THE CLINICAL IMPORTANCE OF 'PAO ZHI' – MEDICINAL PROCESSING

Eric Brand

The extensive use of medicinal processing (known as "pao zhi") is a distinctive and uniquely developed feature of Chinese herbal medicine. Most Chinese herbs first undergo processing before they are employed clinically, and the method of processing often alters or improves the therapeutic effect of a given medicinal. Just as a chef must consider when garlic should be raw vs. cooked for a given dish, Chinese herbalists carefully consider the most appropriate processing method for each individual herb when constructing a formula.

Traditional pao zhi processing methods are primarily used to reduce toxicity, enhance the effects of herbal medicines, and facilitate transportation and storage. Unlike Western herbs, which are often minimally processed and sold as "cut and sifted" small pieces, Chinese herbs are typically processed into "decoction pieces," which are the dried, sliced forms that are dispensed in Chinese pharmacies. Decoction pieces tend to be cut in specific ways that maximize the macroscopic features used for traditional quality assessment, and often multiple processed forms exist for a given medicinal. In some cases, pao zhi processing methods are complex and the processing is conducted at the production regions following harvest, while in other cases simple methods of pao zhi are applied in-house at the dispensing pharmacy.

The art of selecting which processed form of a given herb is ideal for a given case is an essential aspect of clinical practice, yet many Western practitioners lack a strong foundation in the subtleties of pao zhi. For example, most practitioners are familiar with the difference between sheng di huang vs. shu di huang (unprocessed vs. cooked Rehmanniae Radix) and gan cao vs. zhi gan cao (unprocessed vs. honey-fried Glycyrrhizae Radix). However, many practitioners overlook the nuances of pao zhi when prescribing herbs such as bai zhu (Atractylodes Macrocephalae Rhizoma) and yi yi ren (Coicis Semen), which are both better for fortifying the spleen in their dry-fried form and better for treating edema when used in their raw form.

Historical Background

Many of the pao zhi techniques used today have been established for centuries. Processed forms of herbal medicines have been referenced for over 2000 years, with the first records found in Wu Shi Er Bing Fang (Formulas for 52 Diseases), the earliest extant Chinese medical manuscript. Many famous Han Dynasty classical formulas from the Shang Han Lun (On Cold Damage) and the Jin Gui Yao Lue (Essential Prescriptions from the Golden Cabinet) utilize different forms of processed medicinals to accomplish different therapeutic objectives, and the principles established in this early period remain relevant in clinical practice today.

The first text dedicated to the subject of pao zhi emerged in the Northern and Southern Dynasties period (around 500 AD). Titled Lei Gong Pao Zhi Lun (Grandfather Lei's Treatise on Medicinal Processing), this work inspired later generations of specialized texts on processing, including the stunning full-color Bu Yi Lei Gong Pao Zhi Bian Lan (Concise Addendum to Grandfather Lei's Treatise on Medicinal Processing), which was completed in 1591 AD.

Traditionally, many pao zhi methods utilize the application of heat and/or water, such as soaking, boiling, steaming, and stir-frying. These fundamental

methods were outlined in the Ben Cao Gang Mu (Compendium of Materia Medica) in the late 16th century, which introduced the categories of water processing, fire processing, combined water and fire processing, fermentation, etc.; these categories are still used to discuss pao zhi techniques in modern texts.

Today, pao zhi remains a specialty subject within Chinese herbal medicine, complete with an entire genre of literature and research. Pao zhi techniques often have regional variations, and in many cases the specifications for processed herbs vary between official pharmacopoeia texts in China, Korea, Japan, and Vietnam. In the 2010 Chinese Pharmacopoeia, 446 medicinals have specific standards for decoction pieces; as some of these items have multiple processed forms, 647 different specifications of decoction pieces are described in total. In the latest edition of the Chinese Pharmacopoeia, the properties, channel entry, actions, indications, method of use, and dosage are all ascribed to decoction pieces rather than the crude drugs, reflecting the fact that clinical use is based on the prepared decoction pieces.

Reduction of toxicity or side effects

Pao zhi is often used to reduce the toxicity or side effects of herbal medicines. Some characteristic side effects of specific herbs can be mitigated with pao zhi, and in some cases pao zhi is used to reduce the toxicity of herbs that would otherwise be too toxic for internal use.

A number of herbs have irritating side effects that can be reduced through the use of processing. For example, zhi zi (Gardeniae Fructus) is very cold and can easily irritate the stomach and cause vomiting in patients with spleen-stomach deficiency; thus, it is often first scorch-fried (jiao) before use to reduce this tendency. Similarly, hou po (Magnoliae Officinalis Cortex) is typically processed with ginger juice to reduce its tendency to irritate the throat; in fact, much of the hou po that practitioners encounter has already been processed with ginger juice before the decoction pieces arrive at the pharmacy. In the case of cang zhu (Atractylodes Rhizoma), the unprocessed herb is thought to be rather harsh and strongly drying, but when it is dry stir-fried with bran in a wok it becomes more gentle and harmonious; in terms of its chemistry, this effect can be explained by the fact that some of its potentially irritating volatile oils are dissipated by the dry stir-frying process.

