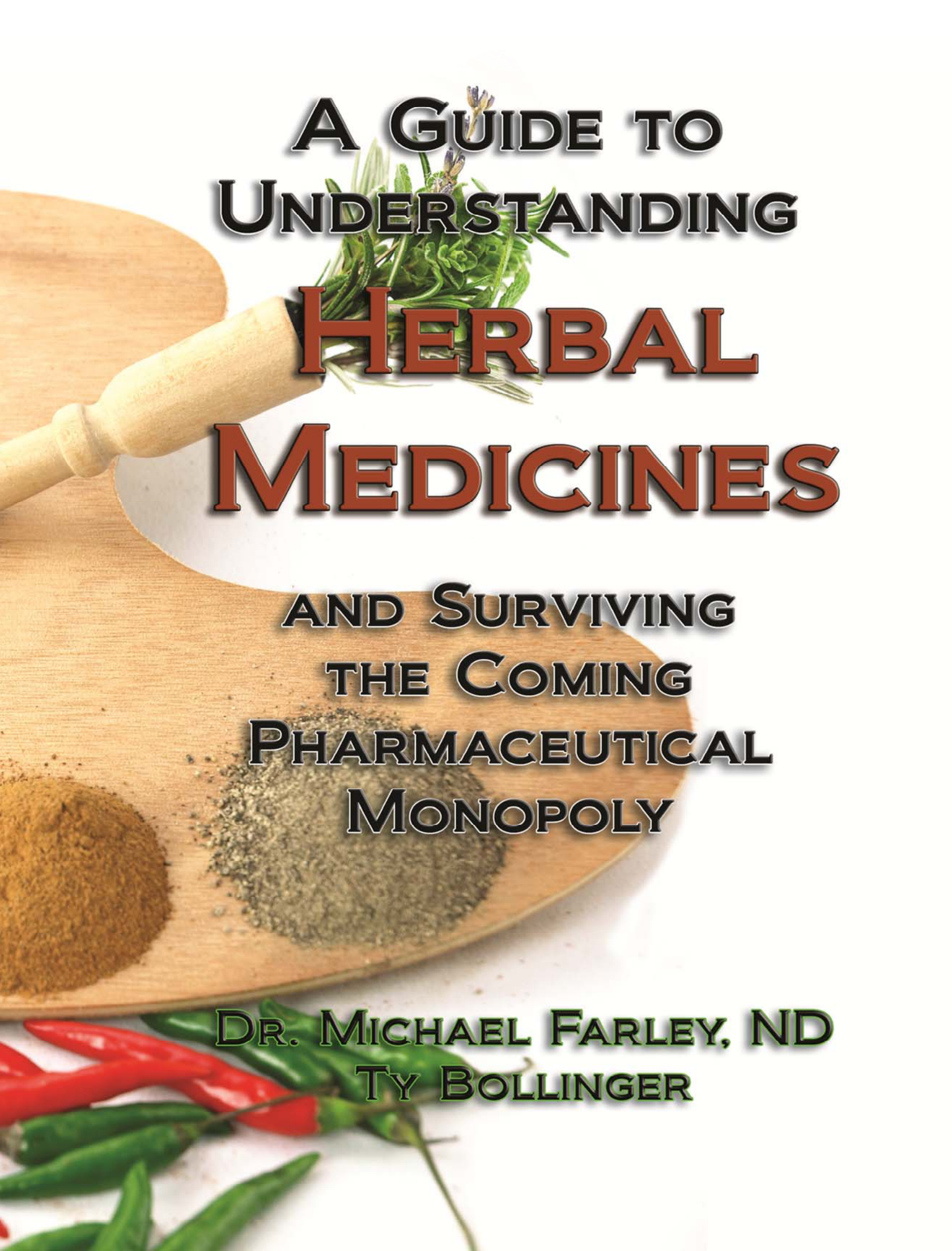
A Guide to Understanding HERBAL MEDICINES

and Surviving the Coming Pharmaceutical Monopoly

Dr. Michael Farley, ND
Ty Bollinger



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Ty M. Bollinger, Dr. Michael Farley ND
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CONTENTS

INTRODUCTION 6

OVERVIEW OF HERBAL MEDICINE 12
HERBS VS. DRUGS 14
ACTIVE CONSTITUENTS OF MEDICINAL HERBS 16
TYPES OF HERBAL PREPARATIONS 20
MEDICAL EFFECTS 22
COMPLEMENTARY MEDICINE 24
WHAT WOULD YOU DO WITHOUT MEDICINE? 26

MEDICINAL HERBS 28
A full-color visual guide to over 100 medicinal herbs, with details of their habitat and description, actions, traditional and self-help uses, and phytochemical effects

"HOW TO" 68
HOW TO GROW HERBS 70
HOW TO HARVEST HERBS 72
HOW DO HERBS WORK? 74
HOW TO COMBINE HERBS & TREAT COMMON AILMENTS 76

SUMMARIUM 84
GLOSSARY 86
INDEX 91
CONCLUSION 97

INTRODUCTION

One must remember that a book cannot replace a complete and accurate diagnosis from a competent medical practitioner. This book is intended to be used as a source of reference, not an index for self-diagnosis and self-medication. Never self-medicate without the advice of a medical professional. Above all, educate yourself before making important health decisions.

