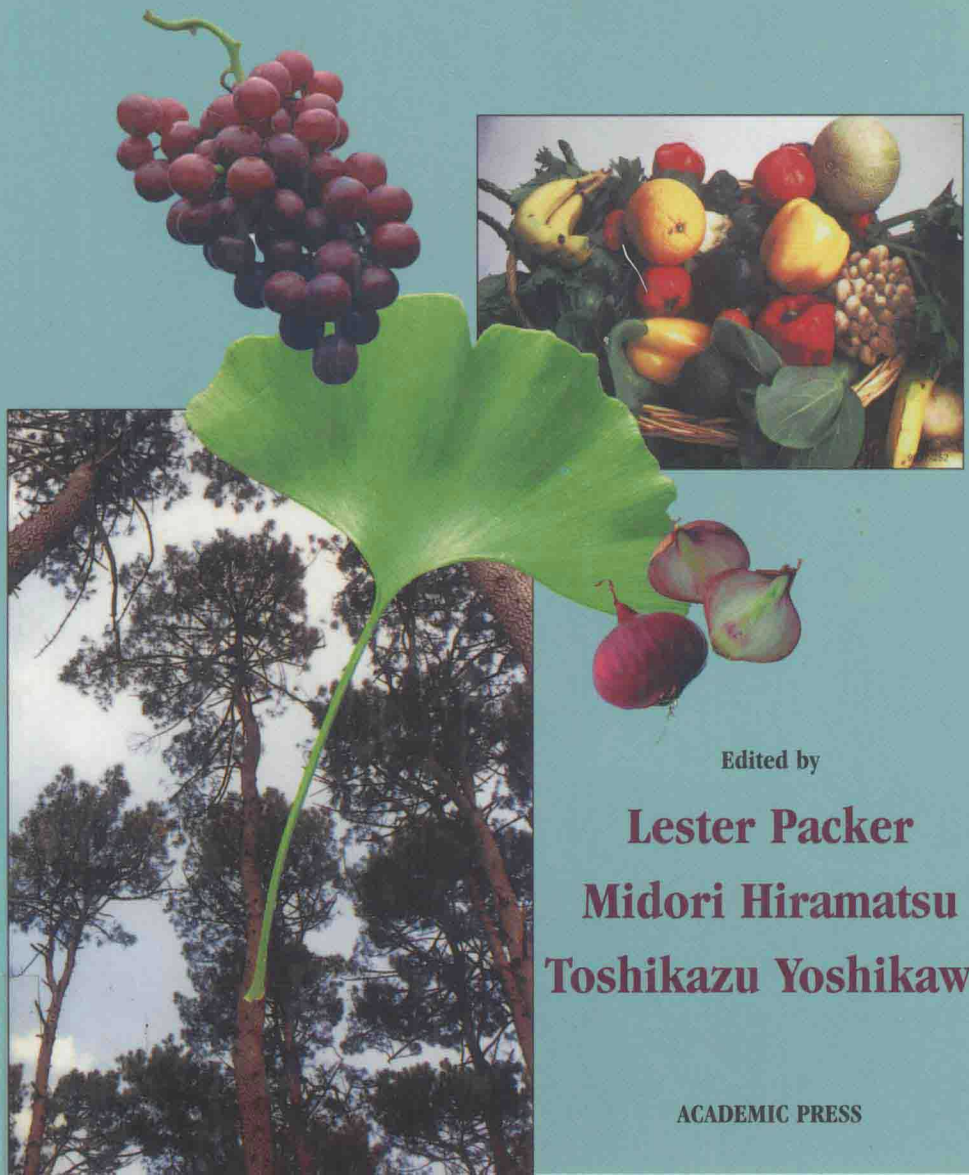
Antioxidant Food Supplements in Human Health



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Front cover illustrations: The tree: French Maritime Pine tree: the source of Pycnogenol; the leaf: from the Gingko biloba tree: the source of EGb 761 extract; fruits and vegetables: richest source of many of nature's antioxidant substances; grapes: starting source for red wine production; rich in antioxidants; onions: rich source of the bioflavonoid quercetin.

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Preface

There has been increasing interest in recent years in healthy life styles and healthy aging; correspondingly, interest in antioxidants and food supplements has grown remarkably. However, it has only been relatively recently that basic science has matched this interest with research. The development of technologies for the study of free radicals and antioxidants has led to many new discoveries in the areas of oxygen and nitric oxide metabolism and pathophysiology, redox regulation of cell signaling, and in the identification of natural antioxidants and their mechanisms of action on free radicals and their role in health and disease.

This volume presents some of the results of this exciting new research. Contributions focus on two main areas: nutrient antioxidants (antioxidants that are either vitamins or commonly found in the diet) and natural source antioxidants (extracts and other products from various sources that are rich in a wide range of antioxidants).