In some cases, the application of pao zhi in TCM results in a significantly different perception of the toxicity of the same substance when comparing Western and Chinese herbal medicine. For example, nutmeg (rou dou kou, Myristicae Semen) has a long history of use in both Western and Chinese herbal medicine. In Western herbal medicine, nutmeg was historically regarded as slightly toxic and intoxicating; however, in Chinese medicine it is subjected to pao zhi and was historically regarded as non-toxic, with virtually no mention of its intoxicating properties in the Chinese materia medica literature. This difference in perception is likely related to the presence of volatile oils that are moderated via traditional pao zhi. In TCM, nutmeg is processed by baking it in flour so that the oils seep into the flour, which is then discarded; this method reduces the volatile oils by about 20% and makes it less irritating.

Another dramatic example can be seen in the case of aconite. Aconite products have been used internally for at least 1800 years in Chinese medicine, despite the fact that the fresh plant is deadly poisonous. Ancient Chinese physicians went to tremendous effort to learn how to harness the therapeutic potential of aconite by reducing its toxicity via pao zhi, and over 40 different methods of processing fu zi (Aconiti Radix Lateralis Praeparata) have been documented in Chinese historical texts. By contrast, aconite was primarily regarded as a poison in the West until the 18th century, when it began to be applied in Western herbal medicine through the use of minute doses of highly toxic preparations.

The processing methods used for aconite in TCM dramatically reduce its inherent toxicity so that it can be used internally. Different preparations of aconite are used in Chinese medicine for different purposes, and some of the traditional differences between aconite products such as fu zi (the cultivated lateral root), chuan wu (the cultivated main root) and cao wu (the wild

Fu zi

root) can be understood through the lens of modern pharmacology. During processing, the highly toxic forms of aconitine alkaloids in the root are transformed into monoester and non-ester diterpenoid alkaloids (benzyolaconines and aconines), which have only a tiny fraction of the toxicity of the original diester diterpenoid alkaloids that are largely broken down via pao zhi.

In terms of pharmacology, aconitine alkaloids have analgesic, anti-inflammatory, and anesthetic effects. In clinical practice, items that are naturally high in these toxic and analgesic aconitine alkaloids tend to be used for conditions such as wind-cold-damp impediment (manifesting in conditions such as joint pain). Traditionally, highly potent and toxic medicinals such as chuan wu and cao wu were thought to strongly dispel cold and relieve pain, and their use corresponds with their naturally higher levels of aconitine alkaloids. By contrast, fu zi is also considered to be effective for wind-cold-damp impediment, but its action of dispelling cold and relieving pain is considered to be more moderate than that chuan wu and cao wu. This moderate action is reflected in the lower aconitine alkaloid content of fu zi when compared with chuan wu and cao wu.

Beyond dispelling cold and relieving pain, fu zi is traditionally associated with a number of actions that are not seen in chuan wu and cao wu. Notably, fu zi is associated with warming the spleen and kidney, as well as returning yang and stemming counterflow for critical conditions known as yang desertion. In addition to its lower content of aconitine alkaloids, fu zi is characterized by a number of other constituents (such as higenamine, coryneine chloride, uracil, and salsolinol) that have cardiac effects and anti-arrhythmic effects; these constituents are thought to be related to the ability of fu zi to return yang and stem counterflow Additionally, fu zi also contains polysaccharides that have been reported to reduce blood sugar and inhibit tumor growth, and the reduction of its acute toxicity by processing allows it to be used at dosages that allow these other constituents to exert their effects. (Planta Med 2010, Zhao 2010).

Alteration or enhancement of effects

In many situations, practitioners have a choice of multiple processed forms for a given herb, with each form offering a distinct advantage depending on the clinical presentation. For example, when used in its unprocessed form, huang qi (Astragali Radix) excels at securing the exterior to treat spontaneous sweating as well as promoting urination to reduce swelling; when it is processed with honey, it is superior for supplementing the middle and boosting qi.

In many situations, pao zhi is used to significantly alter the nature of a given herb, often affecting its temperature as well as its actions. For example, when huang qin (Scutellariae Radix) is used in its unprocessed form, it is colder in nature and is superior for damp-heat in the intestines; when processed with wine, it tends to rise to the upper burner to clear lung heat and has less of a tendency to damage the spleen from its cold nature. In the case of da huang (Rhei Radix et Rhizoma), the unprocessed form has a strong purgative action, while the cooked form has only a weak purgative effect and is instead primarily used to move the blood.

In general, processing with wine tends to cause medicinals to rise to the upper body and enter the blood, while processing with vinegar tends to guide medicinals to the liver. Processing with honey tends to enhance the moistening nature of many herbs that are used to treat cough, and is also used to strengthen the spleen-supplementing effect of herbs such as gan cao (Glycyrrhizae Radix). Often, herbs are charred to stop bleeding, but charring is not necessarily desirable for all blood-stanching herbs. For example, the herb di yu (Sanguisorbae Radix) is used in its unprocessed state to cool the blood and stop bleeding in cases of blood heat, while it is charred to moderate its cold nature to instead stop bleeding by astringency. In the case of shan zha (Crataegi Fructus), the charred form tends to be used for dysentery, while the scorch-fried form is used for dispersing food stagnation and the unprocessed form is used for moving the blood (and is the preferred form for treating hypercholesterolemia and coronary heart disease).

