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## **DOSAGE AND FORM OF HERBS**

### **Decoctions, Dried Decoctions, Powders, Pills, Etc.**

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Herbal dosage is a difficult concept to grasp; partly, this is because of the limitations in our knowledge about the herbs, but it is also the result of variations in our concepts of how herbs may contribute to health. For example, we are limited because we often do not know the identity of the main active constituents or their quantities, nor how those quantities might vary among samples of the raw materials, or how they might be affected by the way the herbs are prepared. As to conceptual framework, some people think of herb action in terms of "energetics" in which the quantity of the herb might not be critical; this is an unorthodox idea, one which has influenced Western practitioners via homeopathy. By contrast, many people would think of herbs in terms of the pharmacological effects of the main active ingredients, in which case a certain dosage range will yield those effects, but lower doses may fail to give the desired results; this is a modern scientific viewpoint. In fact, many people don't give much thought to the question of dosage. An added complication is that both the traditional and modern methods of preparation of herbs are sometimes selected on the basis of what is technologically feasible, what is convenient, or what is affordable, rather than what might be ideal from the consideration of traditional practices or clinical efficacy.

In this presentation, Chinese herbs are the primary concern, though the implications would apply to other herbs. Acknowledging the difficulties mentioned above, the subject will be viewed in terms of the actual practices in Chinese clinical work, practical considerations for use of herbs outside of China, and the modern method of examining the active constituents (to the extent that information is available).

### **DECOCTIONS**

Decoctions are generally inconvenient and unpleasant herbal preparations that are used only as the situation might require. Whether in China or the West, for a person to get a decoction, they would have to make an appointment for a diagnosis, get a prescription, have the prescription filled, spend an hour or so cooking up the tea, and experience the strong taste and smell of the tea as well as sometimes encounter its strong effects, which can include nausea, dizziness, and other symptoms. The person doing the diagnosis and prescribing must be knowledgeable about all the ingredients, their blending into formulas, and how they are to be cooked.

There are some good reasons for using decoctions and the primary one has to do with dosage. If a person is going to try and get a substantial change in their body condition immediately, and if they are going to do so with herbs that are not toxic, it may be necessary to consume a large quantity of herbal material, far too much to put into any other form than a considerable volume of liquid. Further, if the desire is to pursue a condition, that is progressing from one phase to another (as described in the traditional Chinese system) until it is gone, using a different formula day by day or week by week, the decoction format allows the practitioner to design the formula for the patient requirements on the day of

the first visit and then alter it as the condition changes.

Decoctions were a primary method of therapy described in the ancient text *Shanghan Lun*; for many of the conditions described in that text, there were variations of formulas that corresponded to each manifestation of the disease, and to the way the disease changed. Although duration of therapy was rarely indicated, it was evident that the decoctions were intended to be used for a day or a few days, and that the patient was expected to be in a different status within a few days.

Visitors to modern Chinese hospitals during the past few decades will have observed the strong reliance on decoctions there. In fact many hospitals and several independent pharmacies will cook up the herbs on the premises, so as to save the patient part of the trouble. The decoction of herbs in that particular setting is inexpensive and gets the herbs to a large number of patients with varying complaints by allowing a thousand different ingredients to be combined according to the doctor's interpretation.

In Chinese clinical reports, decoctions may be described for treatment of chronic ailments that require a long term of therapy. These are usually used for courses of therapy lasting about one month, to be repeated as needed, typically for up to two or three months. In some instances, even six months or more of therapy is mentioned. The longer term therapy is for conditions that might be otherwise untreatable by modern medicine (or for situations where the modern medical treatments are to be avoided due to their risks or harm); this critical situation can justify putting the patients through months of making and consuming decoctions. Increasingly, Chinese medical reports from China indicate using capsules, pills, or tablets rather than decoctions, so that situation is changing to address modern conditions in China.

The typical dosage range for herbs in decoctions is relayed in the Materia Medica guides. For the majority of commonly used herbs, the range is 6-15 grams for a one day dose, with an average of about 10 grams/day. Some herbs are used at considerably lower or higher dosages routinely, but these are the exceptions that must be learned; some herbs are used in much higher dosage for certain applications. Decoctions are commonly made up of 8-16 ingredients, with an average of about 12 ingredients. Thus, a decoction of about 120 grams of crude herbs is usual (e.g., 12 ingredients x 10 grams/ingredient). For a one week supply of herbs, this translates to nearly 2 pounds of dried herb materials. When treating serious ailments, the dosages may be increased by, on average, about 50%, so that a one week supply comes from about 3 pounds of herbs.

I would like to give an example of a formula from a recent medical report that addresses a common concern today: liver fibrosis (often the result of viral hepatitis, but there are several other potential causes). In a report from the Taizhou Municipal Hospital of Traditional Chinese Medicine (*Journal of Traditional Chinese Medicine* 2003; 23(4): 251-254), the formula administered to patients was called *Dading Fengzhu Tang*, and it was formulated as follows:

Turtle Shell	15 g
Tortoise shell	15 g
Oyster shell	20 g
Peony	20 g
Cannabis seed	5 g

Raw Rehmannia	20 g
Ophiopogon	10 g
Schizandra	6 g
Gelatin	10 g
Baked Licorice	12 g

These ingredients, of which there are 10 items, with a total dosage of 133 grams, were to be cooked up, strained, two chicken egg yolks added and mixed, then divided into two portions to be taken during the day. A course of treatment would be 3 months (at the end of treatment, it was claimed that various blood serum indices that reveal the fibrosis activity were significantly lower in the group taking herbs compared to a control group). Herbalists will recognize that these ingredients are reputed to nourish the yin, settle the yang, and soften hardness.

