

# Dietary Chinese Herbs

Yanze Liu · Zhimin Wang  
Junzeng Zhang  
Editors

# Dietary Chinese Herbs

Chemistry, Pharmacology  
and Clinical Evidence

 Springer

*Editors*

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# Foreword I

“We are what we eat.” This old saying rings true as an increasingly large body of scientific evidence has revealed the close relationship between food and health. In China, we say “disease comes through the mouth,” meaning that bad food choice leads to illness. Indeed, human life relies on three basic resources: the air we breathe, the water we drink, and the food we eat. Human health is thus the outcome of constant interplay among genetic background, environmental condition, and food choice.

In traditional Chinese medicine (TCM), illness means imbalance and the focus is always to adjust and restore the balance. Over 2,000 years, TCM has used herbs and other approaches such as acupuncture, for treatment and prevention of diseases. The prevention approach or health conservation has been an important part of TCM. The oldest herbal “Shen Nong Ben Cao Jing” (Shen Nong Materia Medica) has 120 nontoxic herbs categorized as a superior group, and most of them are tonics and used for health preservation. This forms the basis of using medicated foods and dietary herbs in health maintenance—“food is medicine.”

This book, “Dietary Chinese Herbs: Chemistry, Pharmacology and Clinical Evidence,” edited by Drs. Liu, Wang, and Zhang brings to readers concise reviews of the history of dietary herbs in China, the perspective of natural health products and nutraceutical application relevant to dietary Chinese herbs and ingredients, and focuses on 86 selected herbs that are commonly used and regulated as food or health food raw materials in China. The editors are well-established researchers, all with background in traditional Chinese medicine and phytochemistry, natural products chemistry, or medicinal chemistry. My colleague Dr. Liu had worked on Chinese herbal research in leading institutions in the United States for many years, while Dr. Wang is an expert in China on TCM quality and standardization, a member of the Chinese Pharmacopoeia Commission. Dr. Zhang currently leads the functional ingredients chemistry R&D of a national program on natural health products and functional foods in Canada. They are all passionate about the health benefits of dietary herbs, the bioactive components, mechanisms of actions, and new health food products development.

I have been working in the field of medicinal plant research for more than 60 years, but the love and understanding for medicinal plants never ceases. I am glad to see the book *Dietary Chinese Herbs* edited by Drs. Liu, Wang, and Zhang. Among the books that have touched on TCM for its dietary application, this one is unique as it provides a collection of high-level scientific literature reviews on the most commonly used dietary Chinese herbs. It will be a good reference book for researchers, graduate students, and R&D managers from industry of natural health products, dietary supplements, and functional foods.

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## Foreword II

Traditional Chinese medicine (TCM) and Chinese materia medica (CMM) have thousands of years of history and are important elements of Chinese culture. Most CMM are derived from botanical materials or plants, so they are called Chinese herbal medicines. Historically, decoctions and herbal teas have been the most popular and effective forms; however, tablets, pills, capsules, lozenges, and injections have become the mainstream of modern CMM. Throughout the history of clinical practice, people have recognized and recorded properties such as taste, function, therapeutic effect, dosage, administration, side effects, and toxicity of various herbs. People also understand that some herbs are mainly used for therapeutic purpose, while others are used for their health-maintaining properties. Also, some herbs are mainly consumed as foods, although they show certain biological function and health benefits.

Drs. Liu, Wang, and Zhang have each been working on CMM and natural health products for more than 30 years. With similar research experience and interests, they selected 86 herbs with health-maintaining properties and invited a group of experienced researchers from China, USA, and Canada who worked in this area to contribute to the book shown here.

The book is composed of 88 chapters, including two introductory chapters and 86 chapters on specific dietary herbs, such as renshen (*Panax ginseng*), danggui (*Angelica sinensis*), shanyao (*Dioscorea opposita*), bajitian (*Morinda officinalis*), gegen (*Pueraria lobata*), baiguo (*Ginkgo biloba*), gouqi (*Lycium barbarum*), luhui (*Aloe barbadensis*), jinyinhua (*Lonicera japonica*), juju (*Cichorium glandulosum*), lingzhi (*Ganoderma lucidum*), and yangqicai (*Sargassum fusiforme*). Each herb is described based on botanical identity, chemical constituents, pharmacological studies, TCM application and dietary usage, clinical evidence, safety evaluation and toxicity data. In the botanical identity section, color photos of plants showing typical plant morphology give readers clear information on the sources. Main components, bioactive compounds, and marker compounds with updated references are included in the chemical constituents section. In the pharmacological studies section, traditional, confirmed, and newly discovered pharmacological activities are summarized. In the TCM application and dietary usage section, examples of dietary

usage are included. As one of the current foci on safety and toxicity, authors also included relevant data published for readers' reference.

