Cancer Inhibitors from Chinese Natural Medicines

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Cancer Inhibitors from Chinese Natural Medicines

This book is dedicated to Prof. P.R. Pettit, director of the Cancer Research Institute at Arizona State University, and to Prof. H. Itokawa, supervisor of my PhD program at Tokyo University of Pharmacy and Life Sciences, for their outstanding accomplishments in the discovery and development of novel anticancer agents from natural sources and herbs; to my wife, Wendy, and son, Alex, for their full understanding and strong support; to the memories of my parents, Mr. Bingheng Xu and Mrs. Tingying Li, for their deep love; and to my uncle-in-law, Dr. Mike Y.H. Wu, for his earnest encouragements.

Preface

The risk of cancer is significantly increasing nowadays, which is a serious social and health problem threatening human beings. Hence numerous scientists continuously endeavor on this imperative issue of conquering the malignant disease and declining the incidence of cancer. Because over 60% of currently used anticancer agents are derived from natural sources directly or indirectly, the discovery and development of new effective and safe cancer inhibitors from folk medicines still are important research subjects. In recent decades a large quantity of natural products isolated from Chinese natural medicines have been found to have remarkable bioactivities in the inhibition of cancer cell proliferation, induction of apoptotic death, lessening of metastasis, blockage of angiogenesis in the tumor tissues, and enhancement of present chemo- and radiotherapies. All these remarkable achievements not only afford scientific reasons for utilizing Chinese herbs to augment conventional therapies but also provide various important information for new drug design and development and new therapy strategies to improve the quality of cancer treatment and prevention. The greatest successful example of the discovery and development of novel drugs from Chinese natural medicines is artemisinin, a powerful antimalaria drug from a Chinese herb, *Artemisia apiacea*. The drug was complimented by the World Health Organization for saving millions of patients who suffered from the malarial disease, and the discoverer, Dr. Du Niuniu, was awarded the Nobel Prize for medicine in 2015. This fact strongly inspires scientists to dig into the treasure of Chinese natural medicines. There is an enormous and untapped potential in natural herbs that are beneficial to human health.

The overview of cancer inhibitors from Chinese natural medicines could roughly be classified into five types: (1) inhibitors with powerful cytotoxicity similar to those of current chemotherapeutic agents but displaying toxicity and side effects; (2) inhibitors that exert marked anticancer effects but are lower than (1)-type inhibitors and have minor toxicity or nontoxicity; (3) inhibitors with moderate effects on cancer cells and also have immunoregulative and/or antioxidant properties; (4) inhibitors that are weakly effective against cancer cells but are capable of stimulating the functional immune system and antioxidative system; and (5) inhibitors that normally do not directly affect cancer cells but remarkably enhance the cytotoxicity of the functional immune factors of the host to attack the cancer cells. Based on research results, the multiple types of cancer inhibitors are known to be often involved in single herbs that play diverse roles in cancer therapies. For the improvement of life quality and life duration, different inhibitor-containing herbs, in many cases, are effectively combined in the prescriptions of Chinese medicine by doctors in China to treat cancer patients.

This book primarily is focused on the interface of chemistry/biology and molecular biology, and comprehensively summarizes recent cutting-edge research advances in the field of cancer inhibitors (including extracts and compounds) from Chinese natural medicines. To underline how Chinese natural medicines research continues to make predominant contributions in the domain of the discovery and development of novel cancer inhibitors, this book highlights the scientific evidences of 238 Chinese herbs in eight major aspects: (1) advanced discoveries of cancer inhibitors from Chinese natural medicines; (2) *in vitro* and *in vivo* inhibitory effects against different types of cancer cells, such as their antiproliferative, antigrowth, antimetastatic, antitumorigenic, and antioxidant properties; (3) modern exploration of suppressive mechanisms; (4) synergetic activities in the combination of current cancer therapies with the inhibitors; (5) reversal advantage of the inhibitors against drug resistance; (6) structural modification to derive more important molecules for drug development; (7) formulation researches on nanocapsules/microparticles, immunotoxin/antibody–drug conjugate, and metal complex; and (8) clinical trials and practices of herb extracts and/or promising inhibitors derived from Chinese Natural Medicines (CNM).

Consequently, this book brings readers comprehensive and illuminating insights into cancer inhibitors from Chinese natural medicines. The 238 Chinese herbs have been categorized into 14 chapters in the book according to their main functions in Chinese medicine. For most of the selected herbs, the research data have been collected up to October 2015, from the latest challenges in the anticancer approaches. A large number of abbreviations are used in the book for the convenient description of the mechanisms and others, thus an Index of Acronyms was provided for the entire explanation. Also, numerous Asian journals are cited in the Reference sections of this book. Many of the journal names are quoted with a phonetic transcription of Chinese, Japanese, or Korean. Readers can use Google to search their corresponding English translation, and Google may sometimes bring you to the website of the journal you are searching for.

Finally, I desire that this reference book should provide readers not only abundant information on anticancer chemical biology and molecular biology but also elicit great ideas for utilizing the potential drug candidates and/or adjuvants to challenge the cancer disease in both therapy/prevention and drug development.

Jun-Ping Xu

Author

Jun-Ping Xu, a research professor at the School of Molecular Science at Arizona State University, USA, received his undergraduate training in pharmaceutical science at Shanghai University of Traditional Chinese Medicine, China, and pursued advanced professional studies at Shanghai Institute for Drug Control, China. He started his academic career on Chinese natural medicines at Shanghai Institute of Pharmaceutical Industry, China, and then studied abroad in Japan. After he earned his PhD degree at Tokyo University of Pharmacy, Japan, he returned to Shanghai to join Professor Rensheng Xu's group at the Shanghai Institute of Materia Medica (SIMM), Chinese Academy of Science, to research biologically active and functional agents from Chinese herbs. During two years at SIMM, he submitted nine papers to well-known international science journals and one review. In 1991 he came to the United States to join the Cancer Research Institute at Arizona State University as a postdoctoral research fellow, working with the director, Professor George R. Pettit, on the discovery and development of novel cancer inhibitors from marine organisms and microorganisms. He has published over 100 scientific papers related to these interests. From 2008 to 2013, he taught a class on the history of Chinese medicine to introduce the origination and development of Chinese medicine and basic concepts of the Chinese medicine theoretical system and practice skills, as well as ancient Chinese philosophy, for university students in the Chinese flagship program.

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