

enjoy working out solutions for problems.

1. Abhyankar, K. D., *Astrophysics: Stars and Galaxies*, Universities Press, 2002.

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**Annual Review of Nutrition, 2014.** Robert J. Cousins, Dennis M. Bier and Barbara A. Bowman (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 34. viii + 458 pages. Price: US\$ 90.

Countries around the world continue to be plagued by the increasing prevalence of obesity – the incidence has more than doubled between 1980 and 2014. In 1997, the World Health Organization (WHO) claimed that ‘obesity should be regarded as today’s principal neglected public health problem’<sup>1</sup>, and the National Institutes of Health (NIH), USA recognized that ‘obesity has multiple causes and that there are different types of obesity’<sup>2</sup>.

The number of papers published in this area has more than tripled in the last 10 years. In line with this, the volume under review has devoted almost half of its contents to the important topic of energy metabolism and adipose tissue function. Recent studies are focused on understanding the differences between ‘metabolically healthy’ and ‘metabolically unhealthy’ obesity<sup>3</sup>. In this volume, Martinez-Santibanez and Lumeng have provided a framework to understand adipose tissue remodelling, and introduced the field of ‘immunometabolism’, connecting regulation of immunity with that of metabolism and its role in the remodelling of adipose tissue from ‘healthy’ to ‘unhealthy’ (macrophages and the regulation of adipose tissue remodelling). On the same lines, Trayhurn discusses the role of hypoxia in inducing adipocyte dysregulation, leading to obesity-associated disorders. He also introduces the concept of a third distinct form of adipose other than the white and the brown – the brite adipose tissue, which shares certain overlapping features of the white and brown. The hypothesis here is

that the expanding white fat in obesity is not accompanied by a corresponding increase in blood flow – thus resulting in areas of relative hypoxia. Hypoxia in adipocytes influences the synthesis of the key hormones – leptin and adiponectin, which influence feeding behaviour, as well as the inflammation related adipokines – IL-6, MIF, VEGF, SAA and MMP-2. Increased inflammation results in the conversion of adipocytes from a ‘healthy’ to an ‘unhealthy’ condition – leading to adipocyte dysfunction and insulin resistance.

Different aspects of energy metabolism and control of food intake are also covered in this volume. Hardie has delineated the classical role of AMPK in maintaining energy homeostasis. AMPK is an interesting molecule – it is well preserved in eukaryotic cells and its ancestral role appears to be in the switching from glycolytic metabolism in rapid cell growth, to the oxidative metabolism in quiescent or slow-growing cells. In humans, it appears to play a key role in regulating whole-body energy balance, especially the control of feeding behaviour. The possibility of two commonly used drugs in the treatment of type-2 diabetes and CVD – metformin and aspirin – acting through the activation of AMPK is also discussed. Hayes *et al.* have focused on the crosstalk between the GI tract, the pancreas and the brain in the control of food intake. This is an area of interest both from the pharmaceutical as well as nutritional point of view, since the first step in the battle against the bulge has to be at the level of control of food intake. This review describes the complex overlapping pathways of three anorexigenic peptides – GLP-1, GIP and amylin. GLP-1 and GIP are incretins, which are secreted by the enteroendocrine ‘L’, and ‘K’ cells, and which induce insulin secretion by pancreatic  $\beta$ -cells. On the other hand, amylin is co-secreted by the pancreatic  $\beta$  cells along with insulin, and acts by suppressing food intake by delaying gastric emptying. Recent findings that GLP-1 and amylin act on the mesolimbic reward system to control energy balance are exciting, especially since this model is also applicable to other diseases such as drug addiction and depression. These peptides are therefore likely to be good pharmacological targets to combat diseases linked to dysfunctions in perception of reward and pleasure. Waterland has given

a novel twist to the problem of obesity, by adding the role of epigenetics and/or developmental programming in the control of food intake and energy expenditure. In the ongoing debate as to which component is more important in the control of obesity – food intake versus energy expenditure – many more studies have focused on the former rather than the latter. Recent animal studies, however show that epigenetic mechanisms are involved in an individual’s propensity for physical activity<sup>4,5</sup>. Rapid improvements in technology have increased our understanding of role of epigenetic modifications on cellular differentiation. Although much more work is needed in this area, the idea that epigenetic mechanisms are involved in promoting obesity in our current environment of food surfeit is attractive, especially since it offers an additional route for pharmacological manipulation of food intake.

The fight against obesity in countries like USA has mainly focused on reducing intake of fat, especially saturated fats. This has however led to an increase in the consumption of refined sugars and processed food – leading to the ‘American paradox’ of increasing obesity in spite of a decreasing fat intake. Pepino *et al.* have elucidated the role of the fatty acid transport receptor (CD36) in different aspects such as taste perception, fat intake, absorption and utilization by muscle and adipose. Although at present human perception of taste does not include fat (the five taste qualities are sweet, sour, bitter, salty and umami), the role of CD36 as a ‘taste receptor for fatty acids’ has been proposed on the basis of growing molecular evidence. Together with its role in various aspects of fatty acid signalling such as FA-induced gut peptide secretion, hepatic VLDL output and the activation of mitochondrial FA oxidation by muscle cells, the evidence for a key metabolic role of CD36 is strong. This may eventually serve as another novel target in the fight against obesity. Apart from the amount of fat consumed, the time of day when fat is consumed may also play a role in absorption and storage of fat. Hussain discusses the role of clock genes (histone acetyltransferases) in the regulation of intestinal lipid absorption. Disruptions in circadian rhythm due to modern lifestyles can deleteriously affect intestinal activity, thus increasing the risk of obesity and associated disorders.

