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Mediterranean Diet

Dietary Guidelines and Impact on Health and Disease

Humana Press

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Adrianne Bendich, Ph.D., FACN, FASN, Series Editor

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This volume is dedicated to the memories of John Milner, Ph.D., and Mary Frances Picciano, Ph.D., international leaders in nutrition research, who were friends, mentors, coeditors, and inspirational figures to the editors of this volume.

Foreword

The human diet is complex and ever changing (1). We eat hundreds of individual foods, in thousands of wide-ranging combinations, which we prepare and serve using a diverse array of methods, according to markedly different cultural norms (2). To study the effect of diet on human health, nutrition scientists have attempted to isolate the diet's myriad components, individually and in small groups, to examine what effect, if any, they exert on the body. These studies have led to the suggestion that whole foods may have unique effects on health than individual components (3).

Over the past century, nutrition researchers have made many vital, life-saving advances. The discovery of vitamins in the early twentieth century brought about effective treatments for the deficiency diseases, rickets, beriberi, and scurvy. The 1980s and 1990s saw keen interest in naturally occurring plant substances called phytochemicals that display a wide range of health-promoting, disease-fighting potential (4–20).

But these piecemeal advances have bred a piecemeal understanding in the public's mind. Findings on individual dietary components have indirectly led to the demonization of various nutrients and macronutrients, with damaging effects: health fads that promote the near elimination of carbohydrates or that hold up protein as a panacea (21–35). In response to consumer demand, the food industry floods grocery shelves with low-fat potato chips and cookies. And through it all, the slow, steady ballooning of portion sizes, as well as our waistlines, has proceeded apace (36–38).

As our research methods continue to evolve, and our knowledge expands, it's becoming clear that the big picture is what matters most. Recent studies suggest that our usual patterns of dietary intake and physical activity are more important to wellness than our historically narrow focus on consumption of a few individual foods or nutrients can show (39–48). If we are to move the science forward, it's clear that we must take a step back and examine overall patterns of eating and of living.

As Data Mounts, Recommendations Evolve

At the American Institute for Cancer Research (AICR), we've had a front-row seat at the steady accretion of new insights and understanding as the evidence linking diet, physical activity, and weight to cancer risk has grown. This mounting evidence has occasioned a shift in focus from individual nutrients and phytochemicals to overall dietary patterns. In 1981, the first scientific reports to evaluate the evidence linking various dietary components to cancer risk were published. Importantly, both *The Causes of Cancer* by Richard Doll and Richard Peto (1981) (49) and the *US National Academy of Sciences Report Diet, Nutrition and Cancer* (1982) (50) concluded by issuing urgent calls for more and better research, and by the mid-1990s thousands of studies had been published on diet and cancer.

To evaluate and synthesize these new studies, in 1997 AICR and the World Cancer Research Fund published an expert report, *Food, Nutrition, and the Prevention of Cancer: A Global Perspective* (51). The report presented our recommendations for cancer prevention, which reflected the then-current state of the science. By 2007 the sheer amount of new evidence demanded that AICR/WCRF produce a second expert report, *Food, Nutrition, Physical Activity, and the Prevention of Cancer: A Global Perspective* (52), and by now physical activity was rightfully acknowledged as an important component of a healthy lifestyle. The report's recommendations were as follows:

1. Be as lean as possible without becoming underweight.
2. Be physically active for at least 30 min every day.
3. Avoid sugary drinks. Limit consumption of energy-dense foods.
4. Eat more of a variety of vegetables, fruits, whole grains, and legumes such as beans.
5. Limit consumption of red meats (such as beef, pork, and lamb) and avoid processed meats.
6. If consumed at all, limit alcoholic drinks to 2 for men and 1 for women a day.
7. Limit consumption of salty foods and foods processed with salt (sodium).
8. Don't use supplements to protect against cancer.
9. It is best for mothers to breastfeed exclusively for up to 6 months and then add other liquids and foods.
10. After treatment, cancer survivors should follow the recommendations for cancer prevention.

Clearly, science doesn't stand still, so we've instituted a process of ongoing review and analysis that ensures our recommendations for cancer prevention reflect the latest science. We have partnered with WCRF International on the Continuous Update Project (53), which reviews and analyzes the relevant research on a rolling basis, cancer site by cancer site.

A Focus on Meals, Not Micronutrients

AICR's education team has turned our recommendations for cancer prevention into understandable and practical messages for the American public and has created a visual plate-based model for healthy eating, the New American Plate. The appeal of this approach is its simplicity and flexibility as well as its emphasis on whole foods and whole meals. At their core, AICR's New American Plate, the USDA's My Plate, and scores of other similar approaches represent an encouraging trend borne out by the research—a desire to address health research and health messaging by shifting away from a piecemeal focus on individual foods and food components to overall dietary patterns.

Forest for the (Olive) Trees

One such pattern, around which a tremendous amount of research has accrued, is the Mediterranean diet. Many of the recommendations included in the 2007 AICR/WCRF Expert Report overlap with those of the Mediterranean pyramid, which:

- Highlights the importance of regular physical activity and avoiding sugary drinks
- Limits the consumption of energy-dense foods
- Recommends intake of more of a variety of vegetables, fruits, whole grains, and legumes such as beans
- Limits the consumption of red and processed meats and alcohol

It is notable that like the AICR/WCRF recommendations, the Mediterranean diet was included in the Scientific Report of the 2015 Dietary Guidelines submitted to the Department of Human Health Services and US Department of Agriculture (54).

As detailed in this volume, the Mediterranean diet includes a variety of healthy foods in moderate amounts. But it is more than just a checklist of specific foods and beverages. The traditional Mediterranean diet represents a truly holistic approach that combines fresh whole foods and plenty of physical activity. As you read about this fascinating research, you may be struck by how simple and appealing this lifestyle seems, in terms of both its day-to-day pleasures and its many long-term health benefits. The editors, Drs. Donato Romagnolo and Ornella Selmin, nutrition and cancer researchers at the University of Arizona, have invited world-renowned experts to highlight the key aspects of the Mediterranean diet and lifestyle.

The volume opens with *Part I, Mediterranean Diet and Lifestyle in a World Contest*. This chapter introduces the foundational elements of the Mediterranean pyramid for improving natural resources sustainability and prevention of chronic diseases including overweight, obesity, cardiovascular, cancer, and diabetes. A key concept emerges: that prevention of chronic diseases requires approaches that go beyond simple food recommendations but also involve increased accessibility to healthier food and better medical and healthcare.

In *Part II, Historical, Behavioral, and Geographical Perspective on the Mediterranean Diet and Lifestyle,* the volume focuses on the historical and geographical differences and overlaps of diets characteristic of the Mediterranean region. Concerns are expressed that even in Mediterranean countries, departure from local agricultural activities has reduced the availability of traditional healthier foods and increased dependency on large-scale, and possibly not as healthy, processed foods. These changes are modifying dietary patterns and possibly contributing to an increased burden of chronic diseases even in less developed and food-insecure communities.

