ABSTRACT

Licensed Acupuncturists often use Chinese Herbal Medicine as part of alternative medicine treatment for patients' symptoms. Besides efficacy, product safety is always a primary concern. Choosing high quality and safe Chinese Herbal Medicine is an increasing challenge for alternative medicine providers.

There are many forms of Chinese herbal products in the market today – granules, powders, tablets, pills, capsules, liquids, as well as raw herbs – primarily manufactured in Mainland China and Taiwan, and some in the United States. Many people make the general assumption that products made in Taiwan are safer than those manufactured in Mainland China. While it is true that food safety related incidents occur in Mainland China, these types of incidents occur with equal or greater frequency within Taiwan and other countries, too. Rather than making broad-based assumptions as to which country of origin is 'better' in quality and safety, the following are suggestions to help review and compare all Chinese herbal products regarding safety considerations, regardless of country of origin. When evaluating product quality and safety, let scientific facts prevail over well-written marketing language.

Know agricultural practices

On the Internet, there are relatively common images of large containers of dried herbs in open marketplaces — but that imagery does little to illustrate the scope of agribusiness supporting Chinese Herbal Medicine. Sophisticated manufacturers often own or partner with the farms on which the herbs originate in order to best control purity. Certain agricultural regions are highly regarded for specific herbs, known for higher potency of active ingredients. Manufacturers may now 'DNA-fingerprint' crops to ensure that each harvest is, indeed, a specific herb, and just as importantly, a specific part of the plant. The United States Pharmacopeia (USP) offers certification of an individual herb for a fee, at the manufacturer's request. Such quality control is dedicated to the overall efficacy of the final product.

Know the manufacturer

When purchasing Chinese Herbal Medicine, practitioners see only product brand names, which may not have a direct reference to the manufacturing facility. Often, a brand's products will be sourced from various agricultural suppliers and produced in third-party manufacturing facilities – even multiple facilities with inconsistent manufacturing processes, quality standards, and testing procedures. Since corporate profitability is based on margins, brand manufacturing factories are often changed to support revenue goals. Regardless of the brand name, it is advisable to ask the name and location of the manufacturing facility and whether or not that facility is permitted to outsource production on any of the herbs. Today, manufacturers should be either registered as a "pharmaceutical facility" or "dietary supplement factory", and all should have GMP certification from their own governments. Higher-grade facilities may also have GMP certification issued from other countries.

In addition, ask the supplier whether or not the brand is registered under the same or a different brand name and licensed to sell in the country where it is originally manufactured. For example, in Mainland China, many manufacturers produce herbal products for 'export-only' as those products are prohibited for sale in Mainland China. This is a critical

point of consideration as the China Food and Drug Administration (CFDA) does not monitor, inspect, or manage those products, which creates a potential risk for conformity with baseline quality and safety standards.

Product liability insurance

Ask your sales representative if the manufacturer provides Product Liability Insurance for their products and if that coverage applies to the U.S. market. If the manufacturer does not have Product Liability Insurance or does not cover the U.S. market, ask if the distributor has this coverage. The ascertainment of common business best-practices, such as Product Liability Insurance, may be an indication that the manufacturer or distributor is cutting corners to improve profit margins over public safety considerations.

Ask for the test reports

Since Traditional Chinese Medicine is categorized as a 'dietary supplement' in the U.S. under FDA guidelines, practitioners in the U.S. might dedicate time and effort to understand the quality and safety of products selected. In other countries such as Mainland China, the TCM is part of their overall medical system and classified as pharmaceutical medicine, and monitored by government agency and healthcare entities such as hospitals. So practitioners do not have to personally spending time and effort to ensure the quality and safety of herbal medicine.

When using herbal products that cannot be sold within the country of manufacture, there is great risk that the products are out of any monitor and management in terms of quality and safety except the manufacturers themselves. Therefore, the test report or COA from such manufacturer maybe the only available way to assess the safety of the product.