One might ask why such large doses of herbs are needed. An explanation that herb materials being used in China are of poor quality-and thus the decoctions require extra quantities-is generally not valid (for example, in the formula above the ingredients used there are essentially the same as those used for export). Rather, it is because all the herb materials in the formula are mild in nature; there are no toxic components; there are no significant alkaloids (which are often a safety concern in high dosage); and the majority of the weight of material that is being cooked up is not consumed (e.g., plant fiber, much of the calcium compounds making up the three shells). Of the materials that are consumed, the majority are sugars, starches, and other ordinary ingredients that are not expected to have a significant medicinal effect (the various gelatins from turtle, tortoise, and donkey skin, and the egg yolks provide proteins). Only a relatively small proportion of the substances present might be deemed primary active ingredients of unique medicinal nature.

Further, decoction of herbs is a relatively easy but inefficient method of getting out active ingredients. When the dregs are thrown away, they are saturated with decoction that is not consumed; as the water boils, aromatic ingredients dissipate into the air (in the formula above, there are virtually no aromatics of importance, so this loss is not a major concern); other ingredients may be damaged during the prolonged heating (for example, substances bind together and become inactive because they are then not absorbed; other substances may oxidize and lose activity). Still, the amount of ingredients to be ingested is relatively large because of the high dose of total material. From the point of view of pharmacology, one would expect to need a substantial quantity of the mild components present, such as flavonoids, iridoids, lignans, and calcium compounds, to have an effect on such a serious problem as liver fibrosis.

The inefficiency of decoction is made worse when careful attention is not paid to the different cooking times that might be appropriate. For example, in the formula above, the three shells should be ground up and then decocted a long time to get out some of the hard, mineralized compounds (gelatins from the turtle and tortoise shell will extract more easily). Other ingredients might do better with short decoction: for example, peony root contains some small molecules that will boil away, and it could be cooked for a shorter time. Normally, the gelatin is added after the cooking is done; it is added to the hot, strained liquid (as is being recommended for the egg yolks). This prevents loss of the gelatin that might stick to the herb dregs and to the sides of the pot (along with the extracted turtle and tortoise gelatins).

Decoctions were used by U.S. practitioners when Chinese herbal training was first made available in the late 1970s and throughout the 1980s, particularly because some of the herb teachers were immigrants from China who had worked at the hospitals using the methods described here. But, reliance on this method has declined somewhat for several reasons, including the widespread availability of other forms deemed more convenient by practitioners and patients. Herb decoctions are still prescribed by Chinese immigrants who have prior training and experience in using this form and who are comfortable with designing herb formulas for each patient.

Among the difficulties in using decoctions in the West are the space requirements for storing herbs, the absence of pharmacists to take on the timely task of filling prescriptions, and the lack of adequate training at colleges of Oriental medicine. Many students now study traditional formulas but not the art of designing formulas. The greatest problem is that most patients prefer not to use decoctions if they can be avoided. So, the question arises: can they be avoided? This is, to a large extent, a question of dosage.

## **DRIED DECOCTIONS**

Dried decoctions (which I often refer to as "granules" based on one of the original versions) were developed in Japan in the 1950s as an alternative to decoctions and have become a major method of providing herbs in Japan, Taiwan, the U.S., and Europe. There are some pitfalls in this technique that practitioners need to recognize; it can be a useful product type.

This particular approach to processing of herbs appears to have been generated by the convergence of two trends. Japan began a major industrialization during this post-war period, which led to the application of modern technologies to herbal medicine. At the same time, there was a strong interest in relying on ancient Chinese herbal formulas, especially those from the *Shanghan Lun* (Han Dynasty) and *Hejiju Fang* (Song Dynasty) with the belief that there was something inherently valuable in the ancient formulas that could not otherwise be matched by modern efforts. So, with a high demand for a relatively small number of standard formulas, and a method of mass manufacture of them, a large, successful industry evolved.

In Japan, there are over 200 traditional combinations prepared by this method that are deemed standard pharmaceutical products. The cost of these formulas to patients is covered by the national health insurance. In Taiwan, which adopted the technology and ideas from Japan nearly 50 years ago, the dried decoctions are utilized in dozens of their hospitals and clinics. The preparations were first imported into the U.S. around 1976 and into Europe around 1980, where they not only replaced the use of home-prepared decoctions but also contributed to the prescription of herbs by those who had never worked with the decoctions. Due to various factors (of which price is an important one), the products imported from the Orient mainly come from Taiwan rather than Japan. More recently, China has adopted this technology and now exports the extracts, and at least one company in the U.S. manufactures the granules on a large scale.