Part III discusses the role of *Mediterranean Diet and Lifestyle for Health Promotion*. A key component of the Mediterranean diet is olive oil rich in monounsaturated oleic acid. Fish and nuts provide other sources of fats that positively impact the overall fatty acid profile (i.e., more mono- and polyunsaturated fatty acids compared to a Western diet, which is rich in saturated fatty acids). Authors highlight the beneficial effects of compounds present in olive oil against oxidative processes, cardiovascular disease, cancers, and neurodegenerative disorders. The benefits of the Mediterranean diet extend to improved longevity and reduction of inflammatory processes associated with cardiovascular diseases. Also data are discussed linking adherence to a Mediterranean-like diet and lifestyle and reduced risk of metabolic disorders.

In *Part IV, Aging and Cancer Risk*, authors provide evidence of the benefits of foods—and their wide variety of bioactive compounds—commonly present in the Mediterranean diet (i.e., fruits, vegetables, whole grains, unsaturated fatty acids, lean meat) for reducing or slowing the development of conditions associated with aging (i.e., cognitive decline, dementia, Alzheimer's and Parkinson's). Of particular interest to AICR, which focuses on reducing the cancer burden through nutrition, is the emerging evidence that the Mediterranean diet may have protective effects against the development of breast and colon cancer. Progress in these areas can impact on the development of prevention therapies and reduce cancer mortality associated with breast and colorectal malignancies. A chapter on the developing field of epigenetics clearly points out how dietary exposures to foods and bioactives present in the Mediterranean diet can impact gene expression and, possibly, influence gene expression later in life, or even in subsequent generations.

Finally, *Part V, Building a Mediterranean-Like Pyramid* translates the research concepts presented in the opening and health promotion papers into practical suggestions. First, authors highlight the health benefits of physical activity, which is a key component of the Mediterranean pyramid and other lifestyle behaviors. This is a behavioral component that can cut across cultural and geographical differences and contribute to correcting/preventing excessive energy balance and diseases associated

with overconsumption. The closing chapters of the volume illustrate selected Mediterranean recipes that include information about ingredients, cooking methods, and nutritional value. In the last chapter, the editors and coauthors have translated the information from each recipe into a week-long dietary plan inspired by the Mediterranean pyramid. The recipe information used to build this dietary plan is an instructional material developed by the editors for the Mediterranean Diet and Health Study Abroad Program. This program is held in Italy every year for students, nutrition professionals, and adults who wish to learn about the health benefits of the Mediterranean diet and lifestyle (55).

In closing, our understanding of diet and health has progressed rapidly. Yet today, we are beset by illnesses related directly to poor diets, inactivity, and soaring obesity rates. We applaud the editors and contributors of this volume, a work that supplies a wider, much-needed perspective on an overall pattern of living.

Washington, DC

Susan Higginbotham, Ph.D., RD.
Glen Weldon

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Preface

Death incidence attributable to chronic diseases is projected to increase due to the growing and aging population. The rampant increase in the prevalence of overweight and obesity in the USA and other world populations has been attributed to a combination of dietary, socioeconomic, and behavioral causes. These include an imbalance between dietary recommendations and behavior combined with an increasingly sedentary lifestyle. To reduce the burden of chronic diseases, various dietary guidelines are being released by health organizations in the USA and around the world to promote a rebalancing of calories and more physical activity. International efforts are underway to formulate dietary recommendations that prevent chronic diseases and improve quality of life. Unfortunately, socioeconomic constraints contribute to the paradoxical coexistence of noncommunicable diseases with food insecurity.

Various dietary guidelines and patterns emphasize the importance of variety, proportionality, and moderation in food selections. These include the *Mediterranean diet* which, in 2013, was inscribed by UNESCO in the Representative List of the Intangible Cultural Heritage of Humanity. In 2015, the Scientific Report of the Dietary Guidelines for Americans to the US Department of Human Health Services Department of Agriculture recommended the Mediterranean-style pattern among those dietary patterns associated with health promotion. The impetus for developing this volume stems from the wealth of research evidence suggesting that dietary habits and lifestyle characteristic of the Mediterranean region may offer protection against chronic diseases and improve longevity. Contributors have summarized the most up-to-date research evidence related to foods and dietary behaviors that contribute to a healthy Mediterranean diet and lifestyle, the biochemical mechanisms through which bioactive compounds usually found in Mediterranean foods impact on biological processes associated with disease, and opportunities and challenges for implementing a Mediterranean-like dietary pattern in developed and emerging economies. Twenty chapters were assembled by world-renowned experts who conducted a systematic review of the relevant literature and provided an assessment of chronic disease prevention opportunities using diet and food components characteristic of the Mediterranean region. The tone of this text is to establish a "proof of principle" about the importance of the Mediterranean diet and lifestyle approach for disease prevention. The editors regret that because of space limitations not all areas of research related to the Mediterranean diet and lifestyle could be adequately addressed, and acknowledge that geographical differences around the world impose limitations in the choice of foods and dietary customs.

This volume has been organized into five parts to aid in the assimilation of the materials provided. *Part I*, *Mediterranean Diet and Lifestyle in a World Context*, introduces the challenges and opportunities for maintaining or adopting a Mediterranean-like diet and lifestyle. Emphasis is placed on the realization that sustainability of natural resources is intimately related to agricultural production, food supply, and availability, which in turn impact on dietary behavior and disease risk. Adoption of Mediterranean dietary patterns and lifestyles that have been traditionally associated with reduced incidence of chronic diseases is recommended. Implementation of a Mediterranean-like diet and lifestyle may benefit populations residing in the USA and abroad. Major challenges include globalization

of food supplies, food insecurity, and socioeconomic constraints that limit access to healthier foods, affordable education, and medical care.

Part II, Historical, Behavioral, and Geographical Perspective on the Mediterranean Diet and Lifestyle, addresses the historical and behavioral origins of the Mediterranean diet, regional differences in dietary profiles, and the evolution of traditional Mediterranean diet into modern dietary guidelines. The traditional Mediterranean diet reflects the interactions of diverse populations and civilizations that have occupied the Mediterranean basin over thousands of years. In modern times, specific indexes to measure adherence to Mediterranean dietary patterns and their impact on health status have been developed. A key concept that emerges from this section is that food consumption in Mediterranean countries is a cultural element that goes beyond the need to satisfy nutrition needs. Nevertheless, concerns have mounted that modern diet and lifestyle continue to depart from the traditional Mediterranean "Genius loci" as a result of globalization and technological modifications leading to drastic changes in food behavior and increased susceptibility to chronic diseases.