Understand testing standards and methods of analysis

A professional test report provides test items, analytical methods, and the scientific standard or reference source (such as the *Chinese Pharmacopoeia 2010 Edition*, or the *Hong Kong Application Manual for Registration of Proprietary Chinese Medicine*). These references provide the only government-sanctioned resource where a practitioner can find further information on relevant quality and safety requirements.

As a result of herbal agriculture and manufacturing, coupled with extensive use of Chinese Herbal Medicine, East Asian countries necessarily have set quality and safety standards aiming at herbs and herbal medicine products. Other region such as US and EU, do not have any standards specifically for Chinese herbs and its manufactured products. As applying US or EU safety standards to Chinese herbs, commonly may borrow the standard of a similar agriculture crop (i.e.: Using Chamomile testing criteria as equally applicable for Chrysanthemum).

For detection of different substances, including heavy metals, pesticides, and microbial contaminants, the scientific community gives recognized and specific methods of analysis. In general, there are two major categories of analysis: Qualitative analysis and quantitative analysis. Only quantitative analysis can detect substances in a referenced

comparative analysis. While the cost of quantitative analysis is higher, and results may take longer to receive, the data is most accurate.

Manufacturers using the standards of a country/region for baseline detection may also implement standards of other countries, but must, at the same time, use relevant testing and analysis.

Returning to the Chrysanthemum example… A manufacturer has claimed use of EU pesticide residue standards, in which detections report indicates that, "testing has been conducted for more than 200 kinds of pesticides, in which results are all standard."

Such a statement is not a scientific report and can easily mislead practitioners:

No reference is given to relevant literature;

Specific listing of pesticide residues is not provided; and

How the selection of pesticides for testing was decided is not explained.

As previously noted, the EU has no medicinal standards by which to develop and test products, and if we refer to the application of Chamomile criteria as applicable to Chrysanthemum, pesticides used for these two crops are not the same. EU Chamomile pesticide residue standards lists 454 kinds of pesticides – both practitioners and their patients might be wise to question under whose determination the other 254 pesticide residues were not included!

Reading the test report

A test report, also called a Certificate of Analysis (COA), contains a lot of useful information. The most important areas to review are: microorganisms, heavy metals and pesticide residues.

Microorganisms

Microbiological testing includes the total number of bacteria, yeasts and molds, and the total number of certain bacteria.

However, while the data in the table above is the general standard, different forms of herbal medicine also have some differences in standards.

China Pharmacopoeia lists standards for concentrated granules, tablets, capsules as in below:

The EU and Japan's standards for raw herbal powders:

Heavy Metals

Detection of heavy metals includes Lead (Pb), Mercury (Hg), Cadmium (Cd) and Arsenic (As). Most countries have very similar standards and, in general, standards from the U.S. and EU are higher than others. In Hong Kong, the standards are set differently between raw herbs and manufactured herbal medicine. For manufactured herbal medicine, Hong Kong mirrors the World Health Organization (WHO) standards, which are expressed in a maximum daily intake for

adults. Mainland China includes the four heavy metals mentioned above, but also requires additional testing to detect for Copper (Cu).

Pesticide Residues

Standards and testing of pesticide residues is the most complicated area of evaluation. Around the world, there are thousands of different kinds of pesticides in use. Some are used almost everywhere, and some are used exclusively in specific countries and even on specific crops. To have tests that can detect all pesticide residues is impossible.

Standards for pesticide residues are expressed as Maximum Residue Level (MRL), and are considered "acceptable" or "no risk" if the detected amount of a particular pesticide residue is lower than the MRL for a given crop. Pesticide residue may have different MRLs on different crops therefore, the standard is sometimes specifically indicated by crop or by pesticide.

