The Development Of Chinese Herbal Medicine In A Western Setting: A Discussion Paper

By: Michael McIntyre

The practice of Chinese herbal medicine is now firmly rooted in the West. This article discusses various aspects of the current situation of Chinese herbal medicine in the West, including the need to ensure that its plant medicines are free from pollutants, the requirement to reduce its carbon footprint, and the need for its clinical application to be tailored to focus on treating the burgeoning list of non-communicable diseases associated with a Western industrialised lifestyle. The author proposes that practitioners working in the West should make prudent use of the rich tradition of Western herbalism to provide effective and easily accessible plant medicines, and recommends that the commercial organic growing of Chinese herbs in a Western setting is investigated.

Keywords: Chinese herbal medicine, sustainability, pollution, quality assurance, Western herbology, climate change,

I am sure I am not alone in finding Nina Zhao-Seiler's recent article "Sustainability of Chinese Medicinal Herbs: A Discussion"[1] in the last issue of the *The Journal of Chinese Medicine* thought-provoking. The article made many valuable valid points, and has motivated me to consider further the matter of the sustainability of Chinese herbs in a Western setting. No doubt my reflections will raise an eyebrow or two, but if these thoughts on the development of Chinese herbal medicine (CHM) bring about further debate, in which a variety of views are expressed, I for one will be happy. These discussions are long overdue.

Pollution: the threat to Chinese herbal medicine

The renowned French herbalist Maurice Mességué led a campaign for the production of organic food and vegetables when elected mayor of Fleurance, a small town in the Gers Department (also known as Gascony) in south-western France in 1971. He was uncompromising in his views about herbal medicines:

> *'All the plants you gather, whether growing wild or in fields and gardens … should be uncontaminated by artificial fertilisers, pesticides, herbicides, insecticides, factory effluent, pollution of every kind … you have to do the best you can to try and find flowers, leaves, buds, roots, bark and seeds that are as pure as possible.'*[2]

How many of us can be assured that the CHMs we use meet this standard? The possibility of the pollution of CHMs was somewhat downplayed in Nina Zhao-Seiler's article[1] as 'not so far a problem', but the alarming rise in the contamination of the Chinese environment should be a matter of considerable concern for the CHM community, as it is increasingly for the Chinese population. A *New York Times* article in April 2013 reported:

> *'Cities in northern China have been grappling this winter with record levels of air pollution, which have stirred fear and anger among many Chinese. In January, the Beijing municipal government recorded jaw-dropping concentrations of particulate matter measuring 2.5 micrometers in diameter or smaller ... The highest concentrations were recorded at nearly 1,000 micrograms per cubic meter, which was on par with some severely polluted days in industrial London during the mid-20th century ... Last Sunday, researchers released data that showed that outdoor air pollution had contributed to 1.2 million premature deaths in China in 2010, which was nearly 40 percent of the global total. The data were based on international research done on leading causes of death for the 2010 Global Burden of Disease Study, which was published in a paper last December in The Lancet, a British medical journal. In China, outdoor air pollution was the fourth-leading risk factor for death, the researchers said.'*[3]

It is said that most of China's herbs are grown or gathered in areas remote from cities, the centres of pollution, and for this reason in such a vast country they remain relatively free from pollutants such as pesticides and heavy metals. But chemical smog originating from cities spreads far into the surrounding countryside via prevailing winds, and pollutants enter the water systems affecting rivers, lakes and aquifers. In 2007 the *Wall Street Journal* spelt out these concerns:

> *'China's soil contamination is caused by a range of factors. Mercury released into the air by coal-fired power plants is captured by raindrops, and transferred to the soil and groundwater. Groundwater is also polluted by runoff from*

factories, smelters and mining operations, and then used by farmers downstream from industrial operations to irrigate their crops. Even in rural areas, far from industrial sites, heavy use of fertilizers has contributed to contamination. Fertilizers in China often contain high levels of metals, especially cadmium, which is found naturally in the same sedimentary rocks that contain plant-friendly zinc. Rudimentary sewage-treatment systems throughout much of China mean that organic waste is routinely mixed with industrial waste. When sewage is recycled into fertilizer, it may contain large amounts of metals and other toxic material.'[4]

