



NATURAL PRODUCTS

Essential Resources for Human Survival

Yi-Zhun Zhu • Benny K-H Tan
Boon-Huat Bay • Chang-Hong Liu

editors

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NATURAL PRODUCTS

Essential Resources for Human Survival

*This book is lovingly dedicated to
our children,*

*Julia and Linda ZHU
Noel and Nigel BAY
Barnabas, Beatrice, Bernice
and Bernadine TAN
Min LIU*

*for their constant understanding and
encouragement in all our endeavours*



FOREWORD

At the 3rd International Conference on Natural Products co-hosted in October 2004 by the International Society for the Development of Natural Products and Nanjing University, participants from 37 countries including natural product scientists of international renown scientists came to a conclusion that the great biochemical potentials of plants and microorganisms generate various arrays of chemically complex and/or biologically active natural products, some of them being a MUST for human survival.

This book is edited to provide international readers with the major progress in natural products research. The topics include biosynthesis, chemical synthesis (or modification) and bio-transformation and the diverse range of bioactivity of natural products, and the role of biotechnology to enhance the quality of natural products and their development around the world. The on-going efforts in natural drug discovery, validation, and commercial utilization are a great plus. The editors of the book - Dr Benny K. H. Tan, Dr. Y. Z. Zhu, Dr. B. H. Bay and Dr. C. H. Liu - are leading scientists in different fields of natural product research. The publicity for this monograph certainly highlights well the importance of natural products, and their applications to human disease.

Ren Xiang TAN

*Chair Professor & Associate Vice-President, Nanjing University
President, International Society for the Development of Natural Products*

Note from the Editors

Recently, there has been a renewed interest in the beneficial effects of natural products for the prevention of chronic diseases. It has been estimated that 80% of the world's population rely predominantly on natural plant products which are sold as herbal/food supplements or drugs. Half of the top 50 drugs sold in European pharmacies are based on or derived from natural products. In particular, natural products have become hot spots for life science researchers since many possess unique compounds which remain to be isolated and identified. Despite this, our knowledge and understanding of how and why natural medicines work remain inadequate, thereby limiting their use in patients, especially in Western societies. The chapters in this book will provide readers with the latest overview of natural products research, reporting the chemistry and pharmacology of a range of natural products, from Chinese herbal medicine to tea extracts, microbes to marine sponges and the latest technologies to enhance the synthesis, isolation and purification of bioactive herbal compounds from these products. Additionally, chapters on new tools in information technology that can greatly facilitate the research of natural product scientists, and the technologies available for evaluating medicinal herbal products for purity add value to the book. Overall, the information to be found in this book will add to the existing body of knowledge of natural products, and further support the notion that natural products are an essential resource for human survival.

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Phytonutrients - The Natural Drugs of the Future

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For over 80 years now the allopathic industry, combined with the might and power of the pharmaceutical giants, has been trying to combat degenerative diseases. Though many advances in the diagnosing of diseases and the discovery of a myriad of new names to diseases has occurred, the battle to increase quality of life and the overcoming, curing and proper treatment of degenerative diseases has been all but lost. Allopathic medicine has not changed its treatment of cancer in over 40 years. Though new drugs keep popping up, the results are still the same and the most effective treatment for cancer is still surgery. Heart disease, diabetes, arthritis, leukemia, Alzheimer's, Parkinson's, Hodgkin's, and dozens of other disease names strike fear into our minds and as we age, many of us contemplate... "Which one will take me from this life and how will I fight it?" Today with the current standard of allopathic medicine it is only a matter of time before you are beaten by one of the many known or even unknown degenerative diseases. There are no known cures to any of these degenerative diseases. Currently your only option is a long list of prescription drugs that may alleviate symptoms but slowly eat away your body's immunity and quality of life.

There is hope however. For more than 20 years now scientists have been researching plants and discoveries made within the last 15 years may hold some of the answers to combating many of the degenerative diseases that plague our senior years. We have known for a long time that many of these diseases can be prevented or even cured by changing our lifestyle and eating more fresh fruits and vegetables. Until recently many doctors scoffed at the thought that eating fresh fruits and vegetables would cure a disease. Even today the Food and Drug Administrations policy regarding food that is unadulterated (meaning natural foods) is that they cannot make you sick nor make you well and that no claims on labels or ads can be made to say that they are healthy for you.