The MRL for Chinese herbs is government regulated and mandatory for testing in most East Asian countries. However, requests for which herbs are to be tested, and for what pesticide(s) are not the same by country. For example, Mainland China currently requests detection of organochloride residue level in only licorice and Astragalus; in Taiwan, only ginseng, licorice, astragalus and senna are required to test for pesticide residues; Japan includes organochloride testing for astragalus, Polygala, licorice, etc. – a total of 14 single herbs and all manufactured herbal medicines containing those 14 herbs; and so on.

The U.S. and EU has no standards for testing of pesticide residues specific to Chinese herbs. However, there are MRLs for many widely-used pesticides.

Manufacturers may voluntarily invest in testing more than the requested herbs and pesticides, but should provide detailed test reports, a global standard for scientific laboratory reports. It is an irresponsible and unprofessional approach for a factory's test report to show only a total assimilated amount of pesticide residues, without detailed information as to what specific pesticide is present.

Other harmful substances

There are a number of harmful substances, such as aflatoxins and sulfur dioxide, which are not necessarily included in a general test report. If a company claims that the brand is free of these substances, they should be able to produce the test results and specific documentation. The detection of aflatoxin and sulfur dioxide is not required for every herb, focused mainly on herbals species where there is a higher risk. For example, aflatoxin detection in *China Pharmacopoeia 2010 Edition* applies to Silkworm, Citrus Peel, Sterculia, Persuca and Zizyphus.

In other cases, the herb itself, is the source of a naturally produced toxic substance, such as aristolochic acid in Asarum and ephedrine in Ephedra. Ephedra is banned in the United States… and for Asarum, a test report of "free of aristolochic acid" must be provided. Practitioners who uses Asarum should request this report.

* In *2010 China Pharmacopoeia*, Peony (White), Codonopsis, Atractylodes, Gastrodia, Cyathula, Dioscorea, Asparagus Tuber, Bletilla, Trichosanthes Root, and Pueraria Root, the requirement of sulfur dioxide should not exceed 400ppm (1ppm = 1,000ppb)

Detection scope and frequency

In addition to the test report, practitioners should inquire as to the herbal variety of detection scope, and how often the factory conducts those tests. There is no clear legal provision whether to test all parts of Chinese medicine… or select products and species, nor whether to test all production batches or randomly test sample batches. Manufacturers independently decide the scope and frequency of the testing.

The most stringent security management would be to test all varieties of Chinese Herbal Medicine (all single species and formulas in all forms), and test each batch of every finished product. Of course, costs would be prohibitive, and manufacturers are free to choose any number of varieties of testing for Chinese medicine products based on a random sampling from finished products on a 'routine' basis. Practitioners should inquire for further documentation about how often the sampling test is conducted, and the number of individual herbal species included in that sampling. Today, most factories do test their products and provide the test reports; some even hire a third-party laboratory to conduct independent tests. However, some manufacturers may conduct testing very infrequently in order to minimize expense. Quality and safety management is a sustainable business task, and a single quality test on a single day for one single product cannot guarantee the quality and safety for a wide array of herbal products, sourced from broad geographic regions, and perhaps manufactured in different locations under different conditions.

Detection limit

With the detection of certain hazardous substances, testing units should give the detection limit. This is because:

- Testing standards require the substance is "not detected" or absent;
- The substance is naturally present in original plant, such as aristolochic acid is in Asarum. Theoretically, it is impossible to have a complete absence of substance in situations where it is a natural occurrence.

Different laboratories may set the detection limit differently.

For example: The detection limit of aristolochic acid in Taiwan is 4000ppb or 4 μ g / kg. Hong Kong SGS laboratory standards are 0.3 μ g / kg. When using the Taiwan detection limit (which is much higher) for aristolochic acid, the tested herb can therefore be labeled and marketed as "free of aristolochic acid."

Note: This article cites data from existing literature, such as *China Pharmacopoeia 2010 Edition* and *Hong Kong Application Manual for Registration of Proprietary Chinese Medicines;* some are from other online resources.

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