A 2013 report in *The Guardian* newspaper noted, 'The head of China's ministry of water resources said last year that up to 40% of the country's rivers are "seriously polluted" and an official report from last summer found that up to 200 million rural Chinese have no access to clean drinking water.' The report went on to record that, 'China's lakes are often affected by pollution-induced algae blooms, causing the surface of the water to turn a bright iridescent green. Yet even greater threats may lurk underground. A recent government study found that groundwater in 90% of China's cities is contaminated.'[5]

Research on contaminants

There is little reliable up-to-date research on the contamination of CHMs. A 2003 paper from the Baptist University of Hong Kong noted that Chinese herbal products 'may be contaminated with excessive or banned pesticides, microbial contaminants, heavy metals, chemical toxins, and adulterated with orthodox drugs. Excessive or banned pesticides, heavy metals and microbial contaminants may be related to the source of these herbal materials, if they are grown under contaminated environment or during collection of these plant materials. Chemical toxins may come from unfavourable or wrong storage conditions or chemical treatment due to storage. The presence of orthodox drugs can be related to unprofessional practice of manufacturers.'[6] A 2011 paper from Harvard University Medical School commented:

'Three-hundred-thirty-four samples representing 126 species of CHMs were collected throughout China and examined for arsenic, cadmium, chromium, lead, and mercury. Of the total, 294 samples representing 112 species were also tested for 162 pesticides. At least 1 metal was detected in all 334 samples (100%) and 115 samples (34%) had detectable levels of all metals. Forty-two different pesticides were detected in 108 samples (36.7%), with 1 to 9 pesticides per sample. Contaminant levels were compared to toxicological reference values in the context of different exposure scenarios. According to a likely scenario of CHM consumption, only 3 samples (1%) with heavy metals and 14 samples (5%) with pesticides were found with concentrations that could contribute to elevated background levels of contaminant exposure. According to the most conservative scenario of CHM consumption, 231 samples (69%) with heavy metals and 81 samples (28%) with pesticides had contaminants that could contribute to elevated levels of exposure. Wild collected plants had higher contaminant levels than cultivated samples. Cadmium, chromium, lead, and chlorpyrifos contamination showed weak correlations with geographic location. Based on our assumptions of the likely mode of consumption of raw CHMs, the vast majority (95%) of the 334 samples in this study contained levels of heavy metals or pesticides that would be of negligible concern. However, given the number of samples with detectable contaminants and the range between the more likely and more conservative scenarios of contaminant exposure, more research and monitoring of heavy metals (especially cadmium and chromium) and pesticide residues (especially chlorpyrifos) in raw CHMs are advised.'[7]

Relying on herb traders

My experience of running a Chinese herbal company from 1985 to 1990 inculcated within me a healthy scepticism about the knowledge and integrity of some herbal suppliers in China and Hong Kong. Although this is now some time ago and thankfully some of the problems I encountered then have been remedied, I still remember the extraordinary stubbornness I encountered at the time when I asked suppliers not to supply herbs that had been deliberately smoked with sulphur. One major supplier said that none of his Chinese customers in Europe would purchase herbs such as Dang Gui *(Angelica sinensis – radix)*[8] or Shan Yao *(Dioscorea opposite – radix)* unless they had a bleached-white appearance from sulphur treatment, and that supplying us with sulphur-free herbs would involve too much work and expense.[9] I learnt the hard way that relying on the honesty of herb suppliers in such a long supply chain is unwise. Lest anyone get the impression that I am suggesting that this a problem unique to the Chinese tradition, whilst completing some research on Western skullcap *(Scutellaria laterifolia – herba)* some time ago, I was dismayed to find that independent laboratory analysis revealed that only one of the half-dozen tincture extracts of this herb from the main UK suppliers contained the correct herb. A recent paper on this herb confirms that it is 'crucial that commercial products are adequately identified prior to use.'[10]