In recent years, significant research has been devoted to the subject of pao zhi, and in some cases the results of modern research illustrate mechanisms that help to

elucidate traditional observations. For example, yan hu suo (Corydalis Rhizoma) has been stir-fried with vinegar for nearly one thousand years, and traditionally it is believed that vinegar-processing increases its pain-relieving effect. Through modern research, it is clear that the pain-relieving alkaloids within yan hu suo become more water-soluble after vinegar-processing, which helps to explain why the vinegar-processed form has a stronger pain-relieving action.

Facilitating transportation and storage

Many herbal medicines are processed to facilitate storage, and a number of common processing methods evolved from the need to prevent medicinal materials from degrading during transport. For example, fu zi (Aconiti Radix Lateralis Praeparata) is generally harvested in one large batch at a particular time of the year, but the fresh roots quickly rot unless they are immediately processed by steaming or soaking the roots in brine; often, large amounts of fu zi roots are soaked in brine immediately after harvest, then further processing is done in stages.

In the case of ginseng, there are both red and white forms on the market. The red form (known as hong shen) is steamed following harvest, while the white form (bai ren shen) is simply dried directly. In the modern day, the red form is regarded as warmer and stronger for supplementing qi, while the white form is more neutral and tends to be better for boosting body fluids. However, originally red ginseng arose as a method of preservation so that ginseng could be transported with fewer problems from mold and insect damage, rather than as a way of altering or enhancing its therapeutic effects. Indeed, during our recent investigation of red and white ginseng specimens that had been stored in a museum collection for over 100 years, it was readily apparent that the red ginseng remained in excellent condition, while much of the white ginseng had degraded considerably by comparison.

The topic of medicinal processing is a fascinating subject that lies at the intersection of tradition and science as well as literature and clinical practice. Regardless of whether we prescribe bulk herbs or granules, many practitioners in the West regularly employ herbs that have been subjected to pao zhi, yet all too often there is inadequate awareness of the clinical impact of medicinal processing. We are fortunate to live in an era where the available knowledge in this area is rapidly increasing, and for the sake of our patients, we must do our best to keep this rich traditional knowledge alive so that future generations can continue to build upon the centuries of experience that we are so fortunate to inherit.

Literature

Chinese Pharmacopoeia Commission. Pharmacopoeia of the People's Republic of China, 2010 edition. Beijing: China Medical Science and Technology Press, 2010.

SZ Li (Ming Dynasty). Complete Compendium of Chinese Materia Medica, Volume 38- Compendium of Materia Medica: Jin Ling Edition. Beijing: Huaxia Publishing House, 1999.

JS Zheng, J Qiu. A preliminary study on the Concise Addendum to Grandfather Lei's Treatise on Herbal Processing. Chinese Pharmaceutical Journal. 2004, 39(5): 389-391

ZZ Zhao, HB Chen. Chinese Medicinal Identification: An Illustrated Approach. Taos: Paradigm Publications, 2014.

ZZ Zhao, ZT Liang, K Chan, GH Lu, ELM Lee, HB Chen, L Li. A unique issue in the standardization of Chinese Materia Medica: Processing. Planta Medica. 2010, 76: 1975-1986

ZZ Zhao, P Guo, E Brand. The formation of daodi medicinal materials. Journal of Ethnopharmacology. 2012, 140 (3):476-481

Zhao Zhongzhen, Bai Yao Pao Zhi (Processing of a Hundred Medicinals), Wanli Press. Hong Kong, 2010.

Ye & Zhang, Zhong Yao Pao Zhi Xue (Chinese Medicinal Processing, second edition), People's Medical Publishing House. Beijing, 2011.

Zhao Z. et al., Toxicity Assessment of Nine Types of Decoction Pieces from the Daughter Root of Aconitum carmichaeli (Fu Zi) Based on the Chemical Analysis of Their Diester Diterpenoid Alkaloids, Planta Medica, 2010.

About the Author

A Chinese medicine practitioner from the United States, Eric Brand is a fluent Chinese speaker with extensive experience in mainland China, Hong Kong, and Taiwan. Eric is the author of A Clinician's Guide to the Use of Granule Extracts and the co-author of the text Concise Chinese Materia Medica, and he has translated and edited a variety of modern and classical texts, including the recently acclaimed Chinese Medicinal Identification: An Illustrated Approach.

Eric has a particular passion for Chinese herbal processing, herbal authentication and quality discernment. He is currently completing his PhD in pharmacognosy at the School of Chinese Medicine at Hong Kong Baptist University, and he is the owner of the granule company Legendary Herbs. Eric serves as a Chinese medicine advisor to the American Herbal Pharmacopoeia and is the current Chair of the U.S. delegation for the ISO TC 249 committee on international standards in traditional Chinese medicine.