

# Preface

*Modern Dietary Fat Intakes in Disease Promotion* is the follow-up book to the original one published in 2008 under the running title *Wild-Type Food in Health Promotion and Disease Prevention: The Columbus Concept*, 2008 Humana Press Inc, ISBN 978-1-58829-668-9, E-ISBN 978-1-59745-330-1. It shifts focus from examining the beneficial effects of dietary fat intake to targeting the disease-promoting aspects of fat in the human diet.

A review of both disease promotion and disease prevention reveals many diet–health relationships and paradoxes reported regularly in the scientific literature. Perhaps the most frequently neglected family of *essential* nutrients in contemporary diets is polyunsaturated fatty acids or PUFAs. Their two subgroups omega-6 and omega-3 compete against each other for substrates, intermediaries, and end products in many biological pathways involved in physiological inflammatory processes. A consensus is growing in the modern scientific community about their public health burden through the promotion of chronic degenerative diseases whose incidences and severity continue to increase. Recent attempts at increasing dietary omega-3 fatty acids in foods to reduce disease have met with limited enthusiasm and acceptance by producers, retailers, and consumers—essentially due to the oxidative instability of these acids. Simultaneously, there is a return to plant and animal foods that reflect the wild standard—in other words, which include healthy omega-6/3 fatty acids with an  $\omega 6:\omega 3$  PUFA ratio of 1:1 and/or a 25% proportion of  $\omega 6$  highly unsaturated fatty acids (HUFAs). The goal is to have more balance in blood serum/plasma total lipids in association with a balanced mixture of naturally occurring antioxidant vitamins and minerals. This is the basis of the Columbus Concept, referred to as a new standard in lipid nutrition; it implies a reduction in the relative contribution of omega-6 fatty acids and favors an absolute increase in the contribution of omega-3 fatty acids to the modern dietary pattern.

*Modern Dietary Fat Intakes in Disease Promotion* was a challenging but critical book to edit and publish, as the twentieth century has seen food become readily available due to remarkable advances in agricultural and food-processing technologies. There are both benefits and adverse health consequences to removing cholesterol and omega-3 fats from natural foods, hydrogenating PUFAs from vegetable and fish oils/fats by chemical means, designing high-fat/carbohydrate empty-calorie diets, and spreading around non-biodegradable agrochemicals and pesticides. Such practices today appear to belong to a regrettable era of (1) free-market excitement, probably fueled by a lack of humility in recognizing the historical importance of humanity's adjustment to wild-type foods, and (2) over-confidence in scientific knowledge. Now, at the beginning of the twenty-first century, we have learned from the *cholesterol craze* that nature-designed foods may not need to be altered to improve their beneficial health effects, save perhaps in subgroups of the world population that are genetically predisposed to specific diseases and for whom a

nutrigenetic/genomic approach is more appropriate. Therefore, the twenty-first century appears to be focusing on nutritional sciences based on wisdom and the following basic principles:

1. Appropriate balanced intake of *essential* nutrients.
2. Energy intake = energy expenditure.
3. Whole foods and/or least-processed foods including the following:
  - a. Non-chemically hydrogenated saturated and mono-unsaturated fats for cooking.
  - b. Cold-pressed, non-refined, antioxidant-rich polyunsaturated oils for dressing.
  - c. Extracted, refined, antioxidant-rich highly unsaturated oils for supplementing.

*Modern Dietary Fat Intakes in Disease Promotion* calls for a three-level grasp of the feed–food–fork value chain that includes the following reviewed critical aspects:

1. Behavior: social, cultural, economic, and educational aspects.
2. Composition: fat/protein, triglycerides/phospholipids, and omega-6/-3 ratios.
3. Contamination: peroxides, agrochemicals, and microorganisms.