Quality assurance testing as standard operating procedure

I am out of the herb supply business these days, but it is clear to me that a major obstacle impeding the adoption of rigorous scientific batch testing of herbs in the UK is the number of suppliers that have entered the UK market in the last twenty five years. These companies have tended to compete with one another on price rather than assured quality. This fierce price war doubtless kept the price of herbs down, but made it next to impossible for responsible UK CHM companies to introduce sophisticated and

audited quality assurance (QA) systems to scientifically assay the herbs they sell, as this would have raised the price of their herbs and lost the company its market share.[11] As practitioners we bear a deal of responsibility for this; we should judge a company on much more than the price it charges for its herbs. We should ask if our suppliers run regular QA checks as standard operating procedure (SOP) on the herbs they sell, and whether these are overseen by independent audit. We should also check the following: whether the herbs are batched and dated; whether they are microscopically as well as macroscopically examined; whether the company makes use of chromatographic fingerprinting to assure the identity and quality of its herbs; and whether the company performs any batch testing for heavy metal contamination. In this regard the Approved Suppliers Scheme set up by the UK Register of Chinese Herbal Medicine (RCHM) is a welcome initiative.[12] Personally, I prefer to prescribe decoctions and tisanes than concentrated powders, because at least I can sample the herbs myself by taste, sight and smell. On the whole, I have not found my patients resistant to taking decoctions, which if taken over a longer period of time can be administered at a relatively low dose.

The growing body of scientific literature

Alongside the *Pharmacopoeia of the Peoples Republic of China*, many Chinese herbs are now being monographed in Western pharmacopoeia (notably *The European Pharmacopeia,*[13] *The British Pharmacopeia*[14] *and The American Herbal Pharmacopeia*[15]), providing a growing scientific framework for QA of CHMs. Of considerable importance is the open access downloadable special issue of the Journal of Ethnopharmacology that is devoted to good practice in TCM research.[16] The 10 EU-funded work packages published online are the culmination of three years effort by more than 150 scientists, clinicians and TCM practitioners from over nineteen EU countries and China 'to inform best practice, and harmonise research of safety and efficacy of TCM, especially Chinese herbal medicines (CHM) and acupuncture, in EU Member States and China.' This publication also includes recommendations regarding the clarity and standardisation of TCM herb names - a key part of TCM QA.

The carbon footprint of CHMs

I have mentioned the long supply line of CHMs from China to Europe, which raises another pertinent question about the carbon footprint of the CHMs used in the West. There is, of course, the traditional concept of 'dao di yao cai' (authentic regional medicinal products) i.e. that herbs should be grown in the areas traditionally known for producing the best quality plant materials, but there is no reason that this should be slavishly adhered to. Coffee, once a native plant of Ethiopia, is now successfully commercially grown in a variety of countries on other continents, including Brazil, Vietnam, Indonesia and Colombia. Cinchona trees, the source of quinine, originated from South American countries (e.g. Peru, Bolivia and Ecuador), but were successfully transplanted to India, the West Indies, Java and Fiji. If climatic and soil conditions can be replicated, there seems to be no valid technical objection to growing quality Chinese herbs in Europe or the USA. Modern assay techniques such as high performance liquid chromatography (HPLC) provide a useful way of comparing the chemical fingerprint of authentic 'dao di' herbs against those grown outside the traditional growing area in order to authenticate this venture, thus enabling a new, wholly organic Chinese herbal industry to flourish closer to home.

EMA GACP guidelines

The notion of growing CHMs in the West would have been unthinkable formerly when herbs were so cheaply produced in China, but as the cost of Chinese herbs climbs inexorably, the commercial validity of such a proposition makes more and more sense. The money saved on distribution would pay local producers who were able to follow the "Guideline on Good Agricultural and Collection Practice (GACP) for starting materials of herbal origin" published by the European Medicines Agency (EMA).[17] This, it should be noted, recommends the following:

- *'For cultivated medicinal plants/herbal substances all processing steps have to be documented including the location of cultivation.*
- *For cultivated medicinal plants/herbal substances, it is essential to document the type, quantity and the date of harvest as well as the chemicals and other substances used during production such as fertilizers, pesticides, herbicides and growth promoters.*
- *The geographic location of the collection area and the harvest period should be described as precisely as possible.*
- *Batches of medicinal plant materials should be unambiguously and unmistakeably traceable to their sources. Therefore appropriate labelling and batch assignment should take place as early as possible. Collected and cultivated medicinal plant/herbal substance material should carry different batch numbers.'*

Combining Chinese and Western herbs

Further to the above, I believe that CHM practised in the West needs to make use - where feasible - of herbal medicines grown and used in the West. In some cases the herbs used by Western herbalists bear a remarkable similarity to their CHM counterpart. For example, Yi Mu Cao *(Leonurus heterophyllus – herba)* is almost indistinguishable from its Western counterpart *Leonurus cardiaca – herba* - known commonly as 'motherwort' (a name which echoes the meaning of the Chinese name – 'benefit the mother herb').

