

## The expanding ambit of nutrition science

*Annual Review of Nutrition 1990*. Vol. 10. Robert. E. Olson, ed. Annual Reviews Inc., Palo Alto, USA. 1990 523 pp. Price USA \$41, elsewhere \$45.

Over the years nutritional research has emerged as an endeavour interlinked with several other disciplines, such as Biochemistry, food science, medicine and genetics, to mention only a few. Developments in these areas have led to the evolution of the classical into the modern science of nutrition. This is amply reflected in the 1990 Annual Review of Nutrition, which is incidentally the decennial number. The volume comprises a prefatory essay by T. H. Jukes followed by 23 reviews in energy metabolism (one review); lipids (four); proteins and peptides (two); vitamins (four); inorganic nutrients (four); nutrition, genetics and regulation (two); and clinical nutrition (six).

Jukes, apart from narrating the development of 'nutrition' during his own career, emphasizes the need for scientists to fight against creationists, animal rightists, and science-nay-sayers. He has also pointed out the necessity for scientists to convince society that science is a friend and that the need to increase the literacy of citizens about scientific matters is one of societies' most urgent tasks.

The article 'Regulation of energy expenditure in ageing humans' discusses the components of energy expenditure, viz. resting metabolic rate (RMR), thermic effect of feeding, and thermic effect of activity. Recent work on the influence of ageing and physical activity of RMR and thermogenesis and sympathetic nervous system activity in relation to ageing has been summarized.

Of the four reviews that belong to the area of lipids, two are on polyunsaturated fatty acids (PUFA). It has been pointed out that, with the realization that n-3 fatty acids have the potential to reduce cardiovascular risk, there is a shift in strategy from treating only high-risk individuals to advising entire communities. Although it has been shown that eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) lead to a decrease in circulating triglyceride-rich lipoproteins, the dosage required for

long-term triglyceride lowering is yet to be ascertained. The possibility that excess intake of n-3 fatty acids may lead to adverse effects cannot be lost sight of. Basic understanding of the actions of fish oils is still needed before they are recommended widely to the public. Further the question 'Is fish better than fish oil for protection?' is yet to be answered. In another review, the biochemistry of epidermal fatty acids, the functional role and metabolism of PUFA in the skin, and the influence of dietary oils containing n-6 and n-3 PUFA on epidermal fatty acids have been discussed. An important observation is that a GLA-containing diet leads to the accumulation of prostaglandin  $E_1$  and 15(*S*)-hydroxyeicosatetraenoic acid (15-[*S*]-HETE), which are anti-inflammatory. Hence dietary intake of highly purified vegetable or fish oils or intake of the appropriate constituent PUFA may offer a novel and nontoxic approach for alleviation of cutaneous inflammatory disorders.

The nature of the lipid transfer proteins (LTP) isolable from the d > L21 fraction of rabbit and human plasma, which accelerate the exchange of triglycerides among rabbit lipoproteins, the intricacies of lipid transfer assays, and the regulatory role of LTP form the subject matter of another review in this group. 'Lipoprotein assembly and secretion by hepatocytes' discusses the mechanics of assembly of lipoproteins, and the influence of fatty acids, PUFA, cholesterol biosynthesis, fasting and hormones.

The two reviews in the area of proteins and peptides deal with the pancreas and selenoproteins. Dietary macronutrients regulate pancreatic adaptation at the mRNA level (pretranslational). However, the mechanisms of regulation of mRNA level itself have yet to be understood. The importance of selenium as a trace element lies in the fact that glutathione peroxidase (GPX) is a selenoenzyme. More recently a new form of GPX, viz. GPXII, which degrades phospholipid hydroperoxides, was discovered. Not only has the influence of selenium deficiency on selenoproteins been discussed but comparative references have also been made to copper and ceruloplasmin, zinc and

metallothionein, and iron and ferritin

Recent developments in the vitamin area are covered in four reviews. The occurrence of folate-binding proteins in various tissues, body fluids, their structural properties, and their heterogeneity with regard to binding of folate are discussed in one of them. The main points on vitamin D are the close link between the ability of  $1,25(\text{OH})_2\text{D}_3$  to induce cell differentiation and regulation of calcium metabolism and involvement of putrescine in the development of the mucosa of intestinal villi and calcium absorption, and the ability of vitamin D to induce enzymes concerned with putrescine metabolism. The highlight of the review on vitamin E is a detailed discussion of the use of deuterated tocopherol for studying biochemistry and bioavailability. This aspect is likely to evoke much interest among researchers in this field. Though a novel cofactor was suspected to be associated with bacterial methanol dehydrogenase long back, only in 1980 was it identified as pyrroloquinoline quinone (PQQ). According to the reviewer the exciting feature is that this molecule can be viewed as an extension of tyrosine-based cofactors and several effects that were earlier attributed to the deficiency of this amino acid could probably be due to suboptimal levels of PQQ or pro-PQQ.

