

Preface

After giving a presentation on the topic of “Modern Research on Traditional Herbal Medicine” in the American Chemical Society national meeting (September 2006, San Francisco), I received an e-mail from John Wiley & Sons asking if I would write a book with the same title.

Research on traditional herbal medicine involves botany, chemistry, biology, pharmacology, toxicology, clinical trials, and other disciplines. Chemical composition and biological or biochemical activities of many herbs have been studied by researchers in universities and pharmaceutical companies for purposes of investigation or new drug development. So far, there have been many books introducing functions or actions of herbs. Books on the chemistry of herbal medicines (often called phytochemistry), biochemistry, biology, and pharmacology of herbal medicines are also available. But there is no book giving a full description of all aspects of herbal research and development.

The purpose of research on traditional herbal medicine is not only for new drug development, but also for quality control and mechanism study of herbs. Unlike screen for new drug candidates simply using one or two bioassay tests, exploration of the mechanisms of traditional herbal medicines is much more complex. It requires close cooperation between scientists from many disciplines to unveil the secrets of the herbal kingdom. For maximal cooperation, pharmacologists, biologists, chemists, and clinical doctors need to have basic knowledge of the cooperating fields. To scientists who are very knowledgeable in modern science and have extensive research experience, their knowledge about the applications and theories of traditional medicines, for example, traditional Chinese medicine (TCM) and ayurveda, might be limited. For this reason, their research designs for these herbs may simply copy those for new drug development. As a consequence, the results may not be accurate due to either inappropriate design of extract methods, insufficient experiment duration in animal study, or lower concentration of samples used for bioassay tests. This is why studies using the same assay for the same herb from different labs have often reported different results.

This book introduces the methodology of collection and identification of herbal materials, extraction and isolation of compounds from herbs, *in vitro* bioassay, *in vivo* animal test, toxicology, and clinical trial of herbal research. It is not written as a literature review. Instead, it introduces the basic content and methodology of each research field and the keys for the study of herbal medicine. The purpose of this book is to help scientists who are interested in the study of traditional herbal medicine gain a broader view of herbal medicine and knowledge about its research. I hope this book can be a bridge to provide scientists in different fields with basic information and knowledge about the progress of herbal study and to help them avoid unnecessary mistakes during the studies.

As for background information on my relationship with traditional herbal medicine, I received my B.S. in Chinese Herbal Medicine, my M.S. in pharmacognosy, and my Ph.D. in natural product chemistry in succession from Shenyang, China. My doctoral supervisor

was Xinsheng Yao of Shenyang Pharmaceutical University, a well-known phytochemist and academician in China. I left China as a professor of phytochemistry at Liaoning University of Traditional Chinese Medicine and traveled to Germany as an AvH Research fellow. There I worked in the lab of Rudolf Bauer at Duesseldorf University, a world-renowned expert in plant medicine, in particular of Echinacea, and an aficionado of Chinese herbs. I focused on bioassay screening and standardization of herbal medicines. Later I moved to New York and worked in the lab of Koji Nakanishi at Columbia University, and then to Chicago, where I worked with Norman Farnsworth and John Pezzuto at the UIC/NIH Center for Botanical Dietary Supplement Research in Women's Health at the College of Pharmacy, University of Illinois at Chicago. The project there was the mechanism study of herbs for treating women's menopause symptoms, using *in vitro* bioassays and *in vivo* animal tests.

Unfortunately, I became afflicted with rheumatoid arthritis while I was in Chicago. My wrist gave me so much pain that I was too weak to even open a reagent bottle. Even while being treated with Western medicine, I was once paralyzed and could not get out of bed. For health reasons, I thus had to leave Chicago's harsh weather for California, and started to treat myself with Chinese herbs and acupuncture, in addition to treatment with Western medicine, while working in a research lab for pharmaceutical analysis. In my spare time, I taught Chinese Herbology, TCM Nutrition, as well as modern pharmacology and nutrition, at various schools of acupuncture. A few years later, I opened my own clinic of herbs and acupuncture. Since then I have been treating patients with my combined knowledge on the functions of traditional herbs and their modern biological and pharmacological activities, meanwhile, developing herbal products based on the efficacy of herbal formulas in clinical application. Research, teaching, plus clinical practice strongly consolidated my knowledge on both traditional and modern medicine, and helped me review TCM theories more deeply from multiple perspectives.

My research results on herbs in the past 25 years told me that they work in a way that different from modern drugs: the effect is not from one single compounds in an herb, but is a synergetic results from many components working on many targets. And researchers should not be disappointed if their results showed that the most bioactive compounds screened from an herbal extract in a bioassay are popular second metabolites in plants. Examples include flavonoids, fatty acids, or amines.

The successful treatment of a variety of diseases in my clinic with Chinese herbal formulas has reminded me of what I had first learned during college: the effective treatment with Chinese herbs is mostly based on formulas composed of several or more individual herbs, rather than single ones, and the formulation of a Chinese herbal prescription is guided by theories of TCM. But most scientists conducting research on traditional herb medicine today are either unaware of or are neglecting this.

My research in China, Germany, and the United States has extended my knowledge of phytochemistry, analytical chemistry, biochemistry, biology, and pharmacology and experience with extraction, isolation, identification and analysis of compounds in herbs and their bioassay screening and mechanism study with *in vitro* and *in vivo* tests. This is the reason that boldly accepted the invitation to write this book. To make ensure each

chapter in this book more authoritative, I invited several experts from different fields in China to write some chapters. In the process of my editing, necessary rewriting, rearrangement, additions, and clarification of content were made with the agreement from authors. However, due to limited space, it is impossible to cover all aspects or give detailed information in each chapter. I hope this book will work as a guideline for new scientists working with modern technologies and help them to explore more secrets in the treasury of traditional medicines.

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