were not covered comprehensively, and many attractive aspects of lipid biochemistry excluded, the volume gave a flavour of the variety of old and new developments and showed that life depends on lipids and that there is still life in lipids.

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