Part III presents evidence of the benefits of the *Mediterranean Diet and Lifestyle for Health Promotion*. In addition to olive oil, which is the main source of fats in the Mediterranean region, this section presents other sources of fats that contribute to the overall profile of fatty acids found in the Mediterranean diet. Authors highlight that micronutrients and microconstituents with antioxidant and other properties are common in vegetable oils used in Mediterranean households. These bioactive compounds protect fatty acids from oxidation and are potentially important for reducing chronic disease risk. Olive oil is convincingly recognized as a food that reduces the risk of cardiovascular diseases, and possibly, certain cancers and neurodegenerative disorders. Research evidence is also presented suggesting that the Mediterranean diet decreases inflammatory parameters and risk of mortality. In Chap. 8, the authors conclude that the coordinated actions of phenolic compounds found in red wine and alcohol exert various health effects including a reduced risk of atherosclerosis. Regular and moderate consumption of red wine, 1–2 drinks a day with meals, is recommended. However, sound clinical judgment is needed to determine if alcohol consumption is appropriate based on age, medical history, gender, and predisposition to dependency. No more than one glass of wine/day is recommended for women and two glasses of wine/day for men. Metabolic syndrome has been recognized as a health concern and clinical challenge. There is general agreement that clinical parameters associated with metabolic syndrome can be greatly improved through adoption of lifestyle and dietary changes characteristic of the Mediterranean diet pattern. For example, research evidence from Mediterranean studies suggested a positive correlation between adherence to diets low in saturated fat, trans-fat, cholesterol, added sugar, and sodium; and high in unsaturated fats, complex unrefined carbohydrates, fruits, vegetables, and fish, with improvement of metabolic abnormalities. Unequivocally, these are dietary features typical of the traditional Mediterranean diet. The adoption of metabolomic approaches may offer new opportunities to monitor the health impact of individual food components and Mediterranean-like diets on metabolic syndrome and chronic disease risk.

Part IV, Aging and Cancer Risk, gives attention to the fact that the Mediterranean diet relies heavily on components such as fruits, vegetables, whole grains, unsaturated fatty acids, and lean meats and offers a regimen of nutrient-dense foods that provide viable, healthy and gradual weight loss while reducing a number of chronic health conditions that are so prevalent in the aging population. Of these, cognitive decline, dementia, and Alzheimer's and Parkinson's disease are age-related conditions that affect mature adults worldwide. Risk factors for cognitive diseases include hypercholesterolemia, obesity, diabetes, and cardiovascular factors, such as hypertension and inflammation. Studies suggest that the Mediterranean diet pattern may be beneficial for preventing and/or attenuating biological processes associated with cognitive impairment. Research data on extra virgin olive oil, the main source of saturated fat in the Mediterranean diet, suggest protective effects of olive oil components on markers of neurodegenerative diseases. Mediterranean-like diet and lifestyle are discussed as options to improve brain mitochondrial functions and for treatment of cognitive impairment and neurodegeneration. Turning to causes impacting cancer death, breast cancer remains the most commonly

diagnosed malignancy in women. Epidemiological studies generally recognize the modifying role of diet on breast cancer risk. A Mediterranean dietary pattern and diets high in vegetables, fruit, and fish are associated with a decreased risk of breast cancer. With respect to malignancies of the gastrointestinal tract, mortality rates related to colorectal cancer (CRC) have been declining due to advances in screening and diagnostic technologies. However, CRC remains the third most common cancer diagnosis and fourth leading cause of cancer-related mortality worldwide. Inflammatory bowel diseases (IBD) have been linked to increased risk of CRC. In general, adherence to the Mediterranean dietary pattern has been associated with a decreased risk of IBD and CRC. Mediterranean bioactive food components that modify disease risk include those that affect epigenetic mechanisms and regulate gene expression. Understanding how dietary factors and dietary patterns participate in the regulation of gene expression through epigenetics is a complex task given the wide range of available food choices, diversity of nutrient intakes, individual differences in genetic backgrounds, and intestinal environments where foods are metabolized. Likely, major advances in disease prevention will stem from characterizing the role of numerous enzymes, protein complexes, and factors that participate in epigenetic regulation.

Part V, Building a Mediterranean-like Pyramid, attempts to translate into practice the research concepts presented in the introductory and health promotion chapters. The health benefits of physical activity are undisputed. Regular physical activity mitigates or reverses risk factors commonly associated with chronic diseases including impaired glucose metabolism, dyslipidemia, and low-grade inflammation. Population-based studies document reductions on the order of 30 % or more for incident chronic diseases in active individuals compared to their inactive peers. Physical activity has been associated with improved diet quality and with Mediterranean-like eating patterns in both men and women. This section highlights the need for conservation and improvement of biodiversity to protect and promote in modern era two of the foundational components of the Mediterranean pyramid: biodiversity and conviviality. However, a major challenge remains the implementation of strategies that help populations to transition from dietary practices associated with higher rates of obesity and diabetes to healthier ones. Achieving adherence to healthy eating will require major changes in food behavior and lifestyle. To this end, large-scale efforts are needed involving the coordinated participation of the food and restaurant industries working in collaboration with public health communities and consumers. Overall, the Mediterranean diet emerges as a viable dietary tool to help Americans and other communities around the world to reduce the burden of chronic diseases. However, to make the most of this health promotion opportunity, all stakeholders should participate in a concerted effort and commit to these dietary and lifestyle changes with dispatch.

Chapter 19 presents a compilation of selected recipes from the Mediterranean region. For each recipe, detailed information on the ingredients, quantities, and preparation is presented based on the instructional material developed by the editors for the Mediterranean Diet and Health Study Abroad Program sponsored by the University of Arizona. Recipes are not provided as a medical recommendation, but as examples of dishes that can be prepared without specific culinary training. The closing chapter (Chap. 20) presents estimates of nutrient composition for all recipes discussed in Chap. 19, and their inclusion into a weekly food program using dietary guidelines developed by the Prevención con Dieta Mediterránea (PREDIMED) study to assess adherence to a Mediterranean-like diet. In general, Mediterranean recipes and foods organized into a weekly food pyramid help to meet the requirements for target dietary reference intakes including energy and macronutrients (fat, carbohydrate, protein, and fiber) and for selected minerals (calcium, sodium, and potassium). In the Mediterranean diet, a major contributor to total energy is monounsaturated fatty acids from olive oil and nuts. In this context, concerns have emerged about the quality of olive oil commercially available. For example, in the USA, imported extra virgin olive oil often fails international and US qualitative standards. This suggests that regulatory efforts are needed to inform the consumer about the quality of commercially available olive oil based on standard chemical and biological parameters. Depending on dietary behavior, daily requirements for vitamin D may not be easily met through foods and recipes only.

Thus, endogenous production via skin exposure to sun and/or dietary supplementation may be necessary to achieve minimum vitamin D goals. Strategies useful to alleviate inadequacies in vitamin D include the intake (≥3 times/week) of certain fish-based recipes, adequate sun exposure, and possibly supplemental doses. The usefulness of recipes and food pyramids in meeting nutrient requirements is clearly influenced by physical activity, body weight, height, gender, and age. Nevertheless, great opportunities exist for balancing our plates through adoption of a Mediterranean-like approach.