The 17th century English herbalist, Culpeper, describes the actions of this herb in a way quite familiar to anyone conversant with the actions and indications of Yi Mu Cao.

> *'There is no better herb to take melancholy vapours from the heart and to strengthen it … It provokes urine and women's courses. It is of use to digest and disperse them that settle in the veins, joints and sinews of the body and to help cramps and convulsions.'*[18]

There is of course a counter-argument to the above, and on this account my colleague Mark Wright has issued a justifiable warning about the dangers of mixing different herbal traditions:

> *'Even suppose a person to train in two medical systems, such as biomedicine and Chinese herbal medicine or Western herbal medicine and Chinese medicine, a knowledge of which novel combinations are safe and which are hazardous would still be lacking. Lacking because the empirical knowledge does not yet actually exist. Outcomes would be would be on a basis of retrospective observation.'*[19]

Anyone seeking to develop the Chinese materia medica should certainly heed Wright's warning and proceed cautiously. Nonetheless the genie cannot be put back in the bottle: the last thirty years have seen CHM take firm root in the West. In this new environment practitioners of CHM are daily obliged to experiment with their tradition in ways undreamt of by Li Shizhen, as many patients seek herbal treatment whilst taking a cocktail of conventional prescription drugs. For those practising CHM who are additionally trained and experienced in Western herbs, adding the appropriate Western herbs to a Chinese prescription constitutes no greater step than that already taken by the fusion-cuisine chefs who have innovated our contemporary restaurant cuisine in recent decades by combining elements of different culinary traditions. In effect, I saw this same process at work when I worked alongside doctors in a Nanjing hospital in the 1980s: the doctors added many local 'folk herbs' to their classical prescriptions.

The need for herbal medicine to develop

Herbal medicine cannot stand still; it has to develop to meet contemporary needs. Political upheavals, war and famine as well as climate change could all threaten our lines of herbal supply from East Asia, to say nothing of the dangers posed by pollution already mentioned. In my view, as long as we act with prudence and care, we would be wise to make full use of the rich Western herbal tradition we have inherited to meet the requirements of patients living in a very different world from the ancient Chinese. Moreover, even if we were not to make use of Western herbs in a Chinese medicine setting, the process of integrating Western herbs into the Chinese materia medica is already being undertaken in China itself, where there are few inhibitions in this regard. For example *Echinacea purpurea* was introduced into China in the 1990s and is now grown in several locations for use as a herbal medicine.[20] The Chinese use of St John's wort (*Hypericum perforatum – herba,* Guan Ye Lian Qiao), traditionally used for treating wounds and toxins (as it was throughout the Middle Ages in Europe) has now been extended to relieving depression by regulating Liver qi, for which purpose *Chinese Medical Herbology and Pharmacology* records, it may be used individually or combined with *Yue Ju Wan* (Escape Restraint Pill).[21] The Chinese use of St John's wort has evidently been adopted from the Western herbal tradition, which has long used this remedy for this purpose.[22] The same Chinese materia medica includes the well-known Western herb *Valeriana officinalis – radix* (Xie Cao) in its section on nourishing herbs that calm the shen. The entry records that valerian tranquilises the shen, treats Liver qi stagnation and relieves spasms and pain.[23]

Parallels between Chinese and Western herbology

There are instructive parallels in the development of CHM and Western herbology. As is well known, the therapeutic strategies of the *Shang Han Lun (Treatise on Cold Injury)* were developed circa 220 AD in China at a time when the population density was low and the major threat to human life was from deprivation of warmth, food and shelter leading to hypothermia and death. Zhang Zhongjing made extensive use of the spice Gui Zhi (Cinnamon twigs) to warm his patients and drive out cold. As time passed the population density of Chinese towns grew, and with it the increased possibility of the spread of infectious diseases. This led to the development of the 'wenbing' (warm [pathogen] disorders) school, whose adherents - such as Liu Hejian (AKA Liu Wansu), Ye Tianshi and Wu Jutong - prescribed cooling, fire-toxin-resolving herbs to combat infectious diseases that spread rapidly from person to person and if not quickly and effectively treated can swiftly lead to the patient's demise.

