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Chinese Medicinals

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INTRODUCTION

Natural products have been used for medicinal purposes since ancient times. These include materials from plant, animal, and mineral sources, with the majority derived from plants.

Traditions of materia medica differ among different cultures. Some are rudimentary and primarily verbal while others are extremely extensive and well documented. Examples of the former include medicine as practiced in the jungles and remote regions of Asia, Africa, Australia, and tropical America. This form of medical practice still incorporates a sizable amount of magic or witchcraft but is the one that has captured and continues to capture a major part of our attention. This is due to a number of reasons, including the following two. One, it satisfies the pioneering American spirit where one goes after something exciting that can produce headlines; the end result, which is to seek leads to effective drugs, often appears to be secondary. Two, due to the lack of easy access to non-English or non-European medicinal records, jungle medicine seems to be the only alternative for most American or Western researchers.

In contrast to the primitive practice of herbal medicine and its verbal tradition as currently found in the jungles, there are some very extensively documented medical traditions that are out of reach of most Western researchers. This is not due to a separation by physical distance, but rather by the language barrier. The most extensive and best documented source of materia medica can be found in traditional Chinese medicine. I hope this paper can serve as an introduction to this so far largely untapped resource.

HISTORY

Although Chinese materia medica may not have as long a history as those of Egypt or India, it is the most well-documented and enjoys the most continuous use. Today, the majority of Chinese still depend on it regularly for their health care and so far little of it has been "rationalized" out of existence by modern science, a contrast to traditional medicinals of some other cultures. It is extremely tempting for us to rationalize the effects of an herb or herbal preparation based on the often limited chemical or biological data on it. When we cannot capsule our rationalization in a familiar mold, we often tend to label the herb as worthless. Conversely, if our rationalization fits a preset mold that we can understand, we tend to consider the problem solved and pronounce the medicines either "active" or "inactive." Examples of such medicinals include rhubarb, aconite, and cinnabar.

When we see the word rhubarb (root/rhizome), we instinctively think of it as a cathartic because we in America tend to judge the value of a plant drug by its best known chemical components which in this case happen to be cathartic anthraglycosides. We also associate aconite and cinnabar with strong poisons because of the toxic chemicals they normally contain (aconitine and mercuric sulfide). Yet in Chinese medicine, all three are commonly used for purposes other than those most Westerners know. For example, rhubarb is one of the most used medicinals for upper

gastrointestinal bleeding in China, as evidenced by the large number of clinical reports on this use (Jiao et al. 1980, Jiao et al. 1988, Sun et al. 1986); processed aconite is an ingredient in some Chinese tonics; and cinnabar is a commonly used sedative, although we normally would consider it an antiseptic for external applications only.

Chinese herbal medicine is empirically based. It is the accumulated knowledge of more than four thousand years of practical experience. Based on ancient literary records, we now know that back in 1100 BC during the West Zhou era, Chinese medicine had already developed into different branches, including disease therapy, ulcer therapy, diet therapy and veterinarian medicine.

The following are some of the most well-known documents on Chinese medicinal plant use:

Wu Shi Er Bing Fang (Prescriptions for Fifty-two Diseases)

The first written record exclusively devoted to disease treatment was compiled sometime between 1065 and 771 BC (Sun 1986). It is the *Wu Shi Er Bing Fang (Prescriptions for Fifty-two Diseases)*, which was only discovered in 1973 during the excavation of the Ma Wang Dui tomb at Changsha, Hunan. Prior to that discovery, the *Shen Nong Ben Cao Jing (Shennong Herbal)*, compiled sometime between the 1st century BC and the 2nd century AD, had been the earliest record of Chinese materia medica.

During the excavation of the *Ma Wang Dui* tomb (dated 168 BC), numerous drugs were found in sachets, two of which were clutched in the hand of a skeleton. The drugs positively identified include cassia or Chinese cinnamon, magnolia flower bud (*xinyi*, *Magnolia* spp.), sour date kernel (*suanzaoren*, seeds of *Ziziphus* spp.), ginger [*ganjiang*, *Zingiber officinalis* (Willd.) Rosc.], *gaoben* (rhizome of *Ligusticum* spp.), eupatorium herb [*peilan*, *Eupatorium fortunei* Turcz.], and Sichuan peppercorn [*huajiao*, fruit of *Zanthoxylum bungeanum* Maxim.]. Among other finds were some well-known Chinese classics and the silk scroll copy of the *Prescriptions for Fifty-two Diseases*.