At the time of the publication of this volume, the US Department of Human and Health Services (HHS) and US Department of Agriculture (USDA) released the 2015–2020 Dietary Guidelines for Americans. As mentioned in various chapters in this volume, the intent of the US Dietary Guidelines for Americans is to translate into practice nutrition recommendations to prevent the incidence and/or reduce the burden of chronic diseases. Given the increased prevalence of overweight, obesity, and diabetes during the last two decades in the USA and other developed countries, and association of these conditions with food insecurity, the timely release of the 2015 Dietary Guidelines is a new opportunity to translate advancements in science into policies that promote health through nutrition. The publication of the Dietary Guidelines followed the submission of recommendations by the 2015 Dietary Guidelines Advisory Committee, which was composed of health and nutrition experts. Reference to these recommendations and a list of areas of investigations and research needs can be found in Chap. 2 and Table 2.1. In general, the Advisory Committee made recommendations for increasing consumption of fruits, vegetables, and whole grains and reducing intake of calories, saturated fat, sodium, refined grains, and added sugars. Moreover, underconsumption of vitamin D, calcium, potassium, and fiber was identified as a public concern for the majority of the US population. Importantly, the 2015 Dietary Guidelines Advisory Committee suggested that sufficient research data were available to model certain dietary patterns, including the Healthy Mediterranean-Style Pattern, and examine their nutritional adequacy. Detailed information about the 2015–2020 Dietary Guidelines for Americans can be found in the Appendix of this volume.

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Series Editor Page

The great success of the *Nutrition and Health Series* is the result of the consistent overriding mission of providing health professionals with texts that are essential because each includes (1) a synthesis of the state of the science; (2) timely in-depth reviews by the leading researchers and clinicians in their respective fields; (3) extensive, up-to-date fully annotated reference lists; (4) a detailed index; (5) relevant tables and figures; (6) identification of paradigm shifts and the consequences; (7) virtually no overlap of information between chapters, but targeted, interchapter referrals; (8) suggestions of areas for future research; and (9) balanced, data-driven answers to patient as well as health professional questions which are based upon the totality of evidence rather than the findings of any single study.

The series volumes are not the outcome of a symposium. Rather, each editor has the potential to examine a chosen area with a broad perspective, both in subject matter and in the choice of chapter authors. The international perspective, especially with regard to public health initiatives, is emphasized where appropriate. The editors, whose trainings are both research and practice oriented, have the opportunity to develop a primary objective for their book, define the scope and focus, and then invite the leading authorities from around the world to be part of their initiative. The authors are encouraged to provide an overview of the field, discuss their own research, and relate the research findings to potential human health consequences. Because each book is developed de novo, the chapters are coordinated so that the resulting volume imparts greater knowledge than the sum of the information contained in the individual chapters.

Mediterranean Diet: Dietary Guidelines and Impact on Health and Disease edited by Donato F. Romagnolo and Ornella Selmin is a very welcome and timely addition to the *Nutrition and Health Series* and fully exemplifies the series' goals. There has been an explosion of clinical research over the last two decades on the associations between the consumption of the Mediterranean diet and reduced risk of several age-related chronic diseases, and these studies alone warrant the development of this 20-chapter tome. However, the volume also includes reviews of the newer indications such as reduced risk of developing allergies in younger aged populations. This unique volume represents the first text to provide an integrated review of the historical basis of this healthful diet, its metabolism, and role in multiple aspects of human health and disease prevention and even treatment. The volume also includes key practice-oriented chapters that provide guidance in the development of the Mediterranean diet pyramid as well as highly relevant recipes and diet plans. The reader is presented with balanced, data-driven discussions of the beneficial effects of the nutrient content of this diet that is also helpful in preventing common nutritional deficiencies such as zinc deficiency. The volume is designed as an important resource for nutritionists and dietitians, research and public health scientists, cardiologists, gastroenterologists, and related physicians and healthcare professionals who interact with clients, patients, and/or family members. The volume provides objective, relevant information for professors and lecturers, advanced undergraduates and graduates, researchers, and clinical investigators who require extensive, up-to-date literature reviews, instructive tables and figures, and excellent references on all aspects of the importance of the Mediterranean diet's role in human health and disease.

The editors of this volume are experts in their respective fields. Donato F. Romagnolo, Ph.D., MSc., is a professor of Nutritional and Cancer Biology and member of the Arizona Cancer and the Toxicology Centers, the BIO5 Institute, and the Southwest Environmental Health Sciences Center at the University of Arizona. He is currently a member of the Executive Committees for the Nutritional Sciences and Cancer Biology Graduate Programs at the University of Arizona. He has served as member and chair for the Advisory Board of the Environmental Gene Expression Group of the Southwest Environmental Health Sciences Center; chair for the Research Frontiers in Nutritional Sciences Conference, Department of Nutritional Sciences; and member and chair of the Internal Advisory Committee for Native American Cancer Prevention Program at the University of Arizona. Dr. Romagnolo is an instructor for undergraduate nutritional biology and graduate metabolic integration at the University of Arizona. As a director and instructor of the Mediterranean Diet and Health Study Abroad Program, Global Studies, at the University of Arizona, he promotes the study of the Mediterranean diet and food compounds for the prevention of chronic diseases. Dr. Romagnolo earned an M.S. and a Ph.D. from Virginia Polytechnic Institute and State University and a B.S. from the University of Padua, Padua, Italy. He has held professional positions as nutritionist for agricultural organizations in Italy and as research manager and consultant for private food industries. He was a postdoctoral fellow at the National Institutes of Environmental Health Sciences, National Institutes of Health. Dr. Romagnolo is a member of several professional organizations, including the American Society for Nutrition and the American Association for Cancer Research. He has published book chapters, monographs, and original research in cancer and nutrition-related scientific journals including *Cancer Research*, *The Journal of Nutrition*, *Nutrition and Cancer*, *Breast Cancer Research*, *Molecular Carcinogenesis*, *Environmental and Molecular Mutagenesis*, *Neoplasia*, and *Experimental Biology and Medicine*. He is a member of the *Journal of Biochemistry Editorial Board*. Dr. Romagnolo has been a member of scientific review panels and received research funding from the National Institutes of Health, the US Department of Breast Cancer Research Program, and the Susan G. Komen Breast Cancer Foundation, the American Institute for Cancer Research, and the Arizona Biomedical Research Commission. In his current position, he promotes research that deals with the role of dietary xenobiotics and natural bioactive compounds as epigenetic regulators of expression of genes involved in cancer and inflammation. Current research focuses primarily on the role of environmental and dietary compounds on epigenetic regulation of breast cancer tumor suppressor and proinflammatory genes and prevention of breast and colorectal tumorigenesis by dietary compounds including those commonly found in the Mediterranean diet. Dr. Romagnolo has coedited with John Milner a volume entitled *Bioactive Compounds and Cancer* that is also part of the *Nutrition and Health Series* published by Springer/Humana Press. Ornella Selmin, Ph.D., is a research associate professor of Nutritional Sciences at the University of Arizona. She is a member and laboratory director at the University of Arizona Cancer Center. Dr. Selmin is a member of the BIO5 Institute and Center for Toxicology at the University of Arizona. She has served as a research grant panelist for the National Science Foundation (NSF), the National Institutes of Health (NIH) Integrated Risk Information System Toxicological Review, the Environmental Protection Agency (EPA), Science Advisory Board, American Heart Association, NIEHS/NIH Superfund Program Grant Review Panel, NIH Minority Biomedical Research Grant Review Panel, and the National Center for Environmental Health/Agency for Toxic Substances and Disease Registry. Dr. Selmin has served as Arizona Assurance Program mentor and member of International Science and Engineering Fair Scientific Review Committee at the University of Arizona. She also has served as a member of the Graduate Program in Microbiology at the University of Arizona. Dr. Selmin received a B.S. in biology and a Ph.D. in molecular and cellular biology at the University of Padua, Italy. She has held various professional positions including visiting fellow at the Laboratory of Developmental Biology and Anomalies, NIDR, NIH, Bethesda, MD; research associate, Laboratory of Developmental Biology, VPI & SU, Blacksburg, VA; and visiting associate, Laboratory of Biochemical Risk Analysis, NIEHS, NIH, Research Triangle Park, North Carolina. Dr. Selmin received the Recordati Industries Research Award for Young Scientist and