This book is designed for patients and their physicians or health care practitioners to use together. The use of herbal medicine does not exclude the use of other medications. Many times the educated use of herbals is very complementary to prescription drugs. In other cases, herbals can be used instead of synthetic drugs, either to aid in the prevention of disease or in the cure of the disease itself.

Presented in this book are many of the chemical constituents that exist in each herb. These constituents represent only a small percentage of phytochemicals found in each plant. Many herbs have well over 500 chemical constituents in them. To have listed them all would be an encyclopedia type task for both the writer and reader. However, I have tried to list the chemicals which, to date, seem to be the ones that have the herbal effects. Although very few controlled, double-blind studies on herbs have been done in this country, many of the chemicals found in herbs are well known and their effects have been well documented. This will be of great benefit to the person trying to understand how herbs work and to the physician who wants to integrate them into his practice.

This book is to be used as an aid to learning about herbal remedies. It is not written to appease anyone, but is for those who wish to learn more about herbs. For this reason, you will find that a few of the herbs discussed in this book are not legally obtained in this country. Nonetheless, they have been included because of their proven value. It is not my goal to be politically correct, but to offer as factually as possible the herbs that have shown (through the test of time and the laboratory) to be the most effective.

The current leaning of medicine in the United States has been in the ***treatment*** of diseases, not in the ***prevention*** of them. Patients who are suffering from chronic pain or debilitating long term illnesses are aware that "conventional" medicine does not have all the answers. In the search for alternatives to their treatment they often ask their physician (or primary care giver) for advice on the use and efficacy of herbal medicine. These patients are frustrated with the condition they are in and/or their lack of a speedy recovery. They often blame their doctor and feel betrayed by the existing medical structure. In all probability, the doctor is suffering from the same frustrations, including the patient's lack of recovery and his own inability to help.

Rest assured, it is not your doctor's fault. When asked about herbal medicine (by the rare patient who has the courage to ask), the most often heard response is, "*I'm not sure if that stuff is any good*" or something along those lines. Patients are often discouraged from using herbals, and indeed, sometimes even vitamin and mineral supplements. The fault lies not in the doctor, but in his training.

These may seem to be strange opening words for a book designed to explain the use of herbal medicine, especially coming from the mouth of a naturopathic doctor. However, the reason I have chosen those words as an introduction to this book is to establish what I believe to be true in medicine today. Most physicians care and truly want to assist their patients in recovering from illness or pain.

Doctors work with the tools they learned in medical school. Unfortunately, medical schools are structured in a way that memorization takes the front seat while deductive reasoning falls far behind. This is due to the vast amount of data that has to be assimilated. The patient and physician both feel frustrated by the resulting medicinal approach, often referred to as "cookbook" medicine. This type of medicine is when you (the patient) describe the symptoms, the doctor recognizes those symptoms and then proceeds to prescribe the medicine and/or protocols he was taught. The reason this is dubbed "cookbook medicine" is because fewer and fewer doctors touch their patients; their hands are taking the back seat to their prescription book.

In order for students to graduate and become MD's they have no choice but to learn what has become the American Medical Association's "medicine of today." The leaning of current medical schools is obvious when we look at a few facts. There are approximately 125 medical schools in the United States. Of those 125 schools only thirty of them require a course in nutrition. During four years of medical school, the average training in nutrition received by U.S. physicians is 2.5 hours. When you consider the fact that the risk of death from a heart attack for the average American male is 50%, while the risk of death from a heart attack for an average American, vegetarian, male is 4%, the need for nutritional counseling for physicians is obvious. While vegetarians are not necessarily the healthiest people, this is most definitely a telling statistic.

In the USA, medical treatment has become synonymous with prescription drugs, largely due to the influence of the tremendous sales forces and political influence of the pharmaceutical industry. Also, let's not forget the fact that in this day and age people want instant health. They want and expect to be made well (or better) immediately.

I've found in my practice more and more people saying they don't want to take pills, drugs, or even an aspirin. People are tired of, and discouraged about, putting synthetics and chemicals into their bodies. They're taking the time to educate themselves and exerting more control over their healthcare. The baby boomer generation is now facing mid-life and realizing the need to make significant changes, not wanting to wait until it is too late. They're looking for alternatives and better ways to insure a longer, healthier life.