The *Prescriptions* lists 52 diseases, with 283 known prescriptions for their treatment; over two-thirds of the prescriptions contained two or more components (Chen 1987b). Some of the identified diseases along with the number of prescriptions indicated for each disease are given below:

Disease	No. of prescriptions
Skin ulcers and carbuncles	42
Urinary problems	29
Hernia	24
Wounds and injuries	17
Frostbite	14
Snake bites	13
Warts/tumors	10
Internal hemorrhoids	9
External hemorrhoids	4
Poison arrow wounds	7
Lacquer sores (dermatitis)	7
Convulsions from wounds	6
Male sexual disease(s)	5
Mad dog bites	3
Infantile convulsions	2
Malaria	2

Based on preliminary studies, there are 247 drugs listed, many of which have not been identified or found in later herbals such as the *Shennong Herbal*. One third are derived from mineral or animal sources. Among the identified plant drugs are the following:

Qinghao [herb of *Artemisia annua* L.]
 Magnolia flower bud [*Magnolia* spp.]
 Licorice [root of *Glycyrrhiza* spp.]
Baizhi [root of *Angelica dahurica* (Fisch. ex Hoffm.) Benth. et Hook. f.]
 Fuling [sclerotium of *Poria cocos* (Schw.) Wolf]
Huangqi [root of *Astragalus* spp.]
 Ginger [rhizome of *Zingiber officinale* (Willd.) Rosc.]
 Aconite [main root of *Aconitum carmichaeli* Debx.]
Fangfeng [root of *Ledebouriella divaricata* (Turcz.) Hiroe]
Shaoyao [root of *Paeonia lactiflora* Pall.]

All above drugs are still commonly used in traditional Chinese medicine. Some have been extensively studied by modern scientific methods, including chemical analysis and biological assays, while others have barely been examined. The most extensively studied and well known to American scientists are probably *qinghao*, licorice and *huangqi*. Although modern studies of these ancient drugs have yielded the new antimalarial qinghaosu (artemisinin) from *qinghao*, they have not been able to derive any exciting new "modern" drugs from the other two. Yet, these herbs continue to be two of the most widely consumed in China.

One of the most widely used drugs in treating rhinitis, including allergic rhinitis (e.g. hay fever), is magnolia flower bud. Its written use record

dates back to the *Prescriptions* and its efficacy has been repeatedly reported in modern biomedical literature, though rarely in combinations containing less than three drugs (Ren 1985). Despite the universal occurrence of hay fever and the continued interest in treating this condition, the time-tested magnolia flower has not been exploited by Western drug developers.

Shen Nong Ben Cao Jing (Shennong Herbal)

While the *Prescriptions* is the earliest Chinese record devoted to diseases treated with drugs, the *Shennong Herbal* is the earliest record on Chinese drugs. This herbal, compiled about two thousand years ago, records 365 drugs, describing their sources, properties and uses as well as many cases of their incompatibilities. The drugs are divided according to properties into three categories: superior (120 drugs), medium (120 drugs) and inferior (125 drugs). Superior drugs are those considered at that time to be nontoxic, which could be safely taken in large amounts for extended periods; they are what we now know as tonics. Medium drugs are those that could be toxic or nontoxic, depending on usage. Inferior drugs are toxic, and are used for treating diseases and should not be used for extended periods.

Superior drugs include such well-known ones as ginseng, licorice, *gandihuang* (root of *Rehmannia glutinosa* Libosch.), *huangqi* (root of *Astragalus* spp.), *huanglian* (rhizome of *Coptis* spp.), *wuweizi* [fruit of *Schisandra chinensis* (Turcz.) Baill.], sesame seed, magnolia flower, *lingzhi* (*Ganoderma* spp.), *fuling* or poria [sclerotium of *Poria cocos* (Schw.) Wolf], Chinese date (fruit of *Ziziphus jujuba* Mill.), Job's tears [seed of *Coix lacryma-jobi* L. var. *mayuen* (Roman.) Stapf] and *duzhong* (bark of *Eucommia ulmoides* Oliv.).

Medium drugs include ginger, *mahuang* or ephedra herb (*Ephedra* spp.), *danggui* [root of *Angelica sinensis* (Oliv.) Diels], *jixuecao* or gotu kola [*Centella asiatica* (L.) Urb.], *kuandonghua* or coltsfoot flower (flower of *Tussilago farfara* L.), *yinyanghuo* (herb of *Epimedium* spp.), *haizao* (*Sargassum* spp.), *hehuan* (bark of *Albizia julibrissin* Durazz.), *gaoben*, and *zhuling* or polyporus [sclerotium of *Polyporus umbellatus* (Pers.) Fries].

Inferior drugs include *fuzi* and *wutou*, which are lateral and main root respectively of aconite (*Aconitum carmichaeli* Debx.), rhubarb root (root and rhizome of *Rheum* spp.), *baitouweng* [root of *Pulsatilla chinensis* (Bge.) Regel], *lianqiao* or forsythia fruit [*Forsythia suspensa* (Thunb.) Vahl], *qinghao*, croton seed (fruit of *Croton tiglium* L.), *guanzhong* (rhizome of *Dryopteris crassirhizoma* Nakai and other ferns), and *langdangzi* or henbane seed (*Hyoscyamus niger* L.).

Many of the drugs in the *Shennong Herbal* are still being used today including all the ones listed above. Some of these uses have not changed after more than two thousand years and their rationale can be scientifically justified. For example, the use of *haizao* (*Sargassum* spp.) in the treatment of swelling of the neck (goiter) can be explained by its high content of iodine; the use of *guanzhong* (*Dryopteris*) in the treatment of intestinal worms certainly has its counterpart in the West, so does the use of *langdangzi* (henbane seed) as a muscle relaxant.