Walkabout for Biosafety Excellence Award, vice president for Research at the University of Arizona. Dr. Selmin has published in various environmental, nutrition, and cancer-related journals including *Anti-Cancer Agents in Medicinal Chemistry*, *Advances in Nutrition*, *Molecular Carcinogenesis*, *Journal of Nutritional Gerontology and Geriatrics*, *Journal of Nutritional Biochemistry*, *Cardiovascular Toxicology*, *Cancer Epidemiology*, *Biomarkers & Prevention*, *Cancer Research*, and *Journal of Biochemistry*. Dr. Selmin received research funding from the National Institutes of Health, the US Department of Breast Cancer Research Program, and the Arizona Biomedical Research Commission. Dr. Selmin is the co-instructor of the Mediterranean Diet and Health Study Abroad Program, Global Studies, at the University of Arizona. In her current position at the University of Arizona Cancer Center, she promotes research that deals with the role of environmental xenobiotics and natural bioactive compounds as modulator of genes involved in cardiovascular diseases and breast and colorectal cancer.

The 20 chapters in this comprehensive volume are organized in five parts: Mediterranean Diet and Lifestyle in a World Context; Historical, Behavioral and Geographical Perspective on the Mediterranean and Lifestyle; Mediterranean Diet and Lifestyle for Health; Aging and Cancer Risk; and Building a Mediterranean-Like Pyramid.

Part I: Mediterranean Diet and Lifestyle in a World Context

The two introductory chapters in the first part provide readers with a historical perspective as well as the basics of nutritional aspects of the Mediterranean diet and include discussions of the beneficial environmental impact of this diet especially in the light of the reduction in consumption of red meat. The examination of the nutrient density of the diet and enhanced metabolism of cardioprotective diet components provides the basics of energy balance so that the more clinically related chapters can be easily understood. The first chapter reminds us that the Mediterranean diet reflects the cultural, historical, social, territorial, and environmental heritage that has been transmitted from generation to generation for centuries and is intimately linked to the lifestyles of the Mediterranean people throughout their history. The second chapter reviews the major metabolically related diseases and the importance of the Mediterranean diet compared to other dietary plans and reviews of the global recommendations including that of UNESCO in 2013 that included the diet in the Representative List of the Intangible Cultural Heritage of Humanity and also the diet's inclusion in the Scientific Report of the 2015 US Dietary Guidelines.

Part II: Historical, Behavioral, and Geographical Perspective on the Mediterranean Diet and Lifestyle

Part II contains three chapters that continue the examination of many of the culturally related aspects of the Mediterranean diet and lifestyle. We are reminded, in Chap. 3, that today's version of the Mediterranean diet evolved in the region during a succession of dominant civilizations—Egyptian, Hebrew, Phoenician, Greek, Carthaginian, Roman, Arab, Byzantine, Ottoman, and others. These cultures with varied religious food laws introduced different foods, culinary practices, and food traditions throughout the Mediterranean region. There is a comprehensive review of the relevant diet intake studies and the chapter contains 99 references. The fourth chapter examines the traditional Mediterranean diet that is characterized by a plant-based diet containing legumes, whole grains, fruits and vegetables, nuts, and seeds; olive oil is a main source of fat and there is a low intake of saturated fat, a low-to-moderate intake of dairy products, moderate consumption of fish, and low-to-moderate

amounts of wine consumed during meals. This dietary pattern is consumed by people in the 22 countries that border the Mediterranean Sea. The differences between diets in these countries are reviewed and the specific foods are discussed. The chapter also includes a description of the scoring systems currently used to determine the adherence to the Mediterranean diet within survey studies as well as for patient care. This volume has several unique chapters, including Chap. 5 that describes the French diet and food habits that are in many ways comparable to the Mediterranean diet. The main characteristics of the French perspective include the use of olive oil, fresh fruits and vegetables, and fish in addition to little snacking between meals, three meals a day that include a mid-day three-course meal, use of raw or no processed foods, home cooking, eating together, and adherence to cultural foods with reduced use of fast or junk foods.

Part III: Mediterranean Diet and Lifestyle for Health Promotion

The third part of this comprehensive volume examines in depth the key components of the Mediterranean diet and their health consequences. The first chapter reviews the importance of the fat sources and compares and contrasts the fatty acid composition of different oils. The macro- and micronutrient composition and major food sources of the oils are compiled in eight helpful tables. There is a discussion of argan oil used mainly in Morocco; this oil is becoming more popular throughout the Mediterranean region. The major clinical studies that have looked at the association between the fats consumed in Mediterranean diets and health outcomes are also tabulated. Chapter 7 examines the importance of the anti-inflammatory characteristics of the oils consumed in the Mediterranean diet and reviews the role of inflammation in the development of cardiovascular disease. The use of biomarkers of inflammation, including C-reactive protein as an index of cardiovascular risk, is described. The recent evaluation of the anti-inflammatory aspects of the Mediterranean diet has resulted in an expansion of potentially beneficial indications, including cerebrovascular disease, diabetes, and Alzheimer's disease. Chapter 8 reviews the data linking red wine consumption with reduced risk of cardiovascular disease. The authors also discuss the epidemiological data correlating the beneficial effects of red wine on cardiovascular health. The metabolism of red wine is reviewed and the components of red wine that may be responsible for the cardioprotective effects are tabulated. The mechanisms of actions of red wine components on blood vessels and metabolic homeostasis are examined, and the authors conclude that coordinated actions of phenolic compounds and alcohol exert beneficial effects and reduce the risk of atherosclerosis. The next chapter looks at the growing population that is diagnosed with the metabolic syndrome and its consequences. The authors examine the dietary recommendations for lowering this risk and these mirror the major components of the Mediterranean diet. The key characteristics of the metabolic syndrome including obesity, non-insulin-dependent diabetes, hypertension, and dyslipidemia are each examined. The clinical data and recommendations to implement the Mediterranean diet in individuals at risk for the metabolic syndrome are reviewed. Chapter 10, the final chapter in this part, provides the reader with an overview of the relatively new science of metabolomics and examines its uses for determining some of the health effects of the Mediterranean diet.