People are moving more toward alternative medicinal approaches. It is the perception of the MD today that is helping this movement along. Tens of millions of people moving in the same direction is not a "craze," it is a change in attitude. Medicine has always become what the people required from it. Now the people have let the health practitioners know, beyond any shadow of doubt, that they want and expect complete health care. The truth sometimes hurts, but it's better to learn and grow than to become extinct.

Although it might be hard to believe, the H.M.O.s could be responsible (more than any other factor) for moving forward the holistic approach towards medicine. Due to H.M.O.s controlling the health care of ever growing numbers of patients, their influence in medicine cannot be overemphasized. In the past few years, H.M.O.s have been experimenting with allowing their patients more freedom in choosing alternative medicine. What they have found has encouraged other H.M.O.s to follow suit. The faster the patient recovers, the less the cost is to the H.M.O. It doesn't take a wizard to realize the profit lies in the fastest recovery time. Eventually, these same organizations will realize that preventing disease in the first place creates the highest possible profit margin. Then the movement will be towards what we have been suggesting all along: prevention.

For the past fifteen years I have taught physicians (including family practitioners, anesthesiologists, orthopedic surgeons, and emergency care specialists) and can honestly say that the vast majority of them have been open to new concepts, if given the opportunity to understand them. As a matter of fact, most doctors who have been practicing for any length of time have learned how little they really know. All health care practitioners who are healers at heart are open to and crave new knowledge that will benefit their patients.

The issue of whether herbal medicine works or not is well past the need for proof. There has been study after study (with more going on today) that have verified the efficacy of herbs as medicines. During the years 1962-1973, of all prescriptions dispensed from community pharmacies, 25% contained a natural active constituent extracted from plant material. Any physician practicing today will recognize the drugs atropine, digitoxin, ephedrine, codeine, digoxin, morphine, quinidine, pilocarpine, pseudoephedrine, quinine, scopolamine, vincaleukoblastine and tubocurarine. These are all plant derived prototype drugs that are discussed in all pharmacology textbooks used today. Do they work? Ask your doctor. Just as importantly, the very longevity and consistency of their use is easily verified.

In Iraq, the grave site of a Neanderthal man was found to contain a large number of pollen granules. These had obviously come from family and friends spreading a bouquet of flowers all around and over the body. Analyzed some 60,000 years after this caveman's death, the pollen has been shown to belong to eight different genera of flowering plants, seven of which are still used medicinally today. Is this a coincidence? Even if we believe that Neanderthal man was an intellectually limited animal, the fact that he sought out and understood that certain plants made him feel better is no stretch of the imagination. Dogs, cats, apes and most other animals have been found to seek plants in the wild which are known to have medicinal properties. Most animals are also known to avoid plants which are toxic.

The advantages of conventional or synthetic pharmaceuticals over herbal medicines, lies in the fact that they are more concentrated in specific properties which at times causes them to work faster. Another advantage for synthetic or conventional medications is that they are very consistent in concentrations and dosages, more so than many herbal companies who are quick to take advantage of an extremely fast growing market. While discussing the efficacy of drugs, it would be tremendously one-sided not to mention that there are synthetics in use today for which no herbal equivalent has yet been found.

Having said this, I will now list the advantages of herbal remedies. Herbs always contain many active constituents which often act synergistically with each other to enhance their effect. When taken in an educated manner, herbals have virtually no side effects as compared to synthetic medications. In fact, herbs tend to enhance body systems rather than deplete them. For example, the daily use of Echinacea to enhance the immune system will not destroy the natural flora of the digestive tract. It will aid in fighting both viral and bacterial infections without leaving women prone to vaginal yeast infections. Unlike antibiotics, which are synthetic, the herb does not invite the development of antibiotic resistant bacteria. Herbs provide precursors for needed hormones and enzymes as well as furnish vital minerals and vitamins for the body to use. There is no question that herbs have a large place in the health care of society today.

If both conventional medicines and herbal remedies have a justified place in modern medicine, where did the great divide come from? Our very human nature has been a giant contributor to this separation of natural healing and modern medicine.

Native Americans had their Shaman and medicine men. African tribes had their medicine men, and European herbalists became famous for their own combinations and discoveries. Just as in medicine today, those that were "in" fought to protect their own special place in their society. Members of these groups maintained a great deal of secrecy to insure their importance within their own social structure. Information was often protected with religious zeal, and much knowledge has been lost due to this short sighted approach. This almost sounds like the MD's, Chiropractors, Naturopaths and Osteopaths of today, doesn't it?

More importantly, unlike "cookbook" medicine where doctors learn the symptoms of a patient then prescribe a drug, herbal medicine requires a more complex approach. Herbalists must know of any herbal interactions and which herbs are required to produce the desired effect. They adjust combinations to deal with several aspects of a disease process at once and treat the whole body not just a symptom. This requires not only education, but what some herbalists have dubbed a "dousing" instinct. This necessitates an intimate knowledge of plants and their products as well as a "feel" for the patient. Due to the amount of time this takes, you'll find very few herbalists or doctors of naturopathy who are able to see a new patient every fifteen minutes.

