accused of nationalist bias. Therefore, scholars (and others) cannot deny the joint-consensus on any socio-cultural grounds and give their own opinions on Vedic rituals, especially if they lack expertise. The only professional course of action available is to write to Sanskrit scholars seeking clarifications about their contradictory scholarship.

In summary, the book presents an excellent account of the Indus civilization for a general audience. It poses new questions of whether historians' rules of evidence can be used to review it. We show that historians' rules of evidence can be extended to scrutinize works by non-academics that rely on the views of contrarian/isolated scholars. Importantly, without any negative connotations on the author's approach, in 2015, we discussed the changes caused by the rules of evidence that must be included in future studies, especially the joint-consensus on Vedic rituals dates of ~3000 BC and its implications. In particular, scholars can no longer propose the Dravidian hypothesis of Indus civilization without new justifications.

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Annual Review of Nutrition, 2020. Patrick J. Stover and Rudi Balling (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 40. x + 461 pages. Price: US$ 118.00.

The volume under review is an interesting and informative potpourri of recent advances in basic, clinical, public health and therapeutic nutrition. The book begins with a biographical chapter – An accidental nutritionist by Alfred Sommer. It is interesting to note that Sommer's medical training at Harvard, included a formal course in nutrition. Alas, nutrition is no longer a formal course in medical education in India today, leaving our doctors to learn this important subject of nutrition by accident.

Sommer calls himself an accidental nutritionist because his journey began in Bangladesh with 'cholera control, cyclone disaster, smallpox epidemic, and formal training in ophthalmology and epidemiology'. His subsequent meticulous work in the area of blindness prevention led to research in the area of vitamin A deficiency and link between vitamin A deficiency, blindness and mortality. This has led to the WHO recommended vitamin A supplementation programme. While vitamin A deficiency still persists in India, the massive dose supplementation programme in India has become controversial, and recommended only in areas where there is clinical deficiency, regardless of dietary deficiency. This is unfortunate because recent advances show that vitamin A has numerous other genomic roles beyond prevention of night blindness and xerophthalmia.

One such recently researched role of vitamin A and retinoic acid, is in cognition and cognitive disease, discussed by Woloszynowska-Fraser *et al*. Brain actively converts retinol (vitamin A) to retinoic acid (RA). RA activates retinoic acid receptors (RAR). Controlled synthesis of RA in brain helps regulate synaptic plasticity in regions of brain involved in learning and memory. Vitamin A deficiency affects these functions.

Adiposity coupled with cardiovascular and central nervous system diseases are increasing in developed and developing countries. Two reviews discuss the protective role of Omega-3 fatty acid (Ω-3FA) – a PUFA, against these conditions. Ω-3FA have hypotriglyceridaemic and cardioprotective effects. They also moderate between white adipose tissue (WAT) and brown adipose tissue (BAT) and whole-body energy homeostasis and metabolic regulation. Ω-3FA also modulate gut microflora which impact WAT and obesity. Kulpahana *et al*. discuss molecular mechanisms and potential of these fatty acids in weight loss management. Zirpoli *et al.* discuss the novel approaches for Ω-3FA therapeutics, and linked molecular mechanisms in cardiovascular and central nervous system diseases. Among the Ω-3 FA, the long chain ones found in fish oil are more effective. Indian diets are heavily loaded towards 6-FA-linoleic acid as compared to 3-FA-linolenic acid, because most commonly consumed vegetable oils like groundnut, sunflower, sesame are deficient in Ω-3FA. Soybean and mustard oils (to a lesser extent rice bran oil), which are good source of Ω-3FA, are not so popular except in some parts of India. Nuts like walnut and linseed (flax seed) are good source of Ω-3FA.

The cellular homeostasis by nutrients is at various levels. Two such control points are discussed in chapters – Nutrient control of mRNA translation (Shu *et al.*) and Roles of regulatory RNAs in nutritional control (Mcneill and Hirschi). The first review describes recent advances in translational control through nutrient sensing mechanisms and the dysregulation involved in diseases such as diabetes, cancer and ageing. Small RNAs including micro RNAs (miRNA)

are non-coding RNAs (ncRNA) involved in gene regulation. The second review discusses the mechanisms by which diet impacts metabolic genes through miRNA. Since foods contain ncRNA, foods may impact gene expression through these RNA. Evidence at present is weak.