We learn that the metabolome is defined as the sum of all low molecular weight metabolites or chemicals present in a cell, organ, tissue, biological fluid, or organism. This complex contains lipids, small peptides, carbohydrates, vitamins, and other cofactors derived from both the metabolism of the host and the symbiotic microbiota, and in humans, there are more than 20,000 metabolites. Metabolomics is the study of all of the effects of an exposure on a human and includes environmental exposure as well as the genetic and epigenetic background of that individual. The chapter includes a discussion of important databases including FooDB, the world's largest and most comprehensive resource on food constituents, chemistry, and biology which is part of the Human Metabolome Database and Phenol-Explorer, a comprehensive database on polyphenol content in foods that

provides data on polyphenol metabolism and the effects of food processing and cooking. Since the Mediterranean-style eating pattern is rich in bioactive food components that have diverse health effects, metabolomics profiling is an important strategy to examine the systemic effects of its components. The chapter, containing 124 references, reviews the major dietary components of the Mediterranean diet and the studies that have looked at their metabolic effects on health outcomes including blood pressure and colon cancer.

Part IV: Aging and Cancer Risk

The five chapters in this part include in-depth reviews on obesity seen in the elderly, neurological diseases of aging and two of the major cancers of aging, breast, and colon and a last chapter that examines the epigenetic effects of the Mediterranean diet. Chapter 11 describes the physiological changes seen with aging and compares these to similar changes seen with obesity. In particular, both groups have a shift in body composition with an increase in fat and decrease in muscle. There is a review of studies of weight loss in the older population using traditional Western diets compared to studies using the Mediterranean diet; of importance, there appears to be greater retention of lean body mass with the Mediterranean diet even in the face of greater weight loss. The newest intervention research indicates that the Mediterranean diet with olive oil significantly lowers the risk of diabetes in older individuals in a weight loss study. The next chapter, authored by the book's editors and their son, includes a broad-based discussion of the age-related diseases that affect the brain and the neuromuscular system including Alzheimer's disease and Parkinson's disease, as well as some of the forms of dementia that can result in mild cognitive decline or vascular dementia resulting from ischemic or hemorrhagic brain lesions. The chapter contains clear descriptions of the etiology of these diseases and the nutritional factors that have been associated with increased risk including inflammation and the microbiome. Preliminary survey data strongly suggest that the adherence to a Mediterranean diet over a lifetime significantly reduces the risk of developing cognitive and neurological diseases associated with aging. Chapter 13 describes the current state of the evidence evaluating the role of diet patterns in breast cancer prevention with a focus on the Mediterranean diet. The discussion of the current epidemiological evidence and mechanisms supporting a role of the Mediterranean diet including postulated mechanisms of breast cancer protection provided by the individual components within the diet are presented. There is a review of the data from the Women's Health Initiative Dietary Modification Trial with particular insights as the primary author was a principal investigator in this landmark study. Several of the food components of the Mediterranean diet are examined and the major potential mechanisms of action are reviewed; the chapter contains over 100 targeted references. Chapter 14 is authored by the editors and colleagues and describes in detail the molecular mechanisms by which the components of the Mediterranean diet affect the risk of developing irritable bowel disease (IBD) and/or colorectal cancer. Both the genetic and epigenetic effects of olive oil, red wine, low intakes of red meat and the increased intake of omega-3 fatty acids are reviewed and referenced in over 120 citations. The authors propose that the combination of Mediterranean foods, rather than specific ones or bioactive compounds found in the Mediterranean diet, impacts the gut microbiome and contributes to the maintenance of intestinal health and prevention of inflammation and cancer of the colon. The final chapter in this part, Chap. 15, describes the development of epigenetic changes in DNA that have been linked to a number of chronic diseases of aging including cancer. The chapter emphasizes data on genes that retain epigenetic plasticity or flexibility that enables genes to respond to environmental exposures including dietary patterns and specific nutrients/dietary factors such as those found in the Mediterranean diet pattern. Although the majority of research in this area relies on in vitro studies that follow metabolic pathways, the research has been of great value and future studies in populations are warranted.

Part V: Building a Mediterranean-Like Pyramid

The five chapters in Part V describe the great complexity in developing a Mediterranean diet pyramid that includes all aspects of the Mediterranean lifestyle as the cultural aspects of this lifestyle, food preparation, and freshness may be as critical as the food components. The first chapter in this part, Chap. 16, provides an examination of the role of physical activity in the improved health aspects of the Mediterranean diet. The chapter includes a succinct definition of physical activity that is contrasted with the definition of exercise and then reviews and tabulates the relevant studies. The global as well as biochemical markers of improved lipid status, weight management, and other benefits are reviewed and 100 references are included in this comprehensive chapter. Chapter 17 explores the traditional Mediterranean concept of lifestyle; conviviality of routine meals taken together with family and friends; consumption of many different foods, sometimes labeled as biodiversity; and the importance of all of the cultural aspects in addition to the consumption of the foods associated with the Mediterranean diet. The chapter emphasizes the importance of herbs (presented in a comprehensive table that includes medicinal uses of herbs as well as culinary uses) in the preparation of meals and their biological potential to affect the benefits associated with the Mediterranean diet. The final three chapters in this cutting-edge volume provide unique insights into the implementation of the Mediterranean diet by first comparing this diet program to other widely used diet programs and then delving deeply into individual meals and their preparations. Chapter 18 compares and contrasts several healthy eating patterns including the Dietary Approaches to Stop Hypertension (DASH) dietary pattern, the US Department of Agriculture food pattern (USDAFP), and the Mediterranean Diet Pattern (MDP) and the chapter includes over 140 relevant references. The comparisons are tabulated to demonstrate the areas where these three healthful diets are very similar and some of the differences that could be responsible for some of the benefits seen with the Mediterranean diet compared to the two other diet plans. The chapter examines the changes in eating habits of the more urban populations in the Mediterranean nations and how these changes may adversely affect the beneficial effects ascribed when these nations and their populations were more agrarian. Current dietary patterns may result in nutrient deficiencies including calcium, magnesium, and/or dietary fiber; these are reviewed in this insightful chapter. Chapters 19 and 20, authored by the volume's editors, provide the reader with unique recipes that have full nutrient contents and weekly nutrient intakes using the Mediterranean recipes calculated. The figures provide excellent representations of the visual appeal of these meals. The recipes use key foods and their nutrients that are representative of the Mediterranean diet pyramid developed internationally in 2011. It must be said that the volume editors "walk the walk" and have devoted themselves to sharing their Mediterranean culture, food preparation, and its links to a more healthful lifestyle with their professional colleagues and students and now with the readers of these chapters and the entire volume.