The dried decoctions are produced by making large batches of either single herbs or traditional herb formulas as decoctions (in large tanks), and then draining the liquid from the dregs. The liquid is then evaporated (using heat and vacuum) to form a syrup. The syrup is then put into a spray-drier along with a powder carrier (usually starch or the dried, powdered, herb dregs), and the remaining water is evaporated, leaving a dry powder. There can be variations in this processing method, but it basically

involves making a decoction and then drying it (freeze-drying is not used).

The addition of a carrier is very important because dried extracted herb materials will turn into a gummy solid or even a hard mass when exposed to even a small amount of moisture. Starch or other material prevents this from happening. The amount of this carrier that is needed depends on the herb used, but typically ranges from 25-50%, so this becomes a large portion of the product.

The amount of extractable materials also varies considerably from one herb to another and from one formula to another. The finished product, on average, is about a 4.5:1 concentration of the ingredients in the crude herbs. Put another way, it takes about 450 grams (about one pound) of raw materials to yield about 100 grams of finished product (a typical amount dispensed at one time). Some products may have a lower concentration, depending on the amount of carrier used and the herb or formula extracted. The manufacturers have been very reluctant to provide information on this important matter.

What does this mean practically? If you would prescribe to a patient a decoction formula made with 90 grams of crude herbs, then you would prescribe about 20 grams per day of the dried extract ( $90/4.5 = 20$ ). This is far more than just about anyone actually recommends. This is the skeleton in the closet of the granule industry. But, there are some important explanatory factors to consider.

First, when Japan replaced herb decoctions with the granules, they had already gotten into the habit of using very small doses of herbs, administering them for a long period of time rather than for a few days or weeks, as described above for decoctions. While their Chinese counterparts might have been prescribing 120 grams of herbs in decoction for a daily dose, the Japanese doctors were using only about one-third that much. And, as a result, they were getting very slight medicinal effects and taking much longer to treat ailments. Second, Chinese doctors were trying to use herbs as the sole remedy for their patients, while the Japanese doctors were using Chinese herbs often as an adjunct to modern drugs. Thus, the Japanese doctors could rely more on the drugs than on the herbs to keep their patients relatively free of symptoms. Third, China was growing, harvesting, and distributing its own herbs under the communist system that forced the prices down (literally pennies per day for these massive decoctions); by contrast Japan had to import many of the herbs, and the cost was quite high. Thus, they tended to use less in Japan in order to make the treatments affordable. This Japanese dosing was also copied by Taiwan as the technology was transferred there.

When the dried herb extracts came to the U.S., the dosing instructions made available to practitioners suggested using about 6 grams per day of the granules. In fact, for most formulas (except those with very few ingredients), it would be necessary to use at least three times that amount to come somewhat close to the Chinese decoction method of therapy. When using such large amounts of the granules, the cost is high and patient compliance goes down because of the strong taste of the herbs. Still, this is much more convenient for the patient than cooking the herbs, and the taste (and effect) is milder than the corresponding decoction because the dose is lower.

The extraction in factories is, or at least, should be, more efficient than home cooking of herbs, and this is sometimes used as an explanation for prescribing proportionately lower doses. When making the large batches under the guidance of experts, it is possible to put an effort into minimizing losses that

arise from cooking materials incorrectly. However, the process of removing the water and spray drying the granules can also lead to some losses, so the end product is not necessarily that much better than a home decoction.

In the U.S. there are nearly 400 traditional formulas available as granules, and there are also about 400 single herbs made as dried extracts. One can prescribe the traditional formulas, or modify them by adding single herb extracts, or one can make up an entirely new formula using the single herb extracts.

There are three ways to consume the materials. One is to put a measured quantity in the mouth and swallow down with a glass of water, just as one would do with a capsule or tablet. This works better with products that are well granulated, because finer powders tend to stick to the mouth. A second way is to encapsulate the granules and take them: some companies provide the traditional formulas already in capsules (or, in a few cases, in tablets). While this enhances compliance for some patients, it also tends to reduce the dosage consumed: a 15 gram daily dose generally requires 30 capsules (500 mg typical fill), which is both costly (compared to loose granules) and a lot of units to take. A third way is to put the dried decoction in a cup, add boiled water, and produce a tea. The products made in fine powder or tiny granule form can simply be stirred up and consumed immediately; any amount of water can be used that allows the person to swallow the materials comfortably. The products that are finer powders work particularly well in this application; but the granulated items can also be used, with additional time soaking in the hot water. When a tea is made from these products, after sitting for a while in the cup, there will be some silt at the bottom of the cup. This is the carrier substance, and it need not be consumed (but can be consumed).

## POWDERS

Powdering of crude herbs to make medicines has a long history, having been mentioned in the *Huangdi Neijing* and even the pre-*Neijing* scroll "*Wushier Bing Fang*" (about 168 B.C.). The use of powdered herbs reached two peaks in Chinese medical history, the first marked by the publication of the *Hejiju Fang* (1080 A.D.) which mainly dealt with premade formulas in powder and pill form, and the other being the current era in which powdering machinery and the desire for convenient forms of herbs combined with ecological concerns to focus attention on this method.