Epidemics in China

Historical records show that plague outbreaks occurred in China from ancient times and it seems that diseases such as smallpox and measles arrived in China sometime between 37 and 653 CE.[24] Genomic data and DNA analysis of skeletons has recently indicated that *Yersinia Pestis*, the bacterium responsible for bubonic and pneumonic plague, originated from China or its vicinity between 2,603 years and 28,646 years ago, mutating over time.[25] However, many of the epidemic disease outbreaks were confined to coastal provinces[26] and by 1200 CE the Chinese population achieved successful biological accommodation with the infections that had so severely affected previous generations, demonstrated by the fact that the population

had grown rapidly to reach circa 100 million.[27] However, the Mongol invasion of China in 1211 that led to the Mongols conquering China in 1279 and the foundation of the Yuan Dynasty was also responsible for the introduction of a virulent strain of bubonic plague due to the infected rats and fleas that hitched a ride in the Mongol riders' saddlebags. In 1331 an epidemic spread like wildfire though Hopei (Hebei) Province, killing nine-tenths of its population.[28] By 1393 the Chinese population was estimated to have decreased by almost a half (from 123 million to 65 million).[29] A similar decimation occurred in Europe when plague arrived in 1346 and was responsible for the death of around a third of Europe's population, some 30 million people (primarily peasants) in two years.[30] In China further epidemic diseases (wen yi) occurred frequently, with particularly severe outbreaks recorded in 1506, 1618, 1641, 1644, 1709, 1728, 1853[31,32] and 1894.[33] The Ming Dynasty physician Wu Yaoke commented, 'Hot diseases are the same as warm diseases, but are also called wen yi (warm pestilence) because they go from door to door, recruiting everyone, like the forced–labour campaign from which no one is immune.'[34] In such circumstances, it was hardly surprising that in many cases shanghan strategies should be superseded by more appropriate wenbing treatments.

Comparable developments in the USA

Interestingly, a similar process can be traced in the development of herbal medicine in the USA during the eighteen and nineteenth centuries. Samuel Thomson (1769-1843), the American herbalist and frontiersman, developed a system of treatment aimed at opening the paths of elimination so that toxins could be removed via physiological processes. Mirroring the strategy described in the Shang Han Lun, Thomson reckoned that exposure to cold was an important cause of illness and that disease should be treated by restoring the body's 'natural heat'. Two of his favoured remedies were steam baths and cayenne (chilli) pepper. However, by the time of Thomson's death in the 1840s, the population of the USA was growing fast, and the population density of the new American cities gave rise to epidemic diseases. Faced with rapid onset of infectious disease, Dr Wooster Beach (1794 -1868), the founder of the famous American Eclectic School who worked out of New York City, criticised Thomson for using too much cayenne, arguing that diseases could actually be caused by heat. He criticised Thomson's therapeutic strategy as follows: 'His theory is, that heat is life, and cold is death. And hence the more heat, the more life. Both the theory and the practice are erroneous.'[35] Beach, who in 1832 treated 1000 victims of a cholera epidemic in just three months, recommended cold baths and prescribed cooling eliminative herbs like catnep *(Nepeta cataria - herba)* to cause sweating and break fevers.[36]

A third era – personal climate change

It can be argued that we 21st century humans are now entering a third era - post the *shanghan* and *wenbing* periods - in which 'global warming' has become as much an interior human pathogenic characteristic as an exterior climatic condition. Our sedentary/virtual lifestyles combine with information overload and easy access to sugar and refined carbohydrates to create retained internal heat. Our ancestral heritage gives us the capacity to produce an orchestra of 'flight or fight' chemicals in response to the stress and noise of modern life such as adrenaline, noradrenaline and cortisol, which demand that we go ever faster. But since, more often than not, we neither fight nor take flight, these sympathomimetic chemicals are not burnt off by our once-natural responses and so become internalised as pathogenic heat. In the long term this process appears to underlie many modern pathologies such as metabolic syndrome, PCOS, high blood pressure, heart and circulatory disease, diabetes, allergies and autoimmune diseases. In his seminal book, *The World Until Yesterday*, Jared Diamond highlights 'a wave of non-communicable diseases (NCD) associated with the Western lifestyle and now sweeping the world.'[37,38] He comments, 'almost 90% of all Europeans, Americans and Japanese will die of one of these NCDs, whilst the majority of people in low-income countries die of communicable diseases.'[39]