As important as the previous points were in retarding the growth and research of herbals, the single most important

factor has been the growth and power of the pharmaceutical companies. This began in the United States when country doctors found they did not have enough time to see patients and do the preparations of their own herbal remedies and other medications. This led to the development of apothecaries which prepared these remedies for the doctors. As the number of patients and doctors grew, so did the number of apothecaries. In a very short time these apothecaries started to develop their own formulas and recipes. Thus, the competition began and so did the patenting of medicines. Though some formulas and combinations can be protected by copyright or patent, herbs cannot be protected. They are natural substances, therefore, not able to be patented. Because of this, why bother to research them? The money to be made is in the synthetics.

Because of this, pharmaceutical companies started seeking new synthetic drugs that could be patent protected. Pharmaceutical companies only have one market for prescription drugs: the MD's. With medical doctors as their only market, they naturally do everything they can to insure their market coverage with "detail people." These people are salespersons that pharmaceutical companies hire in order to get their products used and into the hands of doctors. Because herbal companies are too small, there is no way that they can compete in sales and marketing with pharmaceutical companies. The United States has become destitute of MD's who understand herbals and their uses; unlike Europe, and most other countries, who use herbal medicines and still study them aggressively. The path down which doctors have been led could be described as "*better living through chemistry*". They know the shortcomings, but have received no training in other approaches that could be helpful to them.

How much have these factors affected herbal research and advances? There are over 750,000 species of flowering plants and only an extremely small number have been thoroughly studied for potential drug value.

Perhaps what will become even more significant is that when pharmaceutical companies study herbs, they are striving to isolate one constituent that they might be able to synthesize. The study of how all the constituents of the plants interact is often overlooked. Those who read this book will see how many phytochemicals from a single herb often work together on many levels to treat the same symptom.

Other factors also play a role in the slow growth of herbals in conventional medicine in this country. Herbal companies would love to label the products that they produce for physicians use and for the millions of customers they serve. Are they negligent in not doing so? No! The Food and Drug Administration has made it impossible for herbal manufacturers to label their products with any medicinal effects that the herbs possess.

In December, 1994, in Washington DC there was a symposium on Botanical Medicine sponsored by the National Institute of Health, the Office of Alternative Medicine, and the Food and Drug Administration. The purpose of this meeting was to discuss how herbs can best be integrated into conventional health care.

The main discussions of the meeting revolved around establishing the efficacy of herbs, how to regulate herbal medicine and whether herbs need to be classified as drugs. Devra Lee Davis, the senior advisor to the secretary of health, emphasized that the government would like to move forward with a scientific agenda to establish the credibility of herbal medicine. She pointed out that cancer therapy had not changed much since the 1960's and that herbal medicine contains great promise for the future of cancer treatment and other diseases.

Several of the discussions that followed pointed out that though herbs are useful in treating many diseases, they are also dangerous if they are improperly used or if there is no quality control over their manufacture.

Current regulations in the United States require the proper documentation of research to show the validity of effect and safety of a product before it is marketed as a drug. The FDA explained that according to the Dietary Supplement Bill that passed Congress in 1994, herbs are in the category of "dietary supplements" and can be marketed freely as long as there is no medicinal claim made on the label. If there is a claim, then it is illegal to market the product unless it has been approved as either an over-the-counter or prescription drug. The FDA then urged the people attending the conference to do responsible research and validate their claims. They then stated that they shared the same desire as the herbal medicine industry to find new medicines that are safe and relatively free of side effects.

The FDA assured the acupuncture community that they do not regulate medical practitioners and they have no problem with acupuncturists recommending herbs to their patients. However, they cautioned that herbal medicines from China have no quality control and that some Chinese products contain drugs or toxic ingredients that are dangerous or even fatal.

The obvious problem with this seemingly reasonable approach is that if herbal companies do the expensive and time consuming testing to prove the efficacy and safety of their products so that they can be labeled appropriately, they will no longer be able to market the products freely to the general public.

The primary example of herbal medicine that was debated at this conference was garlic. Proponents of herbal medicine at the meeting argued that if garlic is useful in lowering blood cholesterol then it would suddenly become a drug. The FDA responded by saying that was true, but only if garlic was available in bottles with claims on the label. In the absence of claims on the label, the FDA indicated that they have no jurisdiction.

The obvious problem with this approach is that without doing their own reading and research on herbal supplements, neither doctors nor the general public will have any idea what is available and how it should be used.

