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Functional Foods and Nutraceuticals

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General Introduction

History: It is an established fact that foods provide nutrients that nourish our body and keep our system in proper working conditions. However, from early civilization it was also known that certain foods confer additional health benefits to human beings such as prevention and treatment of various types of diseases. "Let food be thy medicine and let your medicine be your food" is a popular quote from Hippocrates (460–370 BC) that emphasizes the role of foods in disease prevention and recognizes a separate role for food in addition to being nutrient providers. Recently, scientists have become focused on the health-promoting effects of foods and there is now abundance evidence that support the role of various foods and their components in promoting human health. In 1989 the word "nutraceutical," a blend of "nutrition" and "pharmaceutical" was coined by Dr. Stephen De Felice, a physician who founded the Foundation for Innovation in Medicine, USA. At the time, Dr. De Felice defined "nutraceutical" as "any food or parts of a food that provides medical or health benefits, including the prevention and treatment of diseases". Since this initial definition, the term "functional foods" has also been added to link consumption of certain foods or food products with disease prevention and improved health benefits. Development and regulatory oversight of functional foods began in earnest in Japan in the early eighties with advances in chemical identification of bioactive compounds, processing and formulation of foods as well as elucidation of molecular mechanisms involved in the modulation of metabolic disorders. The initial regulatory environment for functional foods was established by Japan in 1991 with the introduction of "foods for specified health use" (FOSHU) policy that enabled production and marketing of health-promoting foods. Since 1991 over 600 FOSHU products are now available in the Japanese market. The initiative in Japan has spurred a rapid growth in the global functional foods market especially in the USA, European Union, and Canada, all of which now have various regulatory bodies to govern the manufacture and marketing of health-promoting food products. The availability of regional regulatory bodies has spurred intense global research and development aimed at identifying new bioactive compounds that could be used to formulate functional foods and nutraceuticals. While the potential therapeutic activities of several compounds have been reported, there is still paucity of information regarding the molecular mechanisms of action. Most of what is known about the role of bioactive natural compounds in human health has arisen mainly from in vitro and animal experiments, though human intervention trials are also occurring.

Definitions: These health-promoting foods or compounds are generally classified into two major categories: (1) Functional foods are in fact products that may look like or be a conventional food and be consumed as part of a usual diet, but apart from supplying nutrients they can reduce the risk of chronic diseases such as cancer, hypertension, kidney malfunction, etc. A typical example of a functional food is tomato fruit which is packed with a specific type of compound that helps to remove toxic compounds from our body and thereby prevent damage to essential organs like the heart, kidney, lungs, brain, etc. Other typical examples of functional foods include soybean, fish, oat meal, cereal bran (wheat, rice), and tea (green and black). Apart from traditional foods, there are also functional foods that are produced through food processing such as the antihypertensive sour milk that has been shown to reduce blood pressure in human beings. (2) Nutraceuticals are health-promoting compounds or products that have been isolated or purified from food sources and they are generally sold in a medicinal (usually pill) form. A good example is a group of compounds called isoflavones that are isolated from soybean seeds and packaged into pills that women can use instead of synthetic compounds during hormone replacement therapy. Other examples of nutraceutical products include fish oil capsules, herb extracts, glucosamine and chondroitin sulfate pills, lutein-containing multivitamin tablets, and antihypertensive pills that contain fish protein-derived peptides.

The content of this book has been organized based on two main sections; the first describes the bioactive properties of major nutrients (carbohydrates, proteins, lipids, and polyphenols) while the second discusses the role of major food types (soybean, fish, milk, fruits, and vegetables, and miscellaneous foods) in health promotion. It is hoped that users of this book will benefit from information provided on the potential mechanisms that have been proposed for the bioactivity of various foods and their components.

Contents

Part I

Nutrient Components of Foods