Powders may be ingested directly (swallowed with some water or tea) or made into a tea by briefly boiling in hot water, and straining out the dregs that sink to the bottom. Powders may be rolled into sticky pills, called honey boluses, or sliced to make tablets (the Chinese term for tablet, *pian*, means slice).

The boiling powders are represented by well-known formulas such as *Xiao Yao San*. A common method of using these is to have a batch of powder made in advance and stored in a tightly sealed bottle to give to patients as needed. The patients will then be instructed to boil some water with ginger root or some other recommended substance, then add the powder and boil for just a few minutes. The dose of these powders is only a few grams. For example, *Xiao Yao San* is used in a dose of 9 grams; this would be cooked with 6 grams dry ginger and 3 grams mentha, so that the total dose is 18 grams. This compares to 60 grams that is used in modern Chinese clinics to make a decoction. Why the lower dosage for the powder?

First, the powder typically has a different indication than the corresponding decoction. The powder is commonly used for functional disorders, while the decoctions are commonly used for organic disorders. Thus, for example, liver qi stagnation with dizziness is a functional disorder, while hepatitis with fibrosis is an organic disorder. Another reason is that the powdered herbs boiled for a short time are better extracted (because there are no large pieces of raw herb materials needing prolonged boiling) and have less damage or binding of active constituents as occurs with prolonged boiling. A Song Dynasty physician commented that the use of decoctions was declining in his time and that "When there is a situation where the use of decoctions is indicated, doctors usually prescribe boiling powders."

The honey pills that were common prior to the relatively recent introduction of mass-produced tablets were simply made by combining herb powder with honey and rolling into a pill. Typically, these pills were made with one-third honey and two-thirds herb powder, and the pill size was commonly 6 or 9 grams in total. These rather large pills would then be consumed either by adding them to water and boiling them briefly (thus, the same preparation as above the powder above, but sweetened with honey), or they could be chewed up, or sliced into smaller pieces and swallowed whole (if soft enough). The dose would usually be one pill each time, one to three times per day depending on the condition. Thus, the dosing would typically range from 12-18 grams of the herb powder.

Concerns have been expressed that powdered herbs are not absorbed efficiently. Actually, with modern powdering technology, these fine materials rapidly release the active constituents when combined with gastric juices, and do so at temperatures and under conditions more favorable to maintaining the active ingredients than in the rolling, evaporating boil of a decoction. Some active ingredients are actually better obtained direct from swallowed powders than from decoctions, but other active ingredients (e.g., those that are quite stable in the boiling pot) are present in powders at far lower amounts than in decoctions. Often, the uses for the pills are different than for the decoctions, in the same way that the uses for the boiling powders are different.

Although the large honey pill has been produced continuously to the present time, one of the preparations favored in some Chinese factories for the past few decades is the water pill, which is a small round pill. Most acupuncturists are familiar with these; they are sometimes called "tea pills". These are made in large rolling drums. The pills are usually 175 mg each, and come in bottles of 100 or 200 pills, so a bottle of herbs contains only 17.5 or 35 grams of the herb materials. This is a small amount, even when compared to the boxes of honey pills (10 pills made with a total of 45-60 grams of herbs). The recommended dosing on the package label for these water pills is typically 8 pills, three times daily, which means that a daily dose is only 4.2 grams of herbs. Many American acupuncturists have learned that this dosing should be increased to 12 pills three times daily, which would yield 6.3 grams per day. How did the dose get so much lower than with the honey pills and loose powders? These pills are primarily intended for over-the-counter sales to people who just want to protect their health or improve a minor symptom or for follow-up after a regular medical treatment with decoctions (or powders or pills taken at higher dosage). The products were intended to be very low in price, so they have very little material in them.

Today, especially in the West, decoctions, dried decoctions, and loose powders are largely being replaced by tableted products. Several manufacturers of Chinese herb formulas have made available

tablets of powdered herbs-or tablets of the dried decoctions-relying on 700 mg to 750 mg tablets. At that tablet size, if a person consumes about 6 tablets three times daily, the dose of herb material (powder or dried decoction) will be about 13 grams, which is close to the recommended range described above for powdered herbs and dried decoctions. However, if put into capsules (which rarely hold more than 500 mg) or if put into smaller tablets of about 500 mg size, even 18 units per day gives a low dosage. Label recommendations are often for using only fewer tablets, but professional literature should indicate these higher numbers.

Powders consumed directly (such as in tablets) sometimes have advantages over the boiled herbs, at least for certain ingredients. To avoid wasting precious materials, it is usually recommended that items which yield little during extraction, which lose potency with heat and/or evaporation, or which are lost to the dregs and the pot, be powdered and ingested directly. This is done even when the bulk of herbs are boiled in a decoction. In ancient times it was said that "The qi of raw materials is most poignant and works first." This suggests an appreciation for the properties of uncooked herbs. In the standard textbook *Zhongyao Xue* (1990), 80 medicinal materials are suggested to be prescribed in powder or pill form, either because they should never be boiled, are best if not boiled, or are more efficiently used if they are not extracted first. Convenience is a major reason why pills and tablets are used.

There are disadvantages to the pills. Some patients don't like to swallow pills, especially the larger tablets; some herbs don't yield enough of their active ingredients in this form. The amount of raw materials used to make the daily dose of pills is so much lower than that for decoctions (sometimes by a factor of 10), that only a part of this difference can be accounted for in terms of losses that occur with decocting. Pills are not expected to accomplish as much as decoctions when using the same types of ingredients.