An excellent example of how these laws affect you is in the following: prostate enlargement (benign prostatic hyperplasia, or BPH) is a very common condition which affects over 50% of males over the age of forty. The results of this disorder are increased urinary frequency, night-time awakening to urinate, reduced urine flow during urination and possibly painful urination as the urine flow decreases. Although this is a common ailment, it can also be a very serious one if left untreated. As the condition worsens, the bladder outlet may become obstructed to the point that urine is retained in the blood, resulting in uremia.

An FDA approved drug called Proscar (Finasteride) was the first used in the treatment of BPH. It works by inhibiting the activity of the enzyme, 5 alpha-reductase, involved in testosterone metabolism (a male sex hormone). Proscar works by blocking the transformation of dihydrotestosterone, a very potent hormone derived from testosterone, within the prostate. It is dihydrotestosterone that causes overproduction of prostate cells which ultimately leads to prostate enlargement.

After a full year of drug therapy, less than 37% of the patients on Proscar will experience clinical improvement. It should also be noted that it takes at least six months before improvement from BHP might be expected by the patient. While on the drug, approximately 5% of patients will suffer from decreased libido, or impotence. Despite the shortcomings of Proscar, the manufacturer (Merck) has predicted sales will soon reach one billion dollars annually. Proscar costs the patient about $75.00 per month. This is just one example, but is true of all the large pharmaceutical companies.

On the other hand, an extract of Saw Palmetto Berries (standardized to 85% to 95% fatty acids and sterols) has repeatedly shown to improve the symptoms of BPH. As in Proscar, the method of action is the same – inhibition of dihydrotestosterone (the compound which causes the prostate cells to multiply excessively). The major difference is that not only does Saw Palmetto Berry extract inhibit dihydrotestosterone's production, but it also inhibits the binding of dihydrotestosterone at the cellular binding sites. This difference translates into better clinical results for Saw Palmetto Berry extract.

Saw Palmetto Berry extract has shown in numerous studies to be effective in treating BPH in nearly 90% of patients. Proscar, by contrast, has shown itself to be effective in less that 37% of the patients. Add to this the fact that Proscar has side effects (Saw Palmetto has none) and Saw Palmetto costs less than one third of what Proscar costs and it starts working within a few weeks, as opposed to six months like Proscar.

Wouldn't you think the FDA would surely want Saw Palmetto available for consumers? Wrong! In 1990 the FDA rejected an application to have Saw Palmetto approved for the treatment of BPH. What this means to you, the patient, is this: even though Saw Palmetto is safer, more effective and less expensive, distributors of Saw Palmetto cannot make any claims for their products.

In Europe, Saw Palmetto Berry extracts are widely used by physicians as medicines. In the USA, extracts identical to those prescribed in Europe are available on the shelves at health food stores and sold as food supplements for which NO CLAIMS CAN BE MADE.

Dr. Michael Farley, ND

This book will help the consumer of herbs, as well as physicians, learn to use herbs responsibly and knowledgeably. It will also enable the patient and physician to work together toward a safe program that will benefit all parties.

"The physician's duty is to heal the sick, not to enrich the apothecary." This observation was made by an angry young German-Swiss doctor in the early sixteenth century. His name was Philippus Theophrastus Bombastus von Hohenheim (1493-1541) although he was more commonly known as Paracelsus. He was the product of a revolutionary age in medicine which produced Calvin (1509-1564) Luther (1482-1546) and Zwingli (1484-1531) among others. Just as others of his day were castigating the abuses and corruptness of the medieval church, Paracelsus and others like him devoted their energies against the glaring abuses of medicine in his time.

I am hopeful that this book will aid all concerned in making the right decisions concerning their health.

Overview of Herbal Medicine

HERBS VS. DRUGS

"*The fruit of the tree shall be for food, and the leaves for medicine*." Ezekiel 47:12.

There are literally thousands of plant species, and many of them have medicinal uses. Medicinal herbs have a long history in treating disease. People have used extracts from plants for thousands of years to treat their ills, the Egyptians were using herbal remedies some 3500 years ago, while there is evidence other ancient peoples (Persians, Chinese, and Indians) have used medicinal herbs for centuries.

While medicinal plants are the actual plants themselves, plant medicines are preparations made from those plants. Plant medicines are the most widely used medicines in the world today. An estimated eighty percent (80%) of the world's population employs herbs as primary medicines. And while drugstore shelves in the US are stocked mostly with synthetic remedies, in other parts of the world the situation is quite different.

However, in the USA, interest in herbs as medicine is on the rise again and the interest is primarily from Big Pharma, which is always looking for "new drugs" to treat diseases. Considering the very long traditional use of medicinal herbs and the large body of evidence of their effectiveness, why is it that we are not generally encouraged to use traditional medicinal herbs, instead of synthetic, incomplete copies of herbs, called drugs, considering the millions of dollars being spent looking for these seemingly elusive substances?