The above description of the volume's 20 chapters attests to the depth of information provided by the 37 highly respected chapter authors, many from Mediterranean countries. Each chapter includes complete definitions of terms with the abbreviations fully defined for the reader and consistent use of terms between chapters. Key features of the comprehensive volume include over 80 detailed tables and informative figures; an extensive, detailed index; and more than 1400 up-to-date references that provide the reader with excellent sources of worthwhile practice-oriented information that will be of great value to health providers as well as graduate and medical students.

In conclusion, *Mediterranean Diet: Dietary Guidelines and Impact on Health and Disease* edited by Donato F. Romagnolo and Ornella Selmin provides health professionals in many areas of research and practice with the most up-to-date, well-referenced volume on the importance of this diet and lifestyle in maintaining the overall health of the individual as well as reducing the risk of certain chronic disease conditions. The volume serves the reader as the benchmark for integrating the complex interrelationships between dietary patterns, physical activity, cultural factors, and the individual

nutrients and foods, such as wine, olive oil, herbs and spices, bioactive molecules, and other unique dietary constituents that are involved in the maintenance of the body's metabolic integrity. Moreover, the physiological, genetic, and pathological interactions between the dietary components of the Mediterranean diet and the functioning of the endothelium, vascular system, microbiome, and immune cells are clearly delineated so that students as well as practitioners can better understand the complexities of these interactions. Unique chapters examine the evolution of the Mediterranean diet and contrast this diet with that of other nations and also with dietary guidelines that national bodies have recommended. The final chapters of this valuable volume provide hands-on examples of meals that incorporate the essence of the Mediterranean diet and include the recipes as well as the evaluation of the nutrient content of these meals. The editors are applauded for their efforts to develop the most authoritative and unique resource on the Mediterranean diet and its role in health and disease, and this excellent text is a very welcome addition to the *Nutrition and Health Series*.

Adrianne Bendich, Ph.D., F.A.C.N., F.A.S.N.

About the Series Editor

Dr. Adrianne Bendich, Ph.D., F.A.S.N., F.A.C.N., has served as the *Nutrition and Health Series* editor for 20 years and has provided leadership and guidance to more than 200 editors that have developed the 70+ well-respected and highly recommended volumes in the series.

In addition to *Mediterranean Diet: Impact on Health and Disease,* edited by Donato F. Romagnolo and Ornella I. Selmin, major new editions published in 2012–2015 and expected to be published shortly include:

1. *Preventive Nutrition: The Comprehensive Guide For Health Professionals, Fifth Edition,* edited by Adrianne Bendich, Ph.D., and Richard J. Deckelbaum, M.D., 2015
2. *Arginine in Clinical Nutrition*, edited by Rajkumar Rajendram, Vinood Patel, and Victor Preedy, 2016
3. *Beverage Impacts on Health and Nutrition*, *Second Edition*, edited by Ted Wilson, Ph.D., and Norman J. Temple, Ph.D., 2015
4. *Nutrition in Cystic Fibrosis*: *A Guide for Clinicians*, edited by Elizabeth H. Yen, M.D., and Amanda R. Leonard, MPH, RD, CDE, 2015
5. *Glutamine in Clinical Nutrition*, edited by Rajkumar Rajendram, Victor R. Preedy, and Vinood B. Patel, 2015
6. *Nutrition and Bone Health*, *Second Edition*, edited by Michael F. Holick and Jeri W. Nieves, 2015
7. *Branched Chain Amino Acids in Clinical Nutrition*, *Volume 2*, edited by Rajkumar Rajendram, Victor R. Preedy and Vinood B. Patel, 2015
8. *Branched Chain Amino Acids in Clinical Nutrition*, *Volume 1*, edited by Rajkumar Rajendram, Victor R. Preedy, and Vinood B. Patel, 2015
9. *Fructose*, *High Fructose Corn Syrup*, *Sucrose and Health*, edited by James M. Rippe, 2014
10. *Handbook of Clinical Nutrition and Aging*, *Third Edition*, edited by Connie Watkins Bales, Julie L. Locher, and Edward Saltzman, 2014
11. *Nutrition and Pediatric Pulmonary Disease*, edited by Dr. Youngran Chung and Dr. Robert Dumont, 2014
12. *Integrative Weight Management*, edited by Dr. Gerald E. Mullin, Dr. Lawrence J. Cheskin, and Dr. Laura E. Matarese, 2014
13. *Nutrition in Kidney Disease*, *Second Edition*, edited by Dr. Laura D. Byham-Gray, Dr. Jerrilynn D. Burrowes, and Dr. Glenn M. Chertow, 2014

14. *Handbook of Food Fortification and Health*, *Volume I*, edited by Dr. Victor R. Preedy, Dr. Rajaventhan Srirajaskanthan, and Dr. Vinood B. Patel, 2013
15. *Handbook of Food Fortification and Health*, *Volume II*, edited by Dr. Victor R. Preedy, Dr. Rajaventhan Srirajaskanthan, and Dr. Vinood B. Patel, 2013
16. *Diet Quality*: *An Evidence-Based Approach*, *Volume I*, edited by Dr. Victor R. Preedy, Dr. Lan-Anh Hunter, and Dr. Vinood B. Patel, 2013
17. *Diet Quality*: *An Evidence-Based Approach*, *Volume II*, edited by Dr. Victor R. Preedy, Dr. Lan-Anh Hunter, and Dr. Vinood B. Patel, 2013
18. *The Handbook of Clinical Nutrition and Stroke*, edited by Mandy L. Corrigan, MPH, RD; Arlene A. Escuro, MS, RD; and Donald F. Kirby, MD, FACP, FACN, FACG, 2013
19. *Nutrition in Infancy*, *Volume I*, edited by Dr. Ronald Ross Watson, Dr. George Grimble, Dr. Victor Preedy, and Dr. Sherma Zibadi, 2013
20. *Nutrition in Infancy*, *Volume II*, edited by Dr. Ronald Ross Watson, Dr. George Grimble, Dr. Victor Preedy, and Dr. Sherma Zibadi, 2013
21. *Carotenoids and Human Health*, edited by Dr. Sherry A. Tanumihardjo, 2013
22. *Bioactive Dietary Factors and Plant Extracts in Dermatology*, edited by Dr. Ronald Ross Watson and Dr. Sherma Zibadi, 2013
23. *Omega 6/3 Fatty Acids*, edited by Dr. Fabien De Meester, Dr. Ronald Ross Watson, and Dr. Sherma Zibadi, 2013
24. *Nutrition in Pediatric Pulmonary Disease*, edited by Dr. Robert Dumont and Dr. Youngran Chung, 2013
25. *Magnesium and Health*, edited by Dr. Ronald Ross Watson and Dr. Victor R. Preedy, 2012
26. *Alcohol*, *Nutrition and Health Consequences*, edited by Dr. Ronald Ross Watson, Dr. Victor R. Preedy, and Dr. Sherma Zibadi, 2012
27. *Nutritional Health*, *Strategies for Disease Prevention*, *Third Edition*, edited by Norman J. Temple, Ted Wilson, and David R. Jacobs, Jr., 2012
28. *Chocolate in Health and Nutrition*, edited by Dr. Ronald Ross Watson, Dr. Victor R. Preedy, and Dr. Sherma Zibadi, 2012
29. *Iron Physiology and Pathophysiology in Humans*, edited by Dr. Gregory J. Anderson and Dr. Gordon D. McLaren, 2012