## **Volume Contents**

The first chapters include discussions of the behavioral aspects of eating. Wilczyńska-Kwiatk, De Meester, Singh, and Łapiński review nutrition as modified by behavior on brain function. They point out that the high-carbohydrate diets promoted by Western food guidelines are associated with clinical manifestations of affective disorders leading to depression. This disease is ranked by WHO as the leading degenerative disease in developed countries. A parallel is made between the increased intake of carbohydrate-rich, refined, grain-based fast foods and lower proportional intake of essential nutrients including omega-3 fats, antioxidant vitamins, and minerals. This observation led the authors to review the effects of dietary essential nutrients, primarily omega-3 fatty acids, on psychological function and mental health. The authors found strong evidence that EPA (eicosapentaenoic acid, C20:5 $\omega$ 3) is a promising dietary supplement for the prevention of mental decay in *healthy* individuals. Puri adds two papers on the potential role of modern lifestyles in myalgic encephalomyelitis and attention-deficit hyperactivity disorder. He shows how a deficiency of and/or imbalance between omega-6 and omega-3 at the tissue level—caused by Western diets and environmental (viral infection, organophosphate) factors—could lead to the rising prevalence of neuron-degenerative diseases in the Western world. Puri concludes that a change in diet should be considered by physicians prior to prescribing a synthetic drug to children and adults newly diagnosed with such disorders. Going and Hingle review data that correlate the health effects of diet and exercise. They define the beneficial influences of regular-to-moderate physical activity and moderate energy-dense, nutrient-rich diets to help control weight and regulate metabolism. O'Hara and Gregg emphasize that focusing health recommendations *only* on body weight (the weight-centered health paradigm) may not be health promoting. First, it is ineffective as a means to improving health or controlling body weight, and second, the attitudes, behaviors, and practices arising from such a paradigm are harmful to health and well-being. In particular, this paradigm is associated with dissatisfaction, dieting,

discrimination, and death. Dokken and Boucher test the hypothesis that excessive caloric intake of any kind versus any specific dietary components, including fats, explains the strong relationship between obesity associated with insulin resistance and type 2 diabetes. Dube and Stanton report on the social context of dietary behavior. They suggest that a multi-faceted approach targeting the home-cooking role model, increasing the availability of fruits and vegetables, and decreasing the availability of snacks is necessary to encourage lifetime healthy dietary practices in children and adults, lower the burden on health-care systems, and to reduce health disparities. Bartholomew and Jowers review strategies for modifying school-based foods and conclude that restricting access to calorie-dense foods by manipulating the price structures of their healthy counterparts (i.e., salad bars versus snack foods) has great potential for success. Singh, Rastogi, Goyal, Vajpayee, Fedacko, Pella, and De Meester review data suggesting that populations of developing countries are more sensitive to modern chronic diseases of affluence than are those of developed countries, suggesting a maladaptive process in the latter. They cite data showing that southeast Asians suffer more diabetes and coronary artery disease than do Caucasians, especially at younger ages, whereas their fat intake is less than 25% and obtained from plant rather than animal food. Vaghefi, Watkins, and Brown define how modern Western low-cost and time-saving diets are finding their ways throughout the planet through economic development and technological progress. The high fat content and the low nutritional value of such diets are discussed from the standpoint of their contribution to promoting diseases globally.

There are important chapters that review the composition of fats, oils, and other constituents in the diet. Vituru and Gormley explain how the oil-seed industry resulted from the ability to hydrogenate oil produced by extraction from seeds. This generalized processing of plant fats thereafter led to the appearance of *trans*-unsaturated fats and the disappearance of  $\omega$ 3 fats in the twentieth-century diet, a double trend that mirrors the dramatic global increase in modern degenerative diseases. Crawford, Lehane, and Ghebremeskel revisit health effects as modified by dietary animal fat. Feeding intensively reared, domesticated animals with growth-promoting oil grains has facilitated artificially fat animals presenting high fat/protein and increased omega-6/3 and triglyceride/phospholipid ratios in their carcasses. Using such animals as food has little in common with using wild animals or game historically as food—and is a possible modulator of human physiology from an evolutionary standpoint. Surai, Pappas, Karadas, Papazyan, and Fisinin point out that modern, land-based agriculture has washed essential micronutrients away from the food supply. Their review focuses on the removal of selenium as a striking example of a lost essential mineral in plants due to low soil pH and high concentrations of sulfur and phosphorus from the massive use of fertilizer. Enrichment of chickens, cattle, and pig feed with selenomethionine appears to be a sustainable transitory solution to the problem until soil composition can be restored, which is appropriate to animal/man feeding requirements. Sabetisoofyani, Larson, and Watson address the primary role of homocysteine in the inception and progression of endothelial dysfunction with accelerated atherosclerosis from both a dietary perspective (a deficiency in essential B vitamins) and a genomic perspective (mutations in cystathione  $\beta$ -synthase or 5,10-methylenetetrahydrofolate reductase). Ravnskov's review summarizes much of his lifetime effort at re-establishing the facts behind lipid nutrition. He concludes that cholesterol and saturated fats are not primary risk factors of cardiovascular disease, claiming that both the market place and limited understanding of research on fats and cholesterol have helped encourage previous misconceptions about cholesterol and heart disease. Ravnskov calls for an urgent revision of modern dietary guidelines based on a more educated approach to dietary lipids.