I have been working in this area, especially pharmacological research, for more than three decades and have traveled to Japan, USA, Korea, Malaysia, and other countries for research and academic exchanges on herbal medicine. It is my honor to have this opportunity to introduce the book. I am sure that readers who are interested in herbal medicine can find what they are looking for.

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# Preface

The concept of “food is medicine” can be dated back to 2,000 years ago in the earliest traditional Chinese medicine (TCM) literature “Huang Di Nei Jing” (“黄帝内经”, or “Emperor’s Inner Canon,” 475 BCE–220 CE), where it emphasized the importance of maintenance or preservation of wellness and health and the prevention of illness and diseases, with the old but still valid notion “the best doctor prevents, not treats illness.” As such, maintaining system balance with the use of food, herbal medicine, and other complementary approaches in an integrated manner is the essence of TCM for disease prevention and treatment.

Over thousands of years, food materials have been continuously studied for their health benefits, while a wide range of TCM herbs have also been investigated and incorporated into the daily diet for maintaining general wellness or prevention of certain diseases in China. In the West, the convergence of food and medicine driven by market force has led to increasing demand for dietary supplements, natural health products, nutraceuticals, or functional foods. This trend has also stimulated interest in the West to look at many natural materials that could be used as sources for developing new, effective, and safe ingredients to capture the rapidly expanding opportunity in the global market place.

The book idea came out a few years ago when the three of us, working in China, Canada, and the United States at that time, were all involved in studying or reviewing the bioactive components of dietary herbs. We realized that, although there is a large and rapidly growing body of scientific information in the literature for various Chinese herbs, it is somewhat scattered and not specific toward dietary applications. The book *Dietary Chinese Herbs* is our first attempt to bring together selected TCM herbs and highlight the plant source, traditional use, main chemical components, biological and pharmacological activities, and clinical and dietary uses. It is not meant to cover all the available information, but rather to introduce these selected herbs with some of the research findings and relevant information on TCM and dietary uses in China. We hope it can be a useful reference for researchers and students in academia, R&D, and business managers in dietary supplement, natural health products, and the functional food industry.



The contents are arranged by starting with a brief chronological review of Chinese literatures on dietary herbs, overview of food and nutraceutical applications, and followed by chapters dedicated to each selected dietary herb. For each dietary herb or group of similar herbs, the plant source, processing method, TCM, and dietary uses will be introduced, and then followed by up-to-date literature reviews of some key chemical, pharmacological, and clinical studies.

In the preparation of this book, we are grateful to the dedication of all contributors for their rich knowledge and diverse perspectives in organizing the chapter contents. We also appreciate the time and efforts of the following students from the Applied Human Nutrition program, Mount Saint Vincent University, Halifax, Canada for language editing assistance: Laura Bellussi, Elizabeth Dickson, Shelby MacGregor, Esther Adsett, Kennedy Bennicke, Gillian Blundon, Ashleigh Cassell, Sarah Creelman, Hayley Ewing, Susan Gillespie, Michelle Higgins, Liza Hooper, Tika Jakobsen, Joseph Legere, Molly McLaughlin, Megan Phillips, Katrina Ross, Katie Tanner, Amanda Worth, Erada Alghamdi, Kim Allen, Melissa Church, Angela Crouquet, Virginia De Silva, Sarah Hallett, Mallory Harvie, Katie Inkpen, Kristen Lutes, Sarah McKay, Janie Nelson-Isenor, Olivia Newton, Leila Shaw, Clarissa Smith, and Mylene Whynot.

We are also greatly indebted to Qiwei Zhang for his help in coordination of the manuscripts and assistance in editing, as well as to Bohdan L. Luhovyy and Phillip Joy for organizing the English editing work.