## **SPECIALTY DRIED EXTRACTS**

Specialty dried extracts usually involve use of additional solvents (which, like the water, are also removed to make the dried product) and may involve several processing steps. This is in contrast to dried decoctions, in which water is the sole extract medium and the only extra processing is removing the water. The material resulting from the special extracting can have a relatively high proportion of a certain desired active component or group of active components; in some cases, the result is a nearly pure compound. These extracted materials are then put into capsules or tablets. Unlike the dried decoctions, which include a large proportion of sticky materials that congeal when exposed to moisture, these products may hold up better without so much carrier substance; further, because they are put into finished dosage forms (e.g., tablets), they may be protected by that means from the moisture exposure that can occur with loose granules. Thus, the amount of carrier material can be only a few percent (or none). For this kind of product, there isn't a general rule about dosing, as it depends upon the content, form, and use of the product. Most commonly, the dosing is a small number of units, such as 1-3 capsules or tablets at a time. Still, it is worth being aware of the specific products and the dosage information, so that one can avoid certain potential problems.

Although a relatively rare issue, it is important to be careful about not overdosing with these products. If one has experience using the preparations made from powdered herbs and from dried decoctions, where the total amount to be ingested is large, one could assume that one of these specialty

products needs to be taken in large amounts, and the quantity can become excessive. There was one product from China, now off the market, that was an isolated herb alkaloid (THP, tetrahydropalmatine) in very small tablets in small vials. Some people, being used to other products packaged in similar manner (such as *Kang Ning Wan*, Pill Curing), understood that one would consume an entire vial at one time. In fact, for that particular product, taking a whole vial of the small pills would be a significant overdose, especially if given to children.

The much more common problem is that the extract material is underdosed. This especially occurs with over-the-counter Western herb products, but the products can be based on Chinese herbs. The processing method for the products is often not revealed. The products may be described as being "standardized," which can give a misimpression that they are especially high in potency.

An example is a product made from ginseng, which is standardized to provide in each capsule either 4 mg or 8 mg of ginsenosides, the main active components of ginseng. This amount of ginsenosides is so far below what is used in routine practice in China, that the product is not usable within this context. A typical decoction of ginseng might provide 10 times the dosage of ginsenosides that is available through this type of standardized extract; and ginseng extract tablets made in China might contain 20 or 30 times the amount found in this product. A similar situation arose with black cohosh extracts, some of which provide only 20 mg of the extract in a dosage unit. Black cohosh is a Western herb related to the Chinese herb *shengma* (cimicifuga). The amount of extract in the standardized products represents 10 times lower dosage than might be used in a Chinese preparation. So, it is necessary to check the literature thoroughly in order to understand the product and its dosage. Some products are taken in quantities of 5, 10, or even 15 tablets at a time (where the tablets are small, typically containing only 200 mg of extract) while others are taken 1-2 tablets or capsules at a time.

## TINCTURES AND OTHER ALCOHOL EXTRACTS

Tinctures and other alcohol extracts are another somewhat popular means of delivering Chinese herb formulas. The idea of making tinctures of all the herbs and formulas that a practitioner might use comes entirely out of adopting a Western approach, which was, in turn, based on use of different types of herbal materials than used in most Chinese prescribing (for example, tincturing was used as a means of preserving fresh herb materials that were rich in volatile ingredients that could be lost upon drying and upon making teas). The dosing of Chinese herbal formula tinctures, made with over a dozen different herbs, is often set at the same level as that for Western single-herb tinctures, resulting in consistent underdosing of the complex formulas that are often comprised of mild herbs (even though the taste of the tincture might be quite strong).

Wine has been known in China for about 4,000 years. Since about 500 A.D. it has become common to produce medicines by steeping the herbs in a distilled liquor. Modern Chinese researchers have investigated the use of the "wine formulas." For example, two books have been published recently, **A Great Compendium of Chinese Medicinal Wines** (1991) and **Treating 100 Diseases with Medicinal Wines** (1990). The uses of the alcohol-based formulas are mainly in the following categories:

**Blood stasis, meridian obstruction, and/or cold syndrome:** arthritis, paralysis, amenorrhea, dysmenorrhea, infertility, post-partum disorders, impotence, phlebitis, arteritis, chronic skin diseases

(especially if associated with a cold syndrome), injuries, and fractures.

**Miscellaneous disorders:** cough/asthma, epilepsy in children, growth disorders due to malnutrition, tinnitus, and loss of voice.

The influence of alcohol on herb formulas is illustrated by the instructions for one of China's most famous remedies, *Yunnan Pai Yao*. When the product is to be used for stopping bleeding, it is to be taken with water. When, on the other hand, it is to be used to vitalize blood circulation, it is to be taken with wine for best effects. The amount of alcohol to be consumed with herbs was addressed by Sun Simiao. He indicated that to obtain the desired action, it was essential to consume a quantity that was sufficient to feel the effect of the alcohol (more than momentarily as a response to tasting it). He cautioned about the adverse effects of consuming too much. The recommended amount of a medicinal wine corresponds to about a "shot glass," which is about 1.5 ounces. This contrasts with some recommendations for tincture preparations using only a few drops at a time, or even a teaspoon. Sometimes, the tinctures are packed in bottles of just 4 ounces, enough for about a three day supply when used in the Chinese manner.