Jahreis and Hengst provide evidence that dietary fats do not represent a health issue per se. They suggest that fats obtained from ruminants fed grass-type, omega-3-rich fodder promote positive effects on established risk factors of CVD. Jacques, Leblanc, and Bergeron review the different options available to the dairy industry for increasing the understanding of both scientists and the lay public about the health roles of certain fats, particularly in terms of the many misconceptions about cholesterol and saturated fats. Modifications of milk-fat composition through cow feeding, enzymatic inter-esterification, and physical fractionation appear to be among the most promising options. De Lorgeril corroborates Ravnskov's review by summarizing recent cholesterol-lowering (absorption, synthesis) trials. He concludes with a similar recommendation that medical (in addition to food) guidelines should be carefully re-examined. He describes how reducing blood cholesterol increases atherosclerotic progression as measured by changes in carotid intima-media thickness. Sharma, Singh, and Katz explain the role of statins in modern and modernizing societies where blood cholesterol and triglyceride lowering has become a health-care priority, notwithstanding the potential side effects of such a preventive approach in what they refer to as *cardiovascular incapability*. Careful selection as to statin types and dosage appears to minimize their side effects on hepatic and renal functions, muscular impairments, and other physical properties while providing sought-after preventive benefits. Vasanthi, Kartal-Özer, Azzi, and Das summarize the recent literature on the efficacy and mechanisms of popular cholesterol-lowering dietary supplements. Zibadi, Larson, and Watson explore how obesity induces *maladaptive remodeling* of the cardiac muscle through alterations in myocyte shape and number and the extracellular matrix, resulting in cardiac hypertrophy and fibrosis. Leptin, an adipokine overproduced in obesity, appears to play a major role in the remodeling process and therefore to provide an avenue of treating obesity and other hyperleptinemic-related cardiac dysfunctions. Cordova et al. present the genetically modified rodent animal models that are developed to test the *maladaptive remodeling* hypothesis in the human obesity, cardiac structural, and functional changes relationship. Togni presents the *non-deficiency malnutrition syndrome* that results from the characteristic load of empty calories in advanced Western diets. In this context, he shows that plant extracts including polyphenols may be recommended as dietary supplements. Kelley, Hubbard, and Erickson review the currently available literature on the influence of conjugated linoleic acid (CLA) isomers on human body composition and tumorigenesis. They conclude that at present it is too early for CLA to be labeled as a health-promoting dietary supplement. Vemuri and Kelley warn that t10,c12-CLA may cause lipodystrophy, insulin resistance, non-alcoholic fatty liver disease, fat mass, and increased body weight in animals and humans.

A unique feature of this volume is the extensive information pertaining to major sources of food contaminants. Surai and Fisinin describe how food processing can affect dietary lipids and eventually promote ill-health effects when not protected from peroxidation. They emphasize the need for improving the conditions of food processing, storage, and cooking at a time when fat hydrogenation is increasingly perceived as detrimental to foods. Surai, Mezes, Fotina, and Denev report on the global endemic contamination of the feed–food–fork chain by fungal metabolites: mycotoxins. These food contaminants have detrimental biological effects on both animal and human health through their organ toxicity, including immunomodulation, neurotoxicity, mutagenicity, carcinogenicity, and teratogenicity. As 25% of the current world crop production is potentially contaminated, it is essential to find sustainable solutions to this fungal-persistent presence in the animal and human food chain. Sioen, De Henauw, and Van Camp review a conflict of interest in establishing dietary recommendations for fish as a source of long-chain,  $\omega$ 3 fatty acids. Modern agro-food and environmental practices translate into loading oceans with all kinds

of persistent and potentially toxic residues that accumulate in fish, in particular fish fats. Their statistical evaluation proposes a balance that can be approached in terms of nutritional benefits versus toxicological aspects of fish consumption. Covaci and Dirtu extend this discussion to naturally produced, organo-brominated compounds from marine micro-organisms present in fish and fish fats. Their review presents evidence that refined fish-oil dietary supplements might be a suitable alternative to fish consumption.

The Columbus Concept, defined by this book and the previous one, still has a long way to go to establish itself in the market place. The way lipid standards are taught and implemented in dietary and medical practices within culinary and medical schools, agro-food and pharmaceutical industries, and legislatures has to be changed. In the balance, the burden and cost of chronic diseases on both modern and modernizing societies is exploding, and currently there is no single critical environmental factor identified other than a dietary omega-6/3 PUFA imbalance.

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