Some nutrient antioxidants are essential: these include vitamins E and C and selenium. Vitamin E is perhaps the most well known of the nutrient antioxidants and was one of the first antioxidants for which epidemiological evidence indicated that health affects accrued when it was consumed in amounts greater than could be found in the diet (e.g., in protection against heart disease). Contributions to this volume examine the role of vitamin E

in lung cancer prevention, the interaction between vitamins E and C, and the differing biological activities of the eight different forms of vitamin E (four tocopherols and four tocotrienols). In addition, selenium, an essential mineral found to be beneficial in supplemental amounts in the prevention of cancer, is examined for its role in selenoproteins, which reduce peroxynitrites, and in peroxidases in mammalian testis.

Other nutrient antioxidants, while not essential, are endogenous cellular components and are coming under increasing scrutiny as they offer numerous health benefits. α-Lipoic acid, found in α-ketoglutarate dehydrogenases, has been shown in numerous studies to have potent antioxidant function and potential in the prevention and therapy of numerous diseases, including diabetes. It is discussed here in relation to its role in the regulation of cell function, its natural sources, and the assay of protein-bound forms. Another antioxidant that is a natural cell component is coenzyme Q. The reduced form, ubiquinol, can react with nitric oxide; in addition, because coenzyme Q can cycle between reduced and oxidized (ubiquinone) forms, its redox cycle is examined for its antioxidant role.

Carotenoids and flavonoids represent a final class of nutrient antioxidants. Both of these groups of compounds contain hundreds of members and thus present a rich and complex area for antioxidant research (as well as the potential for seemingly conflicting results, as recent clinical trials with β-carotene have made clear). An overview of the carotenoids as well as their role in the prevention of cancer, are presented. Flavonoids are discussed in relation to methods for screening their antioxidant activity, their metabolic conversion and its effect on their antioxidant activity against lipid peroxidation, and their interaction with physiologic antioxidants.

Natural source antioxidants, comprising extracts, herbs, and other products, represent a vast and still little-studied area. These products can contain a bewildering array of compounds. Two of the most highly standardized and defined extracts are those of *Ginkgo biloba* (Egb 761) and pine bark (Pycnogenol). Contributions examine both Egb 761 and Pycnogenol for their broad array of antioxidant effects, as well as specifically reporting their effects on nitric oxide metabolism. Two of the most well-known "extracts" have been used as beverages since ancient times—wine and tea. Both are rich in polyphenols and both are discussed in terms of their health benefits. Tea is also discussed, particularly with reference to its effects on cardiovascular disease and on oral hygiene. Polyphenols are also found in various herbs and act as antioxidants, as discussed by Takuo Okuda, and mixed Japanese herbs are examined for their effects on age-related neuronal functions. Finally oyster extract, uyaku (a natural extract used in traditional medicine), and the fermentation product of *Carica pa-*

paya (Bio-Normalizer) are discussed in terms of their antioxidant properties and biological effects.

People everywhere have started to think more about health issues and have taken an interest in antioxidant food supplements. This book is the result of a symposium prompted by such interest: "Antioxidant Food Supplements in Human Health," held in Kaminoyama-city, Japan, October 12–16, 1997. The organizers are grateful to the sponsors and supporters of the symposium. Sponsors included the Society for Free Radical Research Asia, the Oxygen Club of California, and the UNESCO–MCBN (Global Network for Molecular and Cell Biology). Organizations supporting the symposium included A.O.A. Japan Co., Ltd., Kobe, Japan; Arsoa Ohsoa Corporation, Tokyo, Japan; ARZ Co., Ltd., Nara, Japan; BIO CORPORATION Inc., Kumamoto, Japan; Dainippon Pharmaceutical Co., Ltd., Tokyo, Japan; Daiwa Biological Research Institute, Kawasaki, Japan; Fujimi-Yohoen Co., Ltd. Saitama, Japan; Funakoshi Co., Ltd., Tokyo, Japan; Golden Neo-Life Diamite International, CA: Japan Clinic Company Ltd., Kyoto, Japan; Kenko Commerce & Co., Ltd., Tokyo, Japan; Medical Industries Co., Tokyo, Japan; Mitsui Nohrin Co., Ltd., Fujieda, Shizuoka, Japan; Nakachuou Hospital, Ibaragi, Japan; Osato Research Foundation, Inc., Gifu, Japan; Sanmei Co., Ltd., Miyagi, Japan; Sapporokousetsu Hospital, Sapporo, Japan; Saido Co., Ltd., Fukuoka, Japan; Sky Food Co., Ltd., Osaka, Japan; Sunstar Inc., Osaka, Japan; Suntory Limited, Osaka, Japan; the Shingu Hsu-Fu Association, Shingu, Wakayama, Japan; Tradepia Corporation, Saitama, Japan; Veritas Co., Tokyo, Japan; Wellness World Co., Ltd., Akita, Japan; Yamanouchi Pharmaceutical Co., Ltd., Tokyo, Japan; Yamagata Wine Association, Kaminoyama, Yamagata, Japan; and Zeria Pharmaceutical Co., Ltd., Tokyo, Japan.

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