However, new discoveries have proven that there are active ingredients in whole, unadulterated fruits and vegetables that can make us well and actually prevent, and in many cases, cure diseases.

Have you ever asked yourself...

- How can I reduce my risk of getting cancer?
- How can I protect myself from toxins and pollutants in the air and environment?
- How can I boost my immune systems to fight off new viral strains?
- How can I prevent premature aging and the degenerative diseases that come with it?

Your answers may lie with these new active nutrients found in simple fruits and vegetables. These new active compounds have been given the name of Phytonutrients. The word “phytonutrients” simply means nutrients that originate or are found within plants. Adding to your diet nature’s most powerful phytonutrients is certainly paramount in protecting yourself and your family from the ravages of disease. The earlier we start eating fruits and vegetables, the better for our bio-cellular health. While we anxiously wait for the cure of cancer and other devastating diseases, we can arm our bodies with the most powerful protective nutrients available, Phytonutrients.

Classes of Phytonutrients

There are thousands of known phytonutrients and they have been grouped into many different classifications. Many of these you will find that you already know while others you may have never heard of before. All are of benefit and in various clinical studies, many have been proven to prevent, treat and cure degenerative diseases. I will attempt to cover the major classes of phytonutrients in order to help you understand what you are eating in those many fruits and vegetables you consume everyday. Since I began to study phytonutrients it has been hard for me to eat a fruit or vegetable without saying to myself the name of the phytonutrient found in that particular fruit or vegetable. It is very hard to eat a tomato anymore; instead it has become my daily dose of lycopene. I hope the following

chapters do not have a similar effect on you but I do hope that they just might help you understand the wisdom in your mother's vocal command of "Eat your veggies!" during every meal of your childhood years.

BIOFLAVONOIDS

The term bioflavonoid refers to a large family of chemicals found throughout the plant world. Bioflavonoids are sometimes called vitamin P; however, they are not technically vitamins. So what exactly is a bioflavonoid?

Bioflavonoids are phytonutrients or plant derivatives that can have remarkable effects on biochemical pathways in human physiology. There are over 20,000 known bioflavonoids registered in chemical abstracts and over 20 million structures that fit into their chemical classification.

Bioflavonoids occur naturally in fruits and vegetables but they are subject to rapid decomposition and degradation during storage and cooking. For this reason it is important that if you choose to take a bioflavonoid dietary supplement it must be one that is made fresh, contain natural stabilizers to insure the active compounds are still active and it must be combined with all the necessary co-factors needed to activate the bioflavonoids. Bioflavonoids are considered "synergists" to vitamin C and must be combined with vitamin C for optimal benefit. For this reason I usually suggest that one stick to just eating fruits and vegetables that are high in bioflavonoids such as citrus and thus avoid the expense of supplements that may or may not work.

There are numerous bioflavonoids presently undergoing intense study in laboratories all over the world. The emerging results are exciting, to say the least. Clearly, bioflavonoids are becoming extremely impressive phytonutrient agents in cancer prevention.

While many flavonoid concentrates were used in ancient times to treat a variety of human diseases, modern medicine has failed to utilize their enormous therapeutic potential. Nutritional standards are assumed to provide us with all the vitamin C and bioflavonoids we need to be healthy. Even if these set quantities were accurate for maintaining optimal health, how many of us eat diets nutritious enough to maintain maximum health and protection? In other words, do we consume enough fruits and

vegetables to afford us adequate levels of vitamin C and bioflavonoids to provide the protection we need?

“The USDA conducted a study in which they collected dietary information over the course of the year for four independent days. In that study 20% of the adult women had no fruit or juice for four days, and about 45% had no citrus fruit or citrus fruit juice in four days.”

Only 9% of our population gets and eats enough fruits and vegetables on a consistent basis. Unquestionably, most of us are not getting enough vitamin C and flavonoid compounds from our diets.

In addition, it's important to remember that modern farming techniques, premature harvesting of fruits and vegetables, indefinite cold storage, freezing, canning and cooking may denature food of its vitamin C and bioflavonoid content.

Because we know that diseases are often nothing more than nutritional deficiencies, we must make adequate supplementation a priority if we want to enhance our longevity.