Medicinal herbs are considered treasures when it comes to ancient cultures and herbalists, and many so-called weeds are worth their weight in gold. Dandelion, Comfrey, Digitalis (Foxglove), the Poppy, Milk Thistle, Stinging nettle, and many others, have well-researched and established medicinal qualities that have few if any rivals in the pharmaceutical industry. Many of them in fact, form the bases of

pharmaceutical drugs. Research into the medicinal herbs' properties such as the humble Dandelion is currently being undertaken by scientists at the Royal Botanical Gardens, in Kew, west London, who believe it could be the source of a life-saving drug for cancer patients. Early tests suggest that it could hold the key to warding off cancer, which kills tens of thousands of people every year.

Herbalists try to find the underlying cause of an illness rather than treat the individual symptoms. Herbal "synergy" is the key principle of herbal medicine. Their remedies are extracted from leaves, petals and roots of plants and are a complex mixture of lots of different compounds. While a conventional pharmaceutical will

usually be a single active ingredient, the idea of herbal "synergy" explains that the hundreds if not thousands of constituents of a plant extract all work together to treat an illness.

For example, ephedrine an early antiasthma drug was first isolated from the herb Ephedra, traditionally used to treat chest complaints. One of the side-effects of ephedrine is that it raises the blood pressure. Herbalists point out that among the many compounds found in the plant itself is one that lowers blood pressure. So, the herbal remedy contains a compound to treat the chest but also to counteract the side effects of that compound.

So, why is there this need for isolating the "active ingredients"? I can understand the need for the scientific process of establishing the fact that particular medicinal herbs work on a particular disease, pathogen or whatever, and the need to know why and how it does so. But, I also understand the process of choosing and prescribing COMBINATIONS of medicinal herbs, which have a synergistic effect to treat not just the disease, but any underlying condition as well as the person with the disease – That is a big difference and not one that is easily tested using standard scientific methodologies.

Rather than trying to isolate the active ingredient(s), why not test these medicinal herbs, utilizing the knowledge of professional herbalists, on patients in vivo, using the myriad of technology available to researchers and medical diagnosticians to see how and why these medicinal herbs work in living, breathing patients, rather than in a test tube or on laboratory rats and mice (which, by the way, are not humans and have a different physiology).

Big Pharma is not really interested in the effects of the medicinal herbs as a whole, but rather in whether they can isolate a therapeutic substance which can then be manufactured cheaply and marketed as a new drug! Cha Ching! Follow the MONEY!

The problem with this approach is however, that medicinal herbs like Comfrey, Dandelion and other medicinal herbs usually contain hundreds if not thousands of chemical compounds that interact, yet many of which are not yet understood and cannot be manufactured. This is why the manufactured drugs, based on so-called active ingredients, often do not work or produce side effects.

Aspirin is a classic case in point. Salicylic acid is the active ingredient in Aspirin tablets, and was first isolated from the bark of the White Willow tree. It is a relatively simple compound to make synthetically, however, Aspirin is known for its ability to cause stomach irritation and in some cases ulceration of the stomach wall.

The herbal extract from the bark of the White Willow tree generally does not cause stomach irritation due to other, so called 'non-active ingredients' contained in the bark, which function to protect the lining of the stomach thereby preventing ulceration of the stomach wall.

Ask yourself, which would I choose – Side effects, or no side effects? – It's a very simple answer. Isn't it? So why then are medicinal herbs not used more commonly and why do we have pharmaceutical impostors stuffed down our throats? The answer is, that there's little or no money in medicinal herbs for Big Pharma! They, the medicinal herbs, have already been invented, they grow easily, they multiply readily and for the most part, they're freely available.

Furthermore, correctly prescribed and formulated herbal compounds generally resolve the health problem of the patient over a period of time, leaving no requirement to keep taking the preparation – that means ZERO repeat sales… ZERO ongoing prescriptions… ZERO ongoing health problems to "treat."

Big Pharma, on the other hand, primarily aims to relieve symptoms. This results in continual consultations, repeat sales, and perpetual health problems. Which do you think is a more profitable proposition?

In Chinese medicine there is a strict order of hierarchy in any herbal prescription, which requires considerable depth of knowledge and experience on the physician's part. The fact that the primary or principle herb has active ingredients, which has a specific physiological effect, does not mean the other herbs are not necessary in the preparation. This is a fact seemingly ignored by Big Pharma in its need to manufacture "newer and better" drugs.

Knowing that medicinal herbs are so effective, that these plants potentially hold the key to many diseases, are inexpensive and have proven their worth time and time again over millennia, why is it that herbal medicine is still not in the forefront of medical treatments, and is considered by many orthodox medical professionals and Big Pharma representatives as "*hocus pocus*"?