The four reviews in the area of inorganic nutrients discuss goitrogens, metallothioneins in relation to trace minerals, iron deficiency, and zinc and immune function. Goitrogenesis has been discussed in relation to organic and bacterial pollutants and how the condition is aggravated by malnutrition. The many roles of metallothionein, viz. in detoxification of heavy metals, control of absorption of zinc and copper, and ability to scavenge free radicals and impart stress resistance, are the subject of another chapter.

In the chapter on iron, it has been stated that iron deficiency still continues to be a problem, particularly in the developing regions of the world. An exciting finding in recent years is that iron-deficient red-cell precursors express a greater number of receptors for transferrin on the surface, and fragments of these receptors are found in increased quantities in plasma in iron deficiency. The diagnostic value of this finding is to be elucidated in future.

Epidemiological data indicate that zinc deficiency is an important factor in immune dysfunction in some human populations. In experimental animals, zinc deficiency has been shown to have functionally significant effects on almost all components of the immune system. Future lines of work may be directed to production, release and action of cytokines, lymphocyte membrane structure and function, and activation or inactivation of immunoregulatory genes in relation to zinc nutrition.

Although the theory of nutrition partitioning was postulated 40 years ago, its application to livestock production practice is of recent origin. The review on transgenic animals gives an account of transgenic procedures and transgenic expression and summarizes nutrient requirements for transgenic pigs. An important question to be addressed in future concerns how only the positive responses of growth hormone can be achieved. The importance of quantitative kinetic analysis in nutritional work is highlighted in another review. It is further emphasized that a model for compartmental analysis should be viewed as a working hypothesis.

In the essay on amino-acid metabolism in cancer cachexia, limitations of the techniques used in studying protein and amino-acid metabolism have been

discussed, followed by the problems in extrapolating data from experimental models to the human system. The latter point has also been made in 'Nutrition and cataract'. Vitamins with antioxidant potential must be studied for their significance in cataract aetiology. Weight control through proper nutrition would be an important measure in cataract associated with diabetes. Neural tube defects (NTD) may arise owing to genetic or environmental factors. Excess intake of vitamin A and deficiencies of folic acid and zinc appear to be important nutritional factors. The observation that use of folic acid-containing multivitamins during the first six weeks of pregnancy had a protective effect against NTD is a pointer to probable nutritional therapy. Osteoporosis is a disorder associated with ageing. Whereas sex, age and race are uncontrollable factors, diet, particularly a high-protein or a high-fibre diet, which would lead to negative calcium balance, and other factors like physical activity and alcohol, which increases risk of osteoporosis, can be modulated. Appetite regulation is another important topic reviewed. Apart from its involvement in the termination of a meal, cholecystokinin (CCK), a 33-amino-acid polypeptide hormone, is thought to play a role in the pathophysiology of bulimia and the anorexia of ageing. Capsaicin inhibits the ability

of CCK to decrease food intake. Gastro-intestinal peptides also appear to regulate energy metabolism. The ability of capsaicin to promote thermogenesis in experimental animals has not been mentioned.

The last review, 'Nutritional aspects of AIDS', presents a considerable volume of clinical information. It has made the point that AIDS (acquired immunodeficiency syndrome) may be considered as a condition in which nutritional studies may indicate the relationship between the human immunodeficiency virus (HIV) and opportunistic infection and nutritional status—influence on metabolic activity, mechanisms of wasting of lean body mass, and related aspects of metabolic regulation. The review also looks at nutritional management to help AIDS victims.

While several reviews critically discuss recent work and provide summaries and/or conclusions as well as suggestions for future research, others are rather matter-of-fact compilations. Still, the overall impact of the volume on students and researchers in nutrition and related fields would be invaluable.

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## MEETINGS/SYMPOSIA/SEMINARS

### International Satellite Conference on Condensed Matter under Shock Pressures

Place: Bombay, India

Date: 14-15 October 1991

The programme of the meeting will be on the following topics in shock wave physics: equation of state, phase transformations, material synthesis and processing mechanical properties, experimental techniques and numerical simulations.

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### 12th Annual Session of the Academy of Environmental Biology

Place: Rewa

Date: 19-21 December 1991

A symposium on environmental management, resource status, conservation, pollution monitoring and abatement will also be held.

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Organising Secretary '12th Annual  
Session of AEB'  
School of Environmental Biology  
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Rewa 486 003

### International Seminar on Recent Trends in Medical Biotechnology— An Update

Place: Madras, India

Date: 4-7 February 1992

Contact: Dr (Mrs) M. Madhavan

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