There are many different types of bioflavanoids. Some of the most common and thoroughly studied are listed below.

BIOFLAVINOIDS: PROANTHOCYANIDINS

For generations, certain tribes of North American Indians used bioflavonoids extracted from the bark of pine trees for a variety of disorders. Because of its marvelous healing properties, they called this pine the Annedda, or “tree of life”. These Native Americans, who routinely ate deer as their primary source of protein, when confronted with a scarcity of meat asked themselves...where does the deer get its strength? They discovered that deer stripped away pine tree bark and were able to derive life-giving nutrients from its organic composition.

It was also observed that devastating diseases such as scurvy did not afflict those who ate the bark, leaves, or needles of this pine tree. In 1535, Jacques Cartier learned of the medicinal value of the bark, which remained relatively unknown until 20 or 30 years ago when scientists reviewed his notes and commenced research.

Cartier became caught in the bitter snows of Quebec while attempting to navigate the St. Lawrence River. Cartier and his crew subsisted on hard biscuits and cured meat and eventually came down with

what was believed to be scurvy. Scurvy is an abhorrent disease, which causes a very slow and agonizing death.

Several of Cartier's men died before they were approached by the Quebec Indians who prepared a tea they called "Annedda" from the bark of a certain native pine tree. The men took the tea and used the pine needles as poultices. Their recovery was almost immediate. What must have seemed like a miraculous substance was technically, nothing more than vitamin C with bioflavonoids naturally inherent to the pine tree.

Cartier was resourceful enough to document the incident. Over 400 years later, a French professor, Jacques Masquelier, assigned to the University of Quebec discovered Cartier's account. Because he was already involved in bioflavonoid research he became greatly intrigued by pine tree extract. Dr. Masquelier discovered and isolated a bioactive substance known as proanthocyanidin.

After returning to France, Professor Masquelier discovered that these compounds could be extracted from the bark of the French Maritime Pine (*pinus maritima*) found in abundance in southern France. Subsequent intensive research by Dr. Masquelier led to the discovery of the proanthocyanidin family of bioflavonoids. At the time Proanthocyanidins were thought to be the most powerful natural free radical scavenger available. This natural flavonoid has an antioxidant activity 20 times stronger than vitamin C and up to 50 times stronger than vitamin E. Proanthocyanidins are considered safe and effective in the treatment of various diseases and the maintenance of optimal health. This family of bioflavonoids is non-toxic, water-soluble and highly bioavailable.

Because proanthocyanidins scavenge free radicals so effectively, they have shown remarkable curative effects. Extensive research demonstrates that proanthocyanidins are such potent antioxidants they find and neutralize free radicals with great rapidity, allowing cells to regenerate rather than deteriorate.

Specific actions associated with proanthocyanidins include:

- Binds with Collagen and helps with skin elasticity
- Helps prevent excess wrinkling
- Protects capillaries from free radical damage which helps prevent phlebitis, varicose veins and bruising
- Acts as a powerful, natural anti-inflammatory for joint pain and injuries

- Helps control and prevent edema
- Improves the condition of the blood-brain barrier and reverses edema of the brain
- Decreases the production of histamines in Hay fever
- Treats and reduces risk of diabetic retinopathy

Proanthocyanidins have been found to benefit the following conditions

- Ulcers
- Eyesight: Increases visual acuity
- Cancers: Inhibits tumor growth
- Heart Disease
- Atherosclerosis
- Arteriosclerosis
- Multiple Sclerosis
- Colds and Flu
- Prostrate Problems
- Lupus
- Arthritis
- Memory/ Alzheimer's Disease, Senile Dementia
- Stroke
- Parkinson's Disease
- Psoriasis
- Bursitis
- Gastrointestinal Problems
- Insomnia

One of the most significant advantages of this flavonoid compound is its ability to cross and build the blood-brain barrier. Consequently, it acts as an invaluable therapeutic agent in treating depression, chronic fatigue, insomnia or loss of memory.

Other scientific tests have indicated that proanthocyanidins also possess anti-ulcer properties and may work to prevent the formation of undesirable chemicals in the stomach.

The general consensus among many experts in the health field is that proanthocyanidin supplementation is destined to become the most valuable of all the antioxidant compounds. In addition, as more scientific