Could it be that the "powers that be" are just chomping at the bit to see just how far the people can be pushed and cajoled, lied to and deceived before they explode? Big Pharma would just love to see 100% of everything, including our food sources, declared as "medicine" to be had only by prescription.

ACTIVE CONSTITUENTS OF MEDICINAL HERBS

Medical herbs contain active constituents (principles) or parts which have a direct effect on the human body. These constituents have physiological effects on the body which gives them their medicinal effect. There are two kinds of active constituents:

1. Products of primary metabolism, chiefly carbohydrates (such as sugars and starches) amino acids and fatty oils. These substances are produced in the plants through photosynthesis.
2. Products of secondary metabolism (processes resulting in the production of chemicals from the primary metabolites). Though these products often seem to be relatively useless to the plant, they often are very effective medicines in the human body. These constituents include essential (volatile) oils, glycosides, terpenoids, and alkaline substances called alkaloids. A few of these alkaloids include morphine from the Opium Poppy, and ergotamine from the Ergot fungus.

In this section, we will break down each plant into its constituents, but in doing so, it must be remembered that medicinally active constituents usually occur in groups of closely related compounds, together with other substances which (in all probability) potentiate each other's effect on the healing process. This synergistic effect is one of the herbalist's greatest advantages over several conventional medicines. Though various synthetic drugs may be more potent and concentrated, they often have severe side effects.

Herbalists have learned that by using the synergy inherent in plant medicines, they are able to effect substantial medicinal effects without the detrimental side effects of many synthetic or prescription medications. Another advantage that herbalists enjoy is in herbs such as Ginger, which reduces inflammation from flu like symptoms at the same time providing anti viral compounds and compounds to reduce nausea… all of this from just one herb, with no harmful side effects.

The active constituents of plant drugs belong to several different chemical groups, among them are: alkaloids, glycosides, saponins, bitter compounds, tannins, essential oils, volatile oils, terpenes, resins, fatty oils, mucilage, pectines, mineral compounds, organic acids, vitamins and carotenoids.

DAFFODIL
(Amaryllidaceae)

ALKALOIDS

Alkaloids are a diverse group of compounds with alkaline properties. The physiological effects of alkaloids center on the circulatory system and the nervous system. Most herbs in this group have a bitter flavor and are poisonous to varying degrees. There are thousands of alkaloids known and many are used medically. Atropine, codeine, morphine and caffeine are all alkaloids. Plant families rich in alkaloids include the Amaryllidaceae (daffodils), Apocynaceae (Periwinkles), Leguminosae (peas), Liliaceae (lilies), Papaveraceae (poppies), Rubiaceae (bedstraws), & Solanaceae (nightshade).

GLYCOSIDES

Glycosides are products of secondary metabolism in plants. When they are hydrolyzed glycosides split into two parts, one of several sugars (glucose, fructose, etc.) which are the glycone component, and the non sugar (aglycone) component. Each glycoside is associated with a specific enzyme in the plant. These enzymes are stored in cells at different locations of the plant. When the plant part is chewed or crushed, the cell walls are broken and the enzymes come in contact with the glycoside, hydrolysis occurs and the aglycone is activated. The sugars act synergistically by increasing the solubility of the glycoside and its absorption into the body, as well as facilitating its transportation to specific organs.

Glycosides include some of the most effective plant drugs available, and some of the plants in this group are the most toxic known. Glycosides are classified by the chemical composition of their aglycone part:

1. Cardiac glycosides: they affect the contraction of the heart muscle and are used to correct arrhythmias in the heartbeat. They're divided into two groups -- bufadienolides (found in Christmas rose) and cardenolides (found in foxglove, lily of the valley, and oleander).
2. Cyanogenic glycosides: in these the glycosides, the aglycone, is a cyanohydrin compound bonded to a sugar. Upon hydrolysis in the presence of an enzyme (such as saliva in the mouth) prussic acid (hydrogen cyanide) is liberated in minute or larger amounts. Cyanogenic glycosides have antispasmodic, purgative and sedative actions to varying degrees. They are characteristic of the families Caprifoliaceae (Honeysuckles) Linacaeae (Flaxes).
3. Mustard glycosides (glucosinolates): these glycosides contain bonded sulfur and are characteristic of the Cruciferae (cabbage) family. In plants, they occur in conjunction with the enzyme myrosinase. When broken down, mustard oils are liberated. These are excellent antiseptics due to the sulfur compounds. Mustard glycosides are found in White mustard

HONEYSUCKLE
(Caprifoliaceae)

and Horseradish root to name a few.

