

Functional Food Carbohydrates

Edited by

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Preface

Carbohydrates present in food products may vary from small simple sugars to very complex polysaccharides such as those found in plant cell walls. Advances in structural characterization and determination of the physicochemical properties of carbohydrates over the last two decades have unraveled their structural diversity and offered fundamental knowledge, which aids in understanding and predicting functionality as it relates to their end-use applications (e.g., thickening, gelling behavior). As a result, food technologists have concentrated with considerable success on the development and production of a wide range of palatable and marketable food products, using carbohydrates as functional ingredients to modify the appearance, taste, mouth feel, solubility–dispersibility, and stability of such systems. However, until recently, much less attention has been given to the physiological impact and health benefits carbohydrates could have in humans and to the relationship between these nutritional aspects and the chemical constitution and physical properties of the carbohydrate source.

With a rapidly growing international interest and activity in the area of functional foods and nutraceuticals, there is a need to provide a critical overview of the beneficial nonnutritive effects that the various food constituents have on human health. Among them, carbohydrates, which form the bulk of all food consumed by humans, seem to play a central role, showing functional versatility from both a technological and a nutritional viewpoint. For example, research linking the consumption of complex nonstarch polysaccharides with a reduced risk of chronic diseases (including diabetes, cardiovascular diseases, and cancers) is well documented in the literature and has been passed on to consumers with nutritional recommendations to increase their daily dietary fiber intake. Another interesting example to mention is the ability of nonadsorbable carbohydrates, such as fructans (inulin) and fructooligosaccharides, to improve colonic function and stimulate the selective proliferation of beneficial bacteria such as *Bifidobacteria*, which are immunomodulators and can suppress growth of potentially harmful anaerobes in the digestive tract; the potential importance of the changes in colonic function led to the term *prebiotic*.

However, as science begins to uncover some of the physiological roles of carbohydrates, it becomes clear that any dietary recommendations about these constituents should be based on a synthesis of epidemiological, metabolic, animal, and other clinical nutrition data. It also becomes evident that the various physiological effects could be rather specific to certain types of carbohydrates; i.e., biotransformations and functions (physiological and technological) are related to the molecular features–properties of the carbohydrates. In this respect, there is an increased demand to summarize literature information in this rapidly evolving field.

The aim of this book is to address, through clinical and epidemiological evidence, the specific classes of carbohydrates in foods that seem to exert health-enhancing effects, and to discuss the physiological and metabolic roles that different carbohydrates have on disease prevention and management, by focusing attention on certain chronic diseases such as cancer, cardiovascular diseases, diabetes, osteoporosis, various gastrointestinal disorders, etc. The book should be useful to food and nutrition students and scientists, health professionals, and all those who work in the food industry and use carbohydrates as functional ingredients in food formulations and new product development. It aims to cover in a more comprehensive manner a broad range of physiologically active carbohydrate compounds and attempts to provide information on the chemistry, physical properties, processing effects, production, and physiological function of these constituents, by summarizing older literature and the more recent findings, particularly as they have evolved with the development of functional foods and bioactive ingredients as an emerging new science. An attempt was also made to focus on the links between the physicochemical properties and processing of carbohydrates with the health benefits resulting from their regular consumption by humans. Overall, it has been our intention to integrate in this volume the views from authors specializing in the areas of food chemistry and processing, as well as of human nutrition and physiology, in the emerging field of functional foods and nutraceuticals.

Editors

Dr. Costas G. Biliaderis is a professor of the Department of Food Science and Technology, Aristotle University, Thessaloniki, Greece. He received his M.Sc. (1978) and Ph.D. (1980) degrees from the University of Saskatchewan, Canada, and he has held appointments as a research associate with the National Research Council of Canada (1980 to 1981), a project chemist with General Foods, Inc. (1984 to 1985), and an associate professor with the University of Manitoba, Canada (1985 to 1993). An adjunct professor with the University of Guelph, Canada, and a former member of the editorial board of *Carbohydrate Polymers*, Dr. Biliaderis is the author and co-author of numerous journal articles and book chapters in the broad area of physical chemistry of food systems, with a focus on the structure–function relationships of food carbohydrates. His current research interests include the chemistry and physical chemistry of polymeric food carbohydrates (plant and microbial origin), thermal analysis of food constituents, thermophysical properties of polysaccharide blends, and the processing and storage effects on texture and stability of food products and their constituents. Dr. Biliaderis was named a highly cited researcher by ISI-Thomson Scientific (2003) and received several awards for his achievements in research, teaching, and scholarly works.

Dr. Marta S. Izydorczyk is currently a research scientist and program manager of Basic Barley Research at the Grain Research Laboratory, Canadian Grain Commission (CGC), and an adjunct professor at the Department of Food Science, University of Manitoba. She is an active member of the American Association of Cereal Chemists (AACC) International, a member of the AACC Scientific Advisory Panel, and a member of the organizing committee of the 2006 World Grains Summit: Foods and Beverages in San Francisco, U.S. She sits on the editorial board of *Cereal Chemistry*. Dr. Izydorczyk is also a member of the North America Buckwheat Promotional Committee.

Dr. Izydorczyk's areas of expertise are in the molecular structure and physico-chemical properties of starch and nonstarch polysaccharides, their chemical and enzymatic modification, and their interactions with proteins, lipids, and other components of cereal grains. Her barley research program is focused on the chemistry and biochemistry of malting barley. Primary objectives are to identify, explain, and clarify the genetic and environmental factors, and the molecular mechanisms that are responsible for the functionality and performance of barley components during malting and brewing. The program also places emphasis on the structure and functional properties of carbohydrate components, e.g., starch, nonstarch polysaccharides, and dietary fiber from barley, and from other economically important prairie grains.

Dr. Izydorczyk holds a bachelor's degree from the Ryerson Polytechnical University in Toronto, a master's degree in food science, and a Ph.D. in food and nutritional sciences from the University of Manitoba.

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