The dosage of herbs used in making the Western style tincture preparation is usually quite small, about 7-10 grams of dried crude herbs per one ounce of fluid extract. The alcohol/water mixtures (typically 20-40% alcohol) are generally superior to water in extracting several of the active constituents of herbs; the effectiveness of boiling water used in decocting to get ingredients out of the herb mass is often comparable to cold alcohol used in tincturing, but there is less damage with the tincture process. In some cases, such as the immune-enhancing polysaccharides of astragalus, lonicera, medicinal mushrooms, and other herbs, alcohol is actually a poor medium for extraction because it causes the desired components to condense out of the liquid (thus none is left in the finished product).

The dosages usually recommended for tinctures, a few drops, may provide the extract obtained from less than a gram of crude herbs and usually does not provide the "alcohol action" that Sun Simiao deemed important if the alcohol is indeed to count as part of the treatment. Some practitioners advise adding the tincture to boiling hot water to drive off the alcohol, but this further condenses active components (so that they are not consumed or absorbed) and drives off some of the important essential oils (for which alcohol/water is a good medium to aid evaporation).

Why the low dosing of tinctures? In many ways, this comes about from a compounding of some errors. Tinctures were used because the technique was available rather than because it was the most suitable method of providing the herbs. The cost is high, both because of the use of expensive alcohol and because of the need to store and transport liquid, which involves higher weights; the alcohol limits how much can be taken before undesired effects on the brain occur, especially for women and children and also for any desired dosing during the day rather than at night. Combining these limitations with the lack of reference to Chinese literature about medicinal wines has led to mistaken dosing. It has been suggested that tinctures are far better absorbed than other preparations of herbs, but there is little, if any, data that supports this contention and a modest difference in absorption would not compensate for the large difference in quantity of constituents. The ultimate message is that if tinctures are to be used, make sure enough is consumed; tinctures of herbs that might not have the desired active components in the finished product should not be used.

## GETTING THE RIGHT DOSAGE

Few herbs, in any form, have been subjected to careful study against placebos. Some studies conducted initially-that resulted in heavy promotion of herb products-may have indicated dramatic benefits; once the product becomes widely used, it may be subjected to a more careful study, showing little or no effect. Arguments erupt about whether such "negative" studies used the right herb material (even though it may be the most popular one), or whether the double-blind study might remove the evidence of effect. In fact, it is likely that the negative studies reveal two things: one is that the initial claims were exaggerated; the other is that the dosages that are commonly consumed involve underdosing. In the mean time, millions of people may take the herbs and proclaim success by simply interpreting experiences this way: if the condition being treated improves, the herbs "worked." If the condition being treated did not improve, then something else went wrong (e.g., I waited too long to start treatment; I was too irregular in taking the herbs; I ate something that counteracted the herbs...). Practitioners of Chinese medicine frequently participate with their patients in this way of thinking, rather than cautioning about interpreting either positive or negative experiences to be the direct result of the herb ingestion.

In the description of herb forms and dosages provided in this article, the concern about underdosing is mentioned repeatedly. This is, in my view, the greatest problem with practice of herbalism in the West, particularly in the adoption of Chinese herbal practice from China (where it is proclaimed effective based on both thousands of years of experience and modern research) to other countries (where there has been little experience and few studies of those same herbs). The claims made in China are, for the most part, based on using much higher doses of herbs than are used elsewhere.

The reasons for underdosing emerge primarily from a lack of knowledge about herbs and their traditional use. Attention tends to be focused initially on the indications of the herbs or formulas, without adequate concern for utilizing the amount of the herbs needed to attain the desired effects based. Thus, if it is said that "astragalus is good for the immune system," then one might take some quantity of astragalus, but not think about the dosage that is actually needed to get those immune system benefits. In China, the dosing of astragalus in decoction is routinely 9-15 grams per day, but for certain applications it is increased to 30, 60, or even 90 grams per day, and there are medical reports describing even 120 grams per day (dried herb in decoction). During treatment for significant syndromes of immune weakness, the dose of 30 grams per day of astragalus (taken along with another 100 grams or so of other herbs) is standard practice. Small pills of formulas made with astragalus, such as *Buzhong Yiqi Wan*, which have only a few milligrams of astragalus, would not be considered effective (these pills might, however, be used as a follow-up to treatment once the immune problem has been rectified). Dried decoctions could be used in place of decoctions, but to get 30 grams per day of astragalus into this form, the dose of the formula might be on the order of 20 grams per day or more (6 grams of that dried decoction would be astragalus alone). The specialty extracts mentioned previously, some of which correspond to 10:1 extract ratios or higher, might be used to get these high dosages in a few pills. Tinctures taken by dropper may provide inadequate amounts of the herb material in extract form, but one of the key immune enhancing components, comprised of the long chain polysaccharides, is not even present, since such components are insoluble in alcohol.