Tang Ben Cao (Tang Herbal)

The *Tang Herbal* is considered the first official Chinese pharmacopeia which was compiled in the 7th century (659 AD). It was a work compiled by a team of twenty-two high officials and court physicians under the edict of the emperor. It describes 850 drugs, including some foreign ones introduced since the era of the *Shennong Herbal*, such as benzoin, asafoetida, turmeric, black pepper and hezi (fruit of *Terminalia chebula* Retz.). Compared to the *Shennong Herbal*, the *Tang Herbal* records more drugs and in more detail; new uses and properties of old drugs are also described and the number of drugs more than doubled that in the *Shennong Herbal*.

Ben Cao Gang Mu (Herbal Systematics)

The most well-known Chinese herbal is the *Ben Cao Gang Mu* compiled by Li Shi-Zhen in the later part of the 16th century (1590 AD). This work is considered the most extensive work on materia medica ever compiled by a single author. It took Li 38 years to complete. It was based on his own medical and herbal experience and on data from earlier herbals, such as the well-known 11th-century herbal named *Zheng Lei Ben Cao*. Li's herbal describes 1892 drugs (with 1110 drawings), including 11,096 prescriptions, for treating hundreds of illnesses, ranging from the common cold to drunkenness and food poisoning (Chen 1982). The prescriptions in this herbal have recently been categorized and published as a separate volume, making the information much easier to access (Shaanxi 1983). Now a researcher no longer needs to laboriously search the original herbal to locate a treatment for a particular condition. All one has to do is to look up the index in the new book.

When the *Ben Cao Gang Mu* was introduced overseas in the 17th century, it was promptly translated into numerous languages, including Latin, French, German, English, Russian, Japanese and Korean, indicating its usefulness and importance in the field of materia medica.

Zhong Yao Da Ci Dian (Encyclopedia of Chinese Materia Medica)

Although several well-known herbals had appeared since the *Ben Cao Gang Mu*, none can be compared to the *Encyclopedia* in scope and depth. This encyclopedia was compiled by the Jiangsu Institute of New Medicine and was published in 1977. It is the most extensive work ever, in the field of materia medica, consisting of three volumes, one of which is an appendix/index, and comprising a total of 3518 pages. It describes 5767 drugs with 4500 drawings, many in great detail. Of these, over 4800 are of plant origin, the remaining being animal and mineral drugs. In keeping with modern scientific progress, this modern work has many modern features. The information on each long-used medicinal typically contains the following:

- Synonyms
- Drug Source [plant family, species, and part(s) used]
- Description of Plant Species [including habitat and distribution]
- Cultivation Method(s)

Collection [including initial treatment]
 Crude Drug Description [including production regions]
 Chemical Composition
 Pharmacology
 Processing
 Traditional Taste Properties
 Traditional Channel Affiliations
 Traditional Properties and Uses
 Dosages and Methods of Administration Precautions
 Selected Traditional Prescriptions Clinical Reports
 Quotations/Comments from Traditional Herbals or Medical Treatises
 Historical Identification and Sources

The modern botanical, chemical, pharmacological and clinical data included in this book are from the world literature up to and including 1972. It provides the reader with concise information on most Chinese medicinals currently used in traditional medicine. The detailed Appendix/Index allows the researcher to identify drugs of a particular pharmacologic category or drugs that treat a particular disease; it also provides chemical structures of compounds reported present or isolated from drugs described in the *Encyclopedia*.

CONTEMPORARY SOURCES OF INFORMATION ON CHINESE MEDICINALS

During a period of 2500 years, more than 2000 volumes of herbal records have been written by some 330 herbalists/physicians (Hao 1986). The works described above constitute only a few of the dozens of wellknown texts that are frequently consulted by traditional physicians, herbalists and modern researchers who read Chinese.

Books

In addition to the *Encyclopedia*, contemporary works on Chinese medicinals are abundant. They include treatises on general materia medica such as *Zhong Yao Zhi (Manual of Chinese Materia Medica)* and *Quan Guo Zhong Cao Yao Hui Bian (National Collection of Chinese Herbal Drugs)* as well as works on regional medicinals such as *Sichuan Zhong Yao Zhi (Manual of Chinese Drugs of Sichuan)*, *Hubei Zhong Cao Yao Zhi (Manual of Chinese Herbal Drugs of Hubei)*, *Hunan Yao Wu Zhi (Manual of Materia Medica of Hunan)*, *Chang Bai Shan Zhi Wu Yao Zhi (Manual of Plant Drugs of Chang Bai Mountain)*, *Fujian Yao Wu Zhi (Manual of Materia Medica of Fujian)*, and *Chinese Medicinal Herbs of Hong Kong (Chinese/English; 5 volumes; total 943 pp.)*. These are all sizable compilations covering information generally contained in the *Encyclopedia*, but with a slightly different approach and/or regional accent; some also contain medicinals not found in the *Encyclopedia*. Compared to others, the *Chinese Medicinal Herbs of Hong Kong* is the least extensive as it describes in brief only 500 herbs, each with a colored photograph.