Last but not least, we would like to thank the publisher Springer and its publishing editors Stephen Soehlen and Annelies Kersbergen for all the patience and support over the years to bring this from an idea to reality.

Yanze Liu  
Zhimin Wang  
Junzeng Zhang

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# Editors and Contributors

## About the Editors

**Dr. Yanze Liu** graduated from Henan University of Traditional Chinese Medicine (HUTCM) and received his Ph.D. in Organic Chemistry from Zhengzhou University (ZZU), China. He was a visiting scholar at the Institute of Materia Medica, Chinese Academy of Medical Science (CAMC 1985), Beijing, and Okayama University, Japan (1988–1992), who focused on the isolation and structure determination of botanical tannins and polyphenols. He was promoted to associate professor (1991) and full professor (1995), and served as associate director and director in the Department of Organic and Natural Product Chemistry since 1992 at HUTCM. In 1999 Dr. Liu went to the Department of Chemistry, The Pennsylvania State University for his visiting research, and then was transferred to Bio-organic and Natural Product Lab, McLean Hospital/Harvard Medical School, working as postdoc fellow and then as instructor.

Since 2010, Dr. Liu was invited to take the position in charge of *Chinese Herbal Medicines*, a newly founded journal published in English as a senior editor and serve as a full professor in Beijing Union Medical College/CAMC. Dr. Liu as a principal investigator took charge of three national projects of National Natural Science Foundation of China (NSFC) since 1991, one Key Project of National Scientific Research of 9th Five-Year Plan, and one Project of Henan Provincial Foundation for Excellent Young Scientist.

Dr. Liu is a guest speaker of New England School of Acupuncture, Boston, and adjunct professor of ZZU, Beifang University of Nationality, Harbin University of Commerce, and Nanyang Medical College. He was a member of experts of National Toxicology Program under NIH to evaluate 12th Report on Carcinogens. Dr. Liu received a dozen awards and honorary titles including Excellent Young Scientist of Henan Province given by Henan provincial government; published more than 120 papers on national and international journals; invented and patented flash extractor and concentrator for herbal medicine research; and licensed and patented a number of new herbal health products.

Dr. Liu's research was highlighted in the Progress Report of NSFC (1996) as the only one in the area of chemistry and also in the cover of *Chinese Herbal Medicines* (April, 2014). His research interests include natural product chemistry, R&D of healthy food and herbal products, quality control and standardization of herbal products, analysis and characterization of tannin and polyphenol, and crystallization of organic compounds.

**Dr. Zhimin Wang** is the Chief Professor of China Academy of Chinese Medical Sciences (CACMS), Director of National Engineering Laboratory for Quality Control Technology of Chinese Herbal Medicine, and Deputy Director of State Key Laboratory for New Technology in Manufacture Process of Chinese Medicines, from Institute of Chinese Materia Medica (ICMM), CACMS. Dr. Wang obtained his B.Sc. (1984) in Pharmacy from Henan University of Traditional Chinese Medicine, M.Sc. (1991) in Phytochemistry from China Pharmaceutical University, and Ph.D. (1994) in Medicinal Chemistry from Institute of Materia Medica, Chinese Academy of Medical Sciences and Peking Union Medical College, China.

Prof. Wang mainly engages in phytochemistry, quality standard, and quality evaluation of Chinese herbal medicines, and antitumor new drug development. As a principal investigator, he was involved in over 55 research projects related to basic research (National 973 Project) and R&D of new medicines and quality control of Chinese medicines since he joined ICMM. Dr. Wang received over fifteen scientific awards, published more than 300 research papers, and 16 books, including four books in which he served as editor-in-chief. As a senior expert for authoritative evaluation of novel food in China, he is responsible for reviewing the chemistry, quality, and production process of novel food from botanical resources or folk medicines.

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Dr. Zhang then joined Ocean Nutrition Canada Ltd. (ONC, now a division of DSM) as a senior research scientist in the year 2000 to work on a marine-based natural health products and functional food discovery and development, later assumed the role of group leader and principal research scientist in natural products chemistry, and then the manager of licensing and research collaborations at ONC by focusing on potential product licensing opportunities and coordinating R&D collaborations in 2005. While working at ONC, he also took a part-time program at

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