The herb industry, worldwide, including in China, is increasingly turning to the provision of what has been called "nutraceuticals" (or nutriceuticals). This name came about from thinking of nutritional

supplements, like vitamin pills, in which the substances are natural (or synthetically produced but yielding the naturally occurring chemical compound) and purified so that they can be taken in small amounts; that is, amounts comparable to pharmaceuticals. Researchers and manufacturers are working towards isolating and purifying several plant and animal raw materials to deal with the following concerns:

1. Dosage form. If an herb contains 5% of an active component, and an effective dose is 500 mg of active component, then one has to ingest 10 grams of the herb (or use even more in an inefficient decoction process); if the component is made pure, then the desired 500 mg dose will fit into a single capsule or tablet.
2. Concerns about other components. Many herbs contain small amounts of substances that are toxic. The amount present in the herb or its extract may be far too low to cause a toxic reaction, but fear of this potential adverse reaction arises, especially when we lack information about what is the truly safe amount. Thus, separating desired active components from undesirable ones is one of the advantages of this approach. An example is use of the Western herb petasites (butterbur) for treating migraine headache; the natural herb contains pyrrolizidine alkaloids (PAs) that have the potential to cause liver damage (and, the amount in petasites may be high enough to be a risk). So, an extract is made which is essentially free of PAs, but rich in the active components that alleviate migraines.
3. Concern about product quality. Herb materials are notoriously variable in their content of desired constituents. The variations may involve the soil, climate, and other growing conditions, the species of herb, the time when collected, the storage conditions, and the processing conditions. By isolating active components or concentrating them to a high degree, they can be subjected to measurement and a standard can be developed. These standardized extracts, if used in proper dosage, then have reliability (in terms of dosage) similar to that of vitamins, minerals, and drugs.

Despite these advantages, the isolates do not permit one to effectively use the skills of traditional Chinese medicine diagnostics and prescribing. There are too few of these nutraceuticals to replace the hundreds of commonly used herbs, and their properties in relation to the traditional categories are unknown. Therefore, it is important to maintain the integrity of the use of traditional style herb formulas by not relying on placebo effects, but actually prescribing appropriate dosages. Still, the traditional medicine practitioner should carefully examine the situation with nutraceuticals to understand better the concerns that have arisen about herbs and to address them to the extent possible. In addition to the issue of dosage, one must become cognizant of the various matters related to herbal safety and to the problem of the natural variability in herbal materials.

## CONCLUSION

In presenting this overview of dosage and form of herbs, it is my hope that those who prescribe herb products to their patients will be stimulated to consider more closely the dosage being recommended. The practitioner might use his or her skill very effectively in diagnosing a health problem and determining a suitable therapy, while failing to help the patient adequately because the dosage prescribed was far too low. I am aware of this potential problem from speaking with numerous practitioners, some of whom described using an herb prescription in a miniscule dosage; when asked why they decided

upon that dosage, these practitioners did not have an explanation. The failing must be ascribed, at least in part, to the colleges of traditional Chinese medicine; even when taught the correct dosing for decoctions, if the students become practitioners who then do not use decoctions, they may have gotten no guidance in translating to use of other forms of administration. Indeed, the producers of dried decoctions and of imported patent remedies have been so reticent to give clear information about what is in the product that practitioners can not be expected to draw their own conclusions about dosage.

A key point that is only briefly noted above is that the different dosage forms of the same or similar formulation may have different therapeutic applications. Thus, a formula prepared as a decoction may be used for an "organic" disorder, a powder of the same herbs (made as tea or high dosage pill) may be used for a functional disorder, and a small pill or low dosage form may be used as follow-up (preventing relapse) in a patient successfully treated by the other methods. Thus, the indications for a formula might not apply to all the different forms of its preparation.

### **APPENDIX: Time of Day to Take the Herbs**

There are a few descriptions in the Chinese medical literature about the best time to take the doses of herbal remedies, such as the following:

#### **Rule 1: Light herbs after meals, heavy herbs before meals.**

In **Introductory Readings in Classical Chinese Medicine** (Unschuld, 1988) the following is translated from the *Shoshi Baoyuan* (Achieving Longevity by Guarding the Source; 1616 A.D.):

When an illness is located in the upper part of the body, small pills are suitable. One should always take such pills after meals. In some cases, one crushes these pills with one's teeth into powders, in this way regulating a health problem by means of light drugs....When an illness is located in the lower part of the body, large pills are suitable. One should always take such pills before the meals. In some cases the fact that one takes one's meal after the drugs has the effect that the food presses the drugs downwards in the body.

This statement follows the idea that herbs of light nature rise up and treat symptoms in the upper body—they are taken after meals so that they are reflected upward by the mass of food in the center. By lightness, it is seen that he speaks literally: tiny pills or herbs crushed to powder are deemed lighter than whole large pills. In other texts, it is indicated that herbs that have low density (flowers, leaves, stems, and branches) are similarly regarded as likely to float upward. In contrast, heavy materials sink downward and they are taken before meals so that they can sink down unimpeded by a mass of food and can even be pushed down by the food. Again, other texts refer to the dense materials, such as roots, rhizomes, and minerals, as acting on the lower body.