Like books on single herbal drugs, there is an equally large number of books that are exclusively devoted to herbal formulas, some of which date back at least 2000 years. Many well-known classical formulas can now be found in the *Zhong Yi Da Ci Dian: Fang Ji Fen Ce (Encyclopedia of Traditional Chinese Medicine. Prescriptions)*, published in 1980. This formulary incorporates and describes from traditional medical treatises and formularies 7500 selected prescriptions, including 1320 that have duplicate names but different ingredients. Information in each formula includes its classical literature source, the amounts of its component herbs, conditions for which it is used, method(s) of preparation, and method(s) of administration and dosages. The prescriptions included in this work have been selected from such well-known classics as the *Pu Ji Fang (Prescriptions for Healing the Masses)*, published in the 14th century with 61,739 formulas and the *Tai Ping Sheng Hui Fang* (published in 992 AD with 16,834 formulas). Examples of well-known classical formulas that are still widely used today include the *Yu Ping Feng San* (Oade Screen Powder) and *Yin Qiao San* (Honeysuckle Forsythia Powder) for the prevention and treatment of the common cold and other illness; and the *Da Huang Mu Dan Tang* (Rhubarb Peony Decoction) for treating conditions known as *changyong* ("intestinal carbuncle") which includes acute appendicitis. For more recent formulas, one can consult the *Zhong Yao Zhi ji Hui Bian (Collection of Chinese Herbal Preparations)* and *Qian lia Miao Fang (One Thousand Superb Prescriptions)*. The former describes 3873 prescriptions collected from published data during the past 50 years while the latter, published in 1982, describes some 1 100 formulas collected from 600 famous traditional Chinese physicians and/or clinics throughout China.

For those who are interested in herbal veterinarian medicinals, there is the recently published *Min jean Shou Yi Ben Cao (Folk Veterinarian Herbal)*. It describes over 600 herbs (with 461 drawings) and about 10,000 prescriptions for treating more than 1000 diseases in domesticated animals, including pigs, cattle, sheep, horses, donkeys, mules, rabbits, dogs, cats, chickens, ducks, geese, and camels, among others. Information contained in this herbal is based on traditional works on herbal veterinarian medicine compiled over the past 2000 years plus the experience of the author who is a leading authority in herbal veterinarian medicine in China.

For those with mycological interests, *Zhong Guo Yao Yong Zhen Jun (Chinese Medicinal Fungi)* has become a standard reference in this field since its publication in 1974. This book documents 121 fungi used in Chinese traditional medicine, including such highly prized edible fungi as the *Morchella* spp. (for indigestion, excessive phlegm and shortness of breath) to the highly toxic *Amanitopsis volvata* Sacc. (in combination with other fungi for treating backache, numbness in the limbs, and muscle tightness/spasms).

Another area of popular interest is diet therapy. A very useful book on this field is the *Zhong Guo Shi Liao Xue (Chinese Diet Therapy)*. Published in 1987, this book deals with the treatment and prevention of illnesses by using common Chinese medicinals that serve the dual functions both as food and medicine. Information in this book is derived from close to 200 books on diet therapy and related fields, which have been published over the past 2500 years. Food/medicinal plants described in this volume include lily buds (*Hemerocallis fulva* L.), mung bean, chrysanthemum flower, black sesame seed, green onion (*Allium fistulosum* L.), and many other common food/medicinal substances. This book

should be useful to both the health products industry and to regulatory agencies as it might help answer some questions relating to the history of herbal foods.

Also, the currently official *Chinese Pharmacopeia* of natural drugs (1985), containing monographs on 506 single drugs and 207 formulas, can serve as a handy reference on common Chinese medicinals.

Journals

In addition to contemporary books, there are at least 100 journals that deal directly with traditional Chinese medicine and the use of Chinese herbal drugs. They include those published at the national, provincial, and city levels as well as those published by traditional medical institutions. The following is a partial list of these journals.

National:

Acta Botanica Sinica (some English abstracts)—botanical and chemical
Acta Chimica Sinica (most with English abstracts)—chemistry
Acta Pharmaceutica Sinica (most with English abstracts)—general
Acta Pharmacologica Sinica (most with English abstracts)—general
Bulletin of Chinese Materia Medica—general
Chinese Journal of Integrated Traditional and Western Medicine (some English abstracts)—clinical & pharmacological
Chinese Medical Abstracts-Traditional Medicine—general
Chinese Pharmaceutical Bulletin—general
Chinese Traditional and Herbal Drugs—chemical & pharmacological
Journal of New Chinese Medicine—general
Journal of Traditional Chinese Medicine (English version available)—general
National Medical Journal of China (some English abstracts)—clinical & pharmacological
 Plants—botanical sources

Regional:

Acta Botanica Yunnanica (most with English abstracts)—botanical and chemical
Beijing Journal of Traditional Chinese Medicine—clinical
Fujian Journal of Traditional Chinese Medicine—clinical
Henan Traditional Chinese Medicine—clinical
Hubei Journal of Traditional Chinese Medicine—clinical
Jiangsu Journal of Traditional Chinese Medicine—clinical
Jiangxi Journal of Traditional Chinese Medicine and Pharmacology—clinical
Journal of Traditional Chinese Medicine and Chinese Materia Medica of Jilin—clinical
Liaoning Journal of Traditional Chinese Medicine—clinical
Shaanxi Journal of Chinese Traditional Medicine—clinical
Shandong Journal of Traditional Chinese Medicine—clinical
Shanghai Journal of Traditional Chinese Medicine—clinical
Shanxi Journal of Traditional Chinese Medicine—clinical
Sichuan Journal of Traditional Chinese Medicine—clinical
Tianjin Journal of Traditional Chinese Medicine—clinical
Yunnan Journal of Traditional Chinese Medicine—clinical
Zhejiang Journal of Traditional Chinese Medicine—clinical

Institutional:

Journal of Anhui College of Traditional Chinese Medicine—general
Journal of Beijing College of Traditional Chinese Medicine—general
Journal of Chengdu College of Traditional Chinese Medicine—general
Journal of Guiyang College of Traditional Chinese Medicine—general
Journal of Hunan College of Traditional Chinese Medicine—general
Journal of Nanjing College of Traditional Chinese Medicine—general
Journal of Shaanxi College of Traditional Chinese Medicine—general
Journal of Shandong College of Traditional Chinese Medicine—general
Journal of Shenyang College of Pharmacy—general
Journal of Yunnan College of Traditional Chinese Medicine—general
Journal of Zhoiang College of Traditional Chinese Medicine—general

Reports published in these journals are mostly on clinical use of herbs and herbal combinations, although there are a sizable number of research reports as well. The latter can be found primarily in nationally published journals at the top of the above list.

Apart from above journals that primarily deal with natural drugs, reports on these medicinals can also be found in national, regional and institutional journals that cover general medical and pharmaceutical topics. A partial list of such journals follows.

Chinese Journal of Cancer (some English abstracts)

Chinese Journal of Cardiology (some English abstracts)
Chinese Journal of Clinical Pharmacology *Chinese Journal of Dermatology* (some English abstracts)
Chinese Journal of Hematology (some English abstracts)
Chinese Journal of Internal Medicine (some English abstracts)
Chinese Journal of Microbiology and Immunology (most with English abstracts)
Chinese Journal of Oncology (most with English abstracts)
Journal of Marine Drugs (some English abstracts)
National Medical Journal of China (some English abstracts)

SCOPE OF CHINESE MATERIA MEDICA

Single Drugs

The Chinese constitute a fifth of the world's population. Due to the empirical nature of traditional Chinese medicine, most of the effective Chinese medicinals and their combinations as we now know them have been well tested in humans over a period of hundreds to thousands of years. A rough estimate based on available information indicates that there are at least 5000 single plant drugs used in China that have readily accessible documentation. The ones that have not yet been recorded in major works probably also number in the thousands.

One major feature that distinguishes Chinese medicinals from those of most other countries is the specific and often elaborate treatment given Chinese medicinals. Over a period of centuries, crude drugs have often been processed according to specific methods to yield the desired effects. Whether they are simply boiled or heated or mixed with other herbs such as licorice, ginger, or black beans, the purpose is often to reduce toxic side effects and/or accentuate the drugs' beneficial effects. Thus, for example, unprocessed aconite is rarely used internally. In order to render it less toxic and yet retain its desired cardiac effects, it is usually soaked for days and boiled for hours. Recent studies have revealed that under these processing conditions, the most toxic alkaloid, aconitine, can be destroyed or greatly reduced. The resulting processed aconite has cardiotoxic activities and is used to treat cardiac failure and other heart diseases. Another processed aconite (lateral root), called fuzi, is also used in tonic preparations. Consequently, when one intends to study Chinese medicinals, one should bear in mind the nature of their source, because simply knowing their correct taxonomic origin is not enough. The same plant part from the same species, if obtained by different processing methods, can produce widely different pharmacological effects.

Combinations

Chinese drugs are normally used in combinations for various reasons. Two major ones are: to enhance the action of the main drug(s); and to mitigate the toxic side effects of principal component drugs. Since Chinese medicinals are normally used in combinations, the number of herbal prescriptions used by the Chinese people are countless. An educated guess is that they are in the low to middle six figures, as prescriptions in the *Pu Ji Fang (Prescriptions for Healing the Masses)* alone number close to 62,000.

Current Evaluation and Documentation of Chinese Medicinals

Drugs of practically any pharmacological category can be found among Chinese medicinals. During the past twenty-five years, the Chinese have made much progress in bringing their traditional medicines into a modern environment. While scrutinizing traditional medicines with modern methods on the one hand, they continue to expand their traditional uses on the other. Thus, one finds a steady flow of a considerable number of research publications and at the same time huge numbers of clinical reports on use of traditional prescriptions in treating diseases ranging from the common cold to cancer. Most of the published information during the past 150 years has so far been abstracted in a series of three volumes called *Zhong Yao Yan Jiu Wen Xian Zhai Yao (Research on Chinese Materia Medica: Literature Abstracts, 1820-1961, 1962-1974, 1975-1979)*. Also, research and clinical data on about 250 important Chinese medicinals are summarized in the *Zhong Yao Yao Li Yu Ying Yong (Pharmacology and Applications of Chinese Drugs)*. The most active areas of current research and practice in Chinese materia medica include medicinals used in the treatment of cancer and cardiovascular, viral and immunological diseases.