Earlier books included *Vitamin D*, *Second Edition*, edited by Dr. Michael Holick; *Dietary Components and Immune Function*, edited by Dr. Ronald Ross Watson, Dr. Sherma Zibadi, and Dr. Victor R. Preedy; *Bioactive Compounds and Cancer*, edited by Dr. John A. Milner and Dr. Donato F. Romagnolo; *Modern Dietary Fat Intakes in Disease Promotion*, edited by Dr. Fabien De Meester, Dr. Sherma Zibadi, and Dr. Ronald Ross Watson; *Iron Deficiency and Overload*, edited by Dr. Shlomo Yehuda and Dr. David Mostofsky; *Nutrition Guide for Physician*s, edited by Dr. Edward Wilson, Dr. George A. Bray, Dr. Norman Temple, and Dr. Mary Struble; *Nutrition and Metabolism*, edited by Dr. Christos Mantzoros; and *Fluid and Electrolytes in Pediatrics*, edited by Leonard Feld and Dr. Frederick Kaskel. Recent volumes include *Handbook of Drug-Nutrient Interactions* edited by Dr. Joseph Boullata and Dr. Vincent Armenti; *Probiotics in Pediatric Medicine* edited by Dr. Sonia Michail and Dr. Philip Sherman; *Handbook of Nutrition and Pregnancy* edited by Dr. Carol Lammi-Keefe, Dr. Sarah Couch, and Dr. Elliot Philipson; *Nutrition and Rheumatic Disease* edited by Dr. Laura Coleman; *Nutrition and Kidney Disease* edited by Dr. Laura Byham-Gray, Dr. Jerrilynn Burrowes, and Dr. Glenn Chertow; *Nutrition and Health in Developing Countries* edited by Dr. Richard Semba and Dr. Martin Bloem; *Calcium in Human Health* edited by Dr. Robert Heaney and Dr. Connie Weaver; and *Nutrition and Bone Health* edited by Dr. Michael Holick and Dr. Bess Dawson-Hughes.

Dr. Bendich is a president of Consultants in Consumer Healthcare LLC and is the editor of ten books including *Preventive Nutrition: The Comprehensive Guide for Health Professionals, Fifth Edition,* coedited with Dr. Richard Deckelbaum (www.springer.com/series/7659). Dr. Bendich serves on the Editorial Boards of the *Journal of Nutrition in Gerontology and Geriatrics, Antioxidants*, and has served as an associate editor for *Nutrition*, the international journal; on the Editorial Board of the *Journal of Women's Health and Gender-Based Medicine*; and on the Board of Directors of the American College of Nutrition.

Dr. Bendich was a director of Medical Affairs at GlaxoSmithKline (GSK) Consumer Healthcare and provided medical leadership for many well-known brands including TUMS and Os-Cal. Dr. Bendich had primary responsibility for GSK's support for the Women's Health Initiative (WHI) intervention study. Prior to joining GSK, Dr. Bendich was at Roche Vitamins Inc. and was involved with the groundbreaking clinical studies showing that folic acid-containing multivitamins significantly reduced major classes of birth defects. Dr. Bendich has coauthored over 100 major clinical research studies in the area of preventive nutrition. She is recognized as a leading authority on antioxidants, nutrition and immunity and pregnancy outcomes, vitamin safety, and the cost-effectiveness of vitamin/mineral supplementation.

Dr. Bendich, who received the Roche Research Award, is a *Tribute to Women and Industry* Awardee and was a recipient of the Burroughs Wellcome Visiting Professorship in Basic Medical Sciences. Dr. Bendich was given the Council for Responsible Nutrition (CRN) Apple Award in recognition of her many contributions to the scientific understanding of dietary supplements. In 2012, she was recognized for her contributions to the field of clinical nutrition by the American Society for Nutrition and was elected a fellow of ASN. Dr Bendich is an adjunct professor at Rutgers University. She is listed in Who's Who in American Women.

About the Editors

Donato F. Romagnolo, Ph.D., M.Sc., is a professor of Nutritional and Cancer Biology and member of the Arizona Cancer and the Toxicology Centers, the BIO5 Institute, and the Southwest Environmental Health Sciences Center at the University of Arizona. He is currently a member of the Executive Committees for the Nutritional Sciences and Cancer Biology Graduate Programs at the University of Arizona. He has served as a member and chair for the Advisory Board of the Environmental Gene Expression Group of the Southwest Environmental Health Sciences Center; chair for the Research Frontiers in Nutritional Sciences Conference, Department of Nutritional Sciences; and member and chair of the Internal Advisory Committee for Native American Cancer Prevention Program at the University of Arizona. Dr. Romagnolo is an instructor for undergraduate nutritional biology and graduate metabolic integration at the University of Arizona. As a director and instructor of the Mediterranean Diet and Health Study Abroad Program, Global Studies, at the University of Arizona, he promotes the study of Mediterranean diet and food compounds for the prevention of chronic diseases. Dr. Romagnolo earned an M.S. and a Ph.D. from Virginia Polytechnic Institute and State University and a B.S. from the University of Padua, Padua, Italy. He has held professional positions as nutritionist for agricultural organizations in Italy and as research manager and consultant for private food industries. He was a postdoctoral fellow at the National Institutes of Environmental Health Sciences, National Institutes of Health. Dr. Romagnolo is a member of several professional organizations, including the American Society for Nutrition and the American Association for Cancer Research. He has published book chapters, monographs, and original research in cancer and nutrition-related scientific journals including *Cancer Research, The Journal of Nutrition, Nutrition and Cancer, Breast Cancer Research, Molecular Carcinogenesis, Environmental and Molecular Mutagenesis, Neoplasia, and Experimental Biology and Medicine*. He is a member of the *Journal of Biochemistry* Editorial Board. Dr. Romagnolo has been a member of scientific review panels and received research funding from the National Institutes of Health, the US Department Breast Cancer Research Program, the Susan G. Komen Breast Cancer Foundation, the American Institute for Cancer Research, and the Arizona Biomedical Research Commission. In his current position, he promotes research that deals with the role of dietary xenobiotics and natural bioactive compounds as epigenetic regulators of expression of genes involved in cancer and inflammation. Current research focuses primarily on the role of environmental and dietary compounds on epigenetic regulation of breast cancer tumor suppressor and proinflammatory genes and prevention of breast and colorectal tumorigenesis by dietary compounds including those commonly found in the Mediterranean diet. As editor, Dr. Romagnolo coedited with John Milner a volume entitled *Bioactive Compounds and Cancer* for the *Nutrition and Health Series* published by Springer Science+Business Media.