4. Phenolic glycosides: Phenolic glycosides are divided into four main groups;
   a. Simple phenolic glycosides. These compounds contain a simple phenol. They share a characteristic effect and are aromatic. Medicinally they include salicylic derivatives as are found in Willow Bark and Meadowsweet as well as methyl arbutin and arbutin found in the leaves of Bilberry and Barberry.

   b. Coumarin glycosides. These compounds are phenyl propane derivatives. These herbs and plants have a sweet smell like new mown hay. There are several coumarin glycosides. Hydroxycoumarins are found in Horse Chestnut and Ash. Aesculin is the hydroxycoumarin found in Horse Chestnut bark. It has been found to strengthen the capillary walls. Aesculoside is another coumarin found in Horse Chestnut. It absorbs ultraviolet light and is used in sunscreen applications.
   c. Anthraquinone glycoside. All of these are aromatic. These glycosides are pigmented phenolic compounds which readily break down to lose their sugar molecules. Taken internally, many of these phenolic compounds exert a laxative effect, varying from mild to severe.
   d. Flavonoid glycosides. These are aromatic phenolic compounds which include anthocyanins, largely responsible for the yellow blue and red color of flowers, and bioflavonoids. Bioflavonoids are usually yellow in color as is the dried root of licorice. Rutin from Buckwheat and Rue is exceptionally important medically because, like coumarin aesculin, it affects the permeability and strength of the capillary walls. They are used to treat hypertension and other various heart disorders. The flavonoids of Hawthorns are also hypotensives and cardiotonics.
5. Saponins: consist of a triterpene aglycone (sapogenin) and a sugar group (glucose or galactose). These glycosides are often associated with cardiac glycosides. The chemical composition of saponins is very similar to that of sex hormones and some saponin containing herbs are used in the manufacture of birth control pills.

Bitter compounds

These herbs have in common a strong bitter taste that irritate taste buds and stimulate the flow of digestive juices and appetite. Some of these herbs activate the secretion of bile and others increase urine production. They are found in members of the Compositae (daisy) and the Gentianaceae (gentian) families.

Tannins

Tannins are complex polyphenolic compounds that all have the ability to coagulate proteins, alkaloids and heavy metals. This is true, however, only as long as they are fresh enough to dissolve in water. The two types of tannins are condensed tannins (polymers derived from flavonoids) and hydrolysable tannins (esters of gallic acid and glycosides of these esters). Tannins have astringent and antiseptic properties but their chief value in medicine lies in their ability to precipitate proteins in mucous membranes and other tissues, causing a thin layer of coagulation to form. This precipitated matter destroys bacteria by depriving them of nutrition, aiding in the healing of wounds and inflamed mucosa. Tannins also decrease pain by decreasing sensitivity to the inflamed area. Tannins are used in medicines for diarrhea, bronchitis, wounds, hemorrhoids, and mouth and gum infections. Tannins are plentiful in Betulaceae (birch), Ericaceae (willow), and Rosaceae (rose).

Essential oils

Essential oils (volatile oils) are liquid components of plant cells. Unlike fatty or fixed oils, they do not leave a permanent mark on paper. Essential oils primary constituents are complex mixtures of terpenoid substances. Exposed to air or light essential oils oxidize and become less effective.

Medicinally essential oils act as digestive tonics, antiseptics, carminatives, anthelmics, antirheumatics, rubefacients and anti-inflammatories. Many of the essential oils are used for flavoring and are also included in proprietary medicines. These include menthol, thymol and others.

Fatty (fixed) oils

Fatty oils from plants are mixtures of triglycerides, which are water insoluble, but dissolve in organic solvents. Many plant and vegetable oils contain substantial amounts of unsaturated fatty acids and are liquid at room temperature but congeal and become opaque at cooler temperatures. A few of these fatty oils used in medicine include almond oil, corn oil, flax oil, and castor oil.

Almond Oil

Terpenes

A hydrocarbon derived from essential oils, resins and other vegetable aromatic products.

Vitamins

Herbs consistently have many minerals and trace elements that the body requires. It will be noted when you are looking at the herb constituents that they contain all of the phytochemicals (plant chemicals) and trace elements necessary to form a complete supplementary system to assist their actions. They contain very small amounts of vitamins for the most part. For vitamin supplementation it is much easier to get high vitamin dosages from multiple vitamins than from herbs.

Mucilages and pectins

Plant mucilages are amorphous mixtures of polysaccharides that dissolve in water to form extremely viscous colloid systems. In cold water they swell and form a slimy gel. In hot water they dissolve, then gel when the water cools. Most are formed by the cell walls of plants. When mucilages pass through the digestive or respiratory tract they leave a thin protective coating over mucous membranes that protect the membranes from irritation. For this reason they are used to treat infections of the chest, intestine and throat. In small doses they slow the peristalsis thereby having an antidiarrheal effect. In large doses they have just the opposite effect and are used to treat constipation. In large doses they are an extremely effective laxative. Pectins (found in quinces, for example) are classified as plant mucilages because both are polysaccharides and form gels in the same way. They are also used in the treatment of diarrhea.

Quince Fruit
(Cydonia oblonga)