The following are some data on recent studies on Chinese medicinals. As the information is so extensive, the examples given in the following only represent a very small fraction of what actually is available.

Antitumor drugs. There must be thousands of herbal formulas currently used for treating cancer in China. Over 400 of these can be found in three recently published books on anticancer medicinals (Chang 1987, Yang 1981, Hu and Xuan 1982), which were compiled primarily from modern published data; they are prepared from more than 200 single drugs. The prescriptions range from ones that contain medicinals with known antitumor chemicals to those whose components have not yet been chemically and/or pharmacologically studied. Examples are many and the following are a few selected at random (Cheng and Xu 1985, Cheng et al. 1984, Guo et al. 1985, Huang 1987, Jiang 1984, Jiang and Yan 1986, Li 1982, Liu et al. 1985, Ren and Hong 1986, Wang 1987, Yu 1983):

Cephalotaxus fortunei Hook. f, *C. sinensis* (Rehd. et Wils.) Li, *C. hainanensis* Li [bark, root, twigs]—hainanolide, harringtonines, etc.

Camptotheca acuminata Decne. [root, bark fruit, twigs, leaves]—camptothecine, etc.

Iphigenia indica Kunth [bulb]—colchicine

Curcuma zedoaria Rosc., *C. aromatica* Salish., *C. kwangsiensis* S. Lee et C.F. Liang [rhizome]—curdione, curcumol

Crotalaria sessiliflora L., *C. assamica* Benth. [whole plant]—monocrotaline

Sophora subprestrata Chun et T. Chen, *S. flavescens* Ait. [root/rhizome]—matrine, oxymatrine, sophocarpine, etc.

Trichosanthes kirilowii Maxim, *T. uniflora* Hao [root]—trichosanthin

Strobilanthes cusia (Nees) O. Kuntze, *Isatis indigotica* Fort., *Indigofera suffruticosa* Mill., *Polygonum tinctorium* Ait., etc. [qingdailnatural indigo]—indirubin

Rabdosia rubescens (Hemsl.) Hara and other *Rabdosia* spp. [whole plant]—diterpenoids (rubescensines, oridonin etc.)

Cucumis melo L. [peduncle]—cucurbitacins B and E

Ailanthus altissima (Mill.) Swingle [root/stem bark, fruit]—lactones

Cardiovascular drugs. A considerable number of traditional drugs and prescriptions are used in conditions related to the heart and blood. They include those grouped under the categories of *huo xue hua yu* (invigorating blood circulation and dispersing stasis), blood tonics, and hemostatics. The following are a few examples of such medicinals (Chai et al. 1985, Chen 1987a, Deng and Gong 1987, Huang 1986, Jiang 1984, Li et al. 1983, Liu and Chen 1984, Ou et al. 1987, Shan 1988, Shan et al. 1986, Song et al. 1988, Wang and Ba 1985, Wang and Jing 1984, Yang 1988, Yue et al. 1985, Zhang 1985, Zhou 1984):

Pueraria lobata (Willd.) Ohwi [root]—antiarrhythmia, hypotensive, hypoglycemic (e.g. puerarin.)

Ephedra spp. [root/rhizome]—hypotensive (ephedranin A, mahuanin A & B, alkaloids)

Aconitum carmichaeli [fuzi, lateral root]—cardiotonic, anti-thrombin, etc. (e.g. higenamine)

Salvia miltiorrhiza Bunge [root]—anticoagulant, vasodilator (e.g. tanshinones, danshensu)

Ligusticum chuanxiong Hort. [rhizome]-vasodilator, anti-thrombin, anti-atherosclerotic (e.g. tetramethylpyrazine)

Lentinus edodes (Berk.) Sing. [fruiting body]—antiplatelet aggregation, etc. (hydro-alcoholic extract).

Panax pseudo-ginseng Wall. var. *notoginseng* (Burk.) Hoo et Tseng [rhizome]—anti-arrhythmia (saponins)

Polygonum multiflorum Thunb. [root tuber]—anti-atherosclerotic (alcohol extractives)

Polygonum cuspidatum Sieb. et Zucc. [rhizome]—antiplatelet aggregation (polydatin)

Antivital drugs. Antivital drugs can be found in several categories of traditional medicinals. They include the so-called heat-dispersing drugs (antipyretics) and those for treating "exterior symptom complex" (diaphoretics). These drugs are frequently used in prescriptions along with tonics (immunomodulating drugs). The following two formulas are worth noting as they have been in use for centuries:

1. *Yu Ping Feng San* (*Jade Screen Powder*)
Huangqi (astragalus root)
Fangfeng (root of *Ledebouriella divaricata*)
Baizhu (rhizome of *Atractylodes macrocephala* Koidz.)
2. *Yin Qiao San* (*Honeysuckle Forsythia Powder*)
Honeysuckle flower (*Lonicera* spp.)
Forsythia fruit (*Forsythia suspensa*)
Mint (*Mentha haplocalyx* Briq.)
Jingjie (herb of *Schizonepeta tenuifolia* Briq.)
Dandouchi (fermented black soybean)
Niubangzi (fruit of *Arctium lappa* L.)
Jiegeng [*Platycodon grandiflorum* (Jacq.) A. DC]
Danzhuye (herb of *Lophatherum gracile* Brongn.)
Licorice root

Jade Screen Powder was first recorded in 1481 AD. It has tonic properties and is used to build up body resistance in the prevention of the common cold and influenza. Due to its antivital as well as immunomodulating activities, it has drawn much attention in the past few years. So far, studies have demonstrated it to lower the incidence of cold and influenza, prevent the recurrence of chronic bronchitis, and enhance host immunity. After treatment with this prescription, patients' IgA, IgG, and rate of T-lymphocyte transformation and E-rosette formation are all markedly increased (Geng 1986, Li 1988, Liu 1987).

Honeysuckle Forsythia Powder was first recorded in 1798 AD. Currently it is probably the most widely used cold remedy in China and in overseas Chinese communities. It is used in treating the common cold, influenza, and other febrile viral infections. Its multiple pharmacological effects have been reported, which include antipyretic, anti-inflammatory, and anti-allergic (Deng et al. 1986).

Immunomodulating drugs. There are dozens of well-known Chinese medicinals with immunomodulating activities that have been traditionally

used as tonics; some are now also used in cancer to counteract the toxic side effects of chemotherapy and radiotherapy. The following are a few examples of these medicinals (Chen 1985, Chinese 1985, Deng and Liao 1984, Du et al. 1986, Geng 1986, Li et al. 1986, Lin et al. 1985, Liu and Xu 1985, Wang 1987, Zang et al. 1985).

Tremella fuciformis Berk [fruiting body]—polysaccharides

Polyporus umbellatus (Pers.) Fries [sclerotium]—polysaccharides

Poria cocos [sclerotium]—polysaccharides

Lentinus edodes (Berk.) Sing. [fruiting body]—polysaccharides

Cordyceps sinensis (Berk) Sacc. [whole fungus plus host remains]—polysaccharides

Oriental ginseng polysaccharides

Astragalus polysaccharides

Others. I cannot leave this topic without mentioning another category of traditional drugs that are of keen interest not only to the Chinese but to Americans as well. These are the anti-aging medicinals. The newly published *Kang Shuai Lao Fangji Ci Dian (Encyclopedia of Anti-Aging Formulas)* records 1018 formulas, mostly selected from classic formularies, with only a few from modern sources. Over the past few years, I have seen a steady increase in reports on anti-aging research in the Chinese literature. Using modern criteria relating to aging such as immune functions, free radical formation, superoxide dismutase activity, monoamine oxidase activity, and blood lipid levels, many traditional tonics have been shown to have anti-aging effects. They include ginseng, Siberian ginseng [root/rhizome of *Acanthopanax senticosus* (Rupr. et Maxim.) Harms], *Schisandra chinensis* fruit, *lingzhi* (fruiting body of *Ganoderma* spp.), *fuzi* (processed lateral root of *Aconitum carmichaeli*), *Epimedium* herb, *heshouwu* (root of *Polygonum multiflorum*), *danggui* (root of *Angelica sinensis*), *baizhu* (rhizome of *Atractylodes macrocephala*), and *luobuma* (leaf of *Apocynum venetum* L.), among others (Jiangsu 1988, Li et al. 1986).

EXAMPLES OF COMMON CHINESE MEDICINALS

Mahuang

The most well-known Chinese medicinal that has been frequently quoted as a classic example of an herbal drug yielding a modern medicine (ephedrine) is *mahuang* (*Ephedra* spp.). It is the dried stems of one of three *Ephedra* species (*E. sinica* Stapf; *E. equisetina* Bunge; *E. intermedia* Schrenk et C.A. Mey) found in China, primarily in northern regions. It has been used in China as a diaphoretic, anti-asthmatic, and diuretic for at least 2000 years, with written records dating back to at least the *Shennong Herbal* (100 BC-200 AD.). Prescriptions based on *mahuang* for treating asthmatic conditions are countless, some of which date back to ancient formularies, such as the 3rd-century medical classic, the *Shang Han Lun (Theory on Febrile Diseases)*. Other less known uses of *mahuang* include the treatment of influenza and rheumatism. In contrast to the diaphoretic properties of *mahuang* (stem), the root and rhizome of *Ephedra* species, known as *mahuanggen*, has antiperspirant properties. It is used to treat night sweat and spontaneous perspiration as well as excessive perspiration. For the latter, it is often used topically in the form of a powder for dusting or decoction for washing affected areas. Furthermore, recent studies have shown it to contain hypotensive flavonoids and alkaloids. The completely different medicinal properties of aboveground and underground parts of *Ephedra* species serve as another example to highlight the importance of specificity when evaluating and reporting on plant drugs.