## BOOK REVIEWS

Finally, the emerging role of circulating miRNAs as putative early biomarkers of susceptibility to disease as well as dietary exposures is also explored by Ross and Davis. Recent studies suggest that dietary components can modulate the expression of miRNAs that are associated with diseases such as hypertension, CVD, liver diseases and even cancer. There is also a great deal of speculation that miRNA could influence the gut microbiome, and this is interesting especially since modern high-throughput sequencing technologies are rapidly helping us understand the importance of the gut microbiome in human health and disease<sup>6</sup>. The composition of the gut microbiome can be modified by nutritional interventions, and the role of breast milk oligosaccharides in influencing the neonatal microbiome is elucidated by Smilowitz *et al.* The emerging science of glycomics is revealing how specific human milk oligosaccharides help in the selective enrichment of bifidobacteria in the GI tract of breastfed infants, which promotes intestinal barrier and immunological development and function.

The role of micronutrients in various aspects of health and disease continues to be an area of interest for nutritionists as well as pharmacologists. In this volume, three important micronutrients are discussed. Groves *et al.* have highlighted the alarming increase in global incidence of vitamin D deficiency, and its association with a range of neuropsychiatric and neurodegenerative diseases. This is worrying, especially considering the availability and affordability of vitamin D supplementation, and is something that healthcare work and research should focus on immediately. Iron deficiency anaemia continues to plague the world and is especially an issue during pregnancy. But the inter-relationship between iron and copper is only now emerging. Gulec and Collins have succinctly provided a mechanistic understanding of the iron-copper interplay, especially related to how copper influences iron homeostasis.

Finally, particularly in the context of the recent uproar over the quality and claims of some of the popular food products in the Indian market, the last chapter of this volume by Finley *et al.* appears to be topical, and gives some useful information about the regulatory issues regarding the production and marketing of such products in the US. Rules regarding

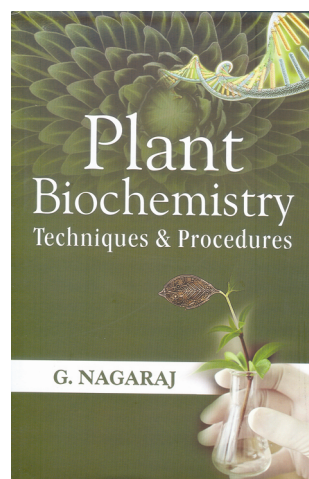
ingredient and nutrient content claims and especially food advertising are clearly delineated, such that the consumer is protected to the maximum extent.

On the whole this volume is an interesting and informative mix of articles that provide sufficient food for thought and plenty of ideas for further research.

1. WHO, Report of a WHO Consultation, Executive Summary, World Health Organization, Geneva, 1997, p. 3.
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3. Bluher, M., *Curr. Opin. Lipidol.*, 2010, **21**, 38–43.
4. Baker, M. S., Li, G., Kohorst, J. J. and Waterland, R. A., *Int. J. Obes. (London)*, 2013; doi:10.1038/ijo.2013.146.
5. Li, G. *et al.*, *Diabetes*, 2013, **62**, 2773–2783.
6. Guinane, C. M. and Cotter, P. D., *Ther. Adv. Gastroenterol.*, 2013, **6**(4), 295–308.

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**Plant Biochemistry: Techniques and Procedures.** G. Nagaraj. New India Publishing Agency, 101, Vikas Surya Plaza, CU Block, LSC Market, Pitam Pura, New Delhi 110 034. 2015. xv + 491 pages. Price: Rs 2700.

Biochemistry amongst the life sciences encompasses a wide range of topics and

effectively makes use of myriad of techniques. Plants serve as the source of food, feed, fibre and a variety of chemicals used in health and food industry. The analytical techniques used in plant biochemistry can be broadly divided into two categories. The first category includes techniques that are used in research to get a better understanding of quantitative and qualitative changes in the biological processes and biochemical compounds occurring in plants. The second category consists of techniques that are involved in routine analysis of a variety of constituents present in plants in the food, agriculture, industrial and pharmaceutical sectors. Although the author of this book does not mention specifically, this book apparently belongs to the latter category. The book is divided in two parts, analytical techniques, and analytical methods and procedures. While the first part provides a superficial description of some of the techniques, the second part is a collection of protocols for the estimation of a variety of biochemicals like carbohydrates, lipids, amino acids, proteins, nucleic acids, vitamins, toxins and anti-nutritional factors. No information has been included on the design of experiments and statistical procedures useful for analytical plant biochemistry. Chapters on several important techniques have been described in just 2–4 pages. In several places, the title of the chapter and the subject discussed in it do not match. The descriptions are often sketchy, full of inaccurate information and faulty language.

The author does not specify any target group of readers; however, in the preface he indicates that this book will be useful to students, researchers and scientists in the plant sciences. While it is true that it is impossible to cover all the areas of plant biochemical techniques in a single book, any book on biochemical techniques to be useful and relevant to students/researchers of today should have included some of the basic techniques employed in molecular biology, genomic and proteomics, like recombinant DNA technology, cloning, expression vectors used to produce proteins, fusion proteins used to purify specific proteins, DNA-protein and protein-protein interactions, etc. None of these modern methods is described in the book.

Further, the book has been written in a completely callous style.