#### **Rule 2: Tonics in the morning, quick-acting herbs in the evening.**

The statement in the *Shoushi Baoyuan* continues: "Prescriptions formulated to supplement are to be swallowed early in the morning before one has said a word; and drugs that are supposed to act quickly should be taken when one has undressed and goes to sleep." Tonics (supplementing agents that do not invoke movement of the humors) are generally thought to be slow-acting and have a heavier nature than those herbs that are supposed to act quickly. Dr. Hong-yen Hsu, speaking of tonics, simply says that "they must be taken on an empty stomach," referring especially to the time before any meals have been

eaten. Quick acting drugs, if taken before bedtime, are consumed after all of the day's meals. In **Forgotten Traditions of Ancient Chinese Medicine** (Unschuld, 1990), Xu Dachun is quoted from his work *Yixue Yuanliu Lun* (1757): "Decoctions move fast, their substance is light; their strength quickly subsides and does not stay...." This statement contrasts decoctions with the other standard preparations-pills, powders, and pastes-which are deemed heavier and longer lasting. In accordance with the previous statements, such decoctions would be taken after meals (because of their lightness) and toward the end of the day (because of their quick action).

### **Rule 3: Penetrating and resolving herbs should not be taken with foods.**

In another section of his book, Xu Dachun says:

By treating a patient with penetrating drugs, one intends to take advantage of their ability to transform accumulations and cause them to move downwards. Such drugs must be taken on an empty stomach, and all at once, so that their qualities can be set in motion. As a result, they will push the filth out of the body by releasing it together with the stools. If, however, one brings such drugs into the body together with beverages or food, new and old will be mixed, and the influences of the drugs will be confused with those of the food [the qi of the drugs and the qi of the food will combine]. As a result, the qualities of the drugs cannot exert their effects and the accumulations of food will be increasingly obstinate.

This passage refers to penetrating, obstruction-resolving agents which include dispersing and purging therapies. Their action, as described here, is to remove accumulations (filth) by a downward push through the intestines. They are taken on an empty stomach, so that the herbs can quickly disperse through the system and can push out the old accumulations before the food is ingested. If taken with the meal (or close to a meal so that food and herbs can intermingle), the herbs will act on the newly ingested material, the influence of the herbs will be altered by the foods, and the herbs may be slowed down. To have the full effect (strong dispersing and clearing action), the dose of herbs is to be taken all at one time, rather than spread through the day, as is often done with other remedies. Early morning would seem appropriate for this type of therapy.

Taken together, these statements from ancient texts suggest that both tonifying and eliminating therapies and all those that must act on the lower part of the body are best taken early in the day and generally before meals, while quick acting and light therapies are taken after meals and later in the day. Decocted tonics, being quick acting by virtue of the decoction form, could be taken later in the day, while tonics in pill form would be taken early in the day.

### **DOSAGE TIMING IN MODERN LITERATURE**

Today, practitioners frequently ignore the rules described in earlier centuries. Patent medicines produced in China rarely carry instructions for timing of the doses. An examination of **Clinical Handbook of Chinese Prepared Medicines** (1989) shows that many of the supplementing formulas are usually suggested to be taken three times daily, as opposed to being taken only first thing in the morning. Timing in relation to meals is rarely mentioned. A case where it is said that the specific timing relative to meals is important is in the use of *Sai Mei An*, a formula made up mainly of calcium carbonate sources used to neutralize hyperacidity of the stomach. According to Zhu: "It is important to administer on an empty stomach only, at least one half hour before a meal, to give the medicine a chance to form a

membrane and line the stomach wall and protect the ulcer from contact with food and gastric secretions." In texts of recent origin, most digestive formulas are recommended to be taken before meals, if any recommendation is given at all. However, when the main purpose is to remove food stagnation, a condition of improperly digested foods, the material is usually taken 30-60 minutes after meals, as suggested for *Jian Pi Wan*.

In books on the Japanese and Taiwanese approach using the dried decoction, the ingestion of herbs two to three times per day appears to be the rule. In his small booklet **Chinese Herbs and Formulas** (1978), Hong-yen Hsu describes the use of these prepared formulas as being taken three times a day "between or after meals." The **1988 Pharmacopoeia of the People's Republic of China** describes the uses and dosage of dozens of patents. In most cases, the pills are to be taken twice daily, though several items are suggested to be taken in the range of 1-2 times and others 2-3 times. According to **Formulas of Traditional Chinese Medicine** (1998), "Usually herbs are recommended to be taken one hour before meals, however, herbs irritating to the gastro-intestinal tract should be taken after meals. Tonic herbs should be taken with an empty stomach....The herbs for acute diseases should be taken at any time....The decoction is usually divided into two or three equal portions...patent medicines are usually taken twice a day, some can be taken one or three times a day."

Over all, the modern thinking usually points to 2 or 3 doses per day, with the timing not considered critical except in special cases (where the herb effect has something to do with eating or sleeping). For disorders that need to be immediately affected by the therapy, repeated ingestion of the herbs throughout the day may be important to maintaining an adequate blood level of the active ingredients to have the desired action. For chronic disorders and for deficiencies that may take a long time to treat, taking herbs twice per day is usually more convenient and is satisfactory, so long as the total dosage is high enough