Sour Date Kernel

One of the most commonly used sedative/hypnotic in Chinese prescriptions for treating insomnia and neurasthenia is *suanzaoren* (sour date kernel). It is the dried ripe kernels of *Ziziphus jujube* Mill. var. *spinosa* (Bunge) Hu ex H.F. Chow (syn. *Ziziphus spinosa* Hu). Although first recorded 3000 years ago, this medicinal has only recently been evaluated by modern scientific methods and found to indeed possess sedative and hypnotic effects in various experimental animals (Hong and Cao 1987). Spinisin, a flavonoid glycoside, is only partially responsible for these effects (Li and Zhang 1983, Yuan et al. 1987, Zeng et al. 1987). Other active components in this drug still await further investigations.

Sour date kernel is also traditionally known to "calm the heart." Recent studies have demonstrated it to have anti-arrhythmic and other cardiovascular activities (Xu et al. 1987).

Qian Ceng Ta

Qian ceng ta is the whole plant of *Huperzia serrata* (Thunb.) Trev [syn. *Lycopodium serratum* Thunb.]. Although not as common as the previous two, it is traditionally used as a detoxicant to reduce swelling, break up blood stasis, and to stop bleeding. During its clinical use, patients were observed to exhibit cholinergic-type reactions in varying degrees. Subsequently, two new alkaloids, huperzine A and huperzine B, were isolated from it and shown to have strong and reversible anticholinesterase activity. The action of huperzine A against acetylcholinesterase was found to be three times stronger than that of physostigmine and thirty times that of galanthamine, with lower toxic side effects. Favorable results from a series of studies conducted in rats and mice plus a preliminary study on human subjects over the past two years indicate that these new alkaloids show promise in the treatment of Alzheimer's disease and related disorders (Liu et al. 1986, Wang et al. 1986, Wang et al. 1988, Tang et al. 1986, Xu and Tang 1987, Zhu and Tang 1987, Yan et al. 1987, Lu et al. 1988).

Detoxicants

"Detoxicant" is a rather vague term that can mean several things in traditional Chinese medicine. A detoxicant can be used to treat "toxic conditions" such as external sores and ulcers or internal conditions characterized by fevers or inflammations, results of viral or bacterial infections. Well-known Chinese medicinals used for such conditions include honeysuckle flower, *qingdai* (natural indigo), houttuynia herb

[*Houttuynia cordata* Thunb.], forsythia fruit [*Forsythia suspensa*, and andrographis herb [*Andrographis paniculata* (Burm. f) Nees.]. Most of these have been extensively studied chemically and pharmacologically. Modern drugs such as indirubin for leukemia and andrographolides for various bacterial infections have been the results of these studies.

Another type of detoxicants that so far have not been examined by modern technics include ginger, mung bean, soybean, and licorice that are routinely used in traditional Chinese medicine for treating drug or food poisoning as well as toxic side effects of cancer chemotherapy and heavy metal poisoning. There is no lack of clinical reports on these uses in the Chinese literature. However, reports on relevant chemical and pharmacological studies on these medicinals are lacking.

CONCLUSION

The Chinese people have been using their medicinals for several thousand years. Over this long period, they have accumulated a sizable pharmacopeia based on actual human trials, and have faithfully recorded their experience and knowledge of these medicines for posterity. Thus, compared to those of other countries, Chinese medicinals are unsurpassed in number, sophistication, and documentation.

Considering the billions of Chinese who have lived and died since ancient times, it is highly probable that for every disease known to mankind, there exists in the Chinese formularies and herbals an effective remedy to treat it. The disease may not bear the modern name familiar to us, but if one knows how and where to search one will most likely find the diseased condition and the drug or prescription for treating it. In fact the treasure house of Chinese medicinals can offer modern science such a fertile field in which to look for leads to new drugs that we simply can no longer afford to ignore it. The data are there. But it will take industrial and/or government executives with foresight to initiate the efforts to make effective use of this information. Considering the poor results of conventional screening programs, obtaining new drug leads among Chinese medicinals may well be the most cost effective strategy and should be the concern of every executive who is interested in inexpensive and effective ways of developing new drug leads.

Since most Chinese medicinals have withstood centuries of safe use, new active principles isolated from them are viewed favorably by the Chinese who rarely hesitate to experiment with them directly on humans. They also continue to experiment with new herbal prescriptions and document them as they have for thousands of years, making the field of Chinese medicinals virtually a continuous massive clinical trial of which Western pharmaceutical and medical researchers should take advantage. With the huge sums of federal money now being spent in AIDS and cancer research, a minute fraction of it spent in tapping this Chinese resource would be most cost effective in obtaining leads to new drugs in these areas.

Lastly, many Chinese medicinals are derived from rather common plant sources. Some of these plants, such as *Pueraria lobata*, *Lonicera* spp., *Ailanthus altissima*, and *Polygonum cuspidatum*, have already been naturalized in America. They could be turned into cash crops with minimal research should a medicinal market be developed.

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