The tonic trap and sugar consumption

These observations call on us to hone our strategic use of herbs to suit the needs of our time. Whereas in days gone by when many were deprived of food and shelter, sweet-tasting Chinese tonics played a major role in the treatment of patterns of deficiency of qi, blood, yin and yang, today many patients suffer from excessive pathogens, damp-heat, blood-heat and blood stasis. In many cases, the last thing such patients need are sweet tonics.

Writing in 1972, Mességué commented, 'For ages and ages men made do with the natural sugars present in fruits and vegetables. Our sweet tooth was considerably less developed. It was not until the Napoleonic era that sugar became extracted on a large scale from sugar beets: a remarkable advance, but not exactly a blessed one.'[40] In the UK, sugar and tea were the twin human fuels that drove forward the industrial revolution, enabling workers to work well beyond the traditional length of the working day. By the end of the 19th century sugar had become a major source of calories for the British working-class family, and was similarly popular in the USA. At the 1904 St. Louis World's Fair, Miss Louisiana was carved from a five-foot sugar lump and candy floss (spun sugar) was introduced, generating huge demand for this new product.[41] In China during the Qing period sugar cultivation and manufacture were undertaken by smallholders, and because sugar-cane had to compete with rice and other subsistence and commercial crops, the per-capita consumption of sugar remained low during the nineteenth century in contrast to the steep increase in consumption in Britain and the USA.[42]

The bitter truth

In this context it is understandable why many bitter herbs from the Western herbal tradition were labelled tonics, because in draining heat and dampness they often produced a feeling of well-being. Writing in 1897 about golden seal *(Hydrastis canadensis – radix)*, which contains bitter-tasting isoquinoline alkaloids including berberine, the renowned American doctor-herbalist TJ Lyle stated, 'This root is the king of tonics to the mucous membrane. It is a mild, positive and permanent stimulating tonic. Its influence, though primarily given to the mucous membrane, extends to all parts of the body, wherever it may be required by the necessities of the vital force or influenced thither by its combination with other agents. It improves the appetite and assists digestion.' Regarding gentian root *(Gentian lutea – radix)*, Lyle says, 'The root is an intense bitter, stimulating tonic … it promotes the appetite and digestion, stimulates the circulation … and is especially valuable in languid conditions and in that of general debility.' In my own practice, I have learnt over the years of the limitations of Chinese herbal tonics (that are so attractive to the novice practitioner), whilst conversely discovering the substantial benefits of bitter, draining herbs that so often enable patients to sleep, digest and live more comfortably within the stressful 21st century environment.

Conclusion

What will herbal medicine look like in fifty years? Who can tell? But the needs of our patients, the demands of climate change and the urgent requirement to reduce our carbon footprint will surely impel us to make more use of CHMs grown locally in the West to produce similar constituent profiles as those grown in China. Large scale wildcrafting - ultimately a threat to the sustainability of herb stocks - should be replaced by cultivation using exclusively organic farming techniques. In addition, we should surely give ourselves permission to develop the CHM materia medica by including appropriate Western herbs on the basis of long experience and careful experiment. I sincerely hope that in time this will lead to a fusion of the best of all traditions based on clinical experience, making use of the most sympathetic and helpful tools that science has to offer, such as systems biology, omic techniques and metabolomics, thereby adopting a more holistic perspective than the reductionist approach of much current pharmacological and biomedical research. This said, I am only too aware of the aphorism ascribed to Hippocrates:

Ὁ μὲν βίος βραχύς,
ἡ δὲ τέχνη μακρή,
ὁ δὲ καιρὸς ὀξύς,
ἡ δὲ πεῖρα σφαλερή,
ἡ δὲ κρίσις χαλεπή.

'Life is short, the art long, opportunity fleeting, experience misleading and judgment difficult.'

Aphorism 1.1, Hippocrates ■

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