Dietary guidelines (dietary reference intakes) have been formulated for nutrients to suggest minimum nutrient requirement which would prevent nutrient deficiencies, maintain growth, development and health. These have to be adjusted in conditions of stress. Passiakos has reviewed the dietary adjustments needed during exposure to the extreme environment – high altitude, heat or cold stress, etc. There is experimental and demographic (a community in Japan) evidence to suggest that calorie restriction (CR) can slowdown ageing and increase life span. Such reduction in calories should be associated with appropriate diet to ensure adequate intake of all the nutrients, and physical activity, particularly in the aged to ensure muscle tone. Flanagan *et al.* summarize the evidence for CR to modify primary (internal inevitable factors) and secondary (external behavioural factors) of ageing. Intermittent fasting is yet another strategy.

Increased life expectancy is also associated with higher levels of polyamines (PA), particularly spermidine in blood. Maedo *et al.* have summarized the preclinical and clinical studies that reveal the role of dietary PA, in human nutrition. Spermidine among the PA plays an important role in different physiological and disease-associated conditions. There is cross talk between PA and gut microbiota. While microbiota can synthesize PA, dietary PA increase the microbiota. Plant foods, particularly fermented foods and cheese are good sources of polyamines.

Besides genes, human metabolism and immunity is controlled by the microorganisms residing in the body, especially in the gut. Fiers *et al*. have discussed the subject of fungal microbiota in nutrition and metabolic health from birth. The fungi can act directly or by influencing the bacterial biota, or through toxins produced on infected food, e.g. aflatoxin. Diet has strong influence on mycobiota. Fermented foods rich in prebiotics (healthy microbiota) are important part of Indian diets.

Nutrition regulation of innate immune system – nonspecific defence mechanisms that come into play immediately or within hours of an antigen's appearance, has been reviewed by Nobs *et al*. This regulation is partly signalled through gut microbiota. Interaction between innate immunity and diet influences metabolic health and disease including diseases such as autoimmune disorders, cancers, allergies, and infections perhaps including COVID-19 (not specifically mentioned in the article). Recent studies (not reviewed) suggest that supplementation with probiotics and micronutrients like zinc, vitamins D and C tend to boost innate immunity against COVID-19.

Though a balanced diet with adequate intake of micronutrients – dense, vegetables and fruits and health-promoting phytochemicals – is known to prevent diseases including cancer, the exact role of foods and nutrients in the management of different cancers is still a grey area. It may vary with the type of cancer and also individual. The role of diet in cancer prevention and chemotherapy based on animal studies and human trials has been discussed by Muittelman.

Intestinal adaptation to nutrition plays an important role in short bowel syndrome, a rare disease, in which there is extensive resection of the intestine. Spontaneous intestinal adaptation – hyperphagia occurs weeks or months after parenteral feeding. Beyec *et al*. have summarized the mechanisms involved in such adaptation, particularly in the modification of luminal content, including nutrients.

Two reviews discuss issues of dietary concern in the US: (i) Inadequate consumption of water due to preference for sugar sweetened beverages (Patel *et al*.) and (ii) Excess sodium intake due to high salt content of processed and packaged foods and foods served in restaurants (Musicus *et al.*). Both have adverse health implications. Attempt is being made to increase access to safe drinking water. Leadership, legislation and education are needed to curtail salt intake, and consumption of sugar-sweetened beverages in preference to safe water.

The dual burden of persisting undernutrition with emerging obesity despite credible reduction in maternal and child mortality seen in developing countries is worrisome. The children who survive must also thrive – physically and mentally without any discrimination. The road map of integrating nutrition with strategies of early childhood development is discussed by Maureen *et al*. The challenges posed by anthropometric undernutrition – stunting and micronutrient deficiencies (very common in India), are also described.

The book concludes with a chapter on the lasting impact of White House Conference 1969, on food nutrition and health. The conference led to recommendations, followed by federal legislation, and programmes to 'alleviate hunger and malnutrition, improve consumers' nutrition knowledge, through education and labelling and monitor the nutrition status of the population'. While there was no other White House conference, fifty years later Harvard University and Tufts University revisited its legacy.

The COVID-19 pandemic has thrown up new challenges, particularly to the developing countries, in the area of health, nutrition, and development, with equity. Ignoring these would be inviting disaster.

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