

A Systematic Study on Confused Species of Chinese Materia Medica in the Hong Kong Market

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Abstract

As more and more people worldwide begin using Chinese herbs, authentication of these herbs becomes an increasingly critical, international problem. Mistakes, misidentification, or willful deception can cause illness and even death. Questionable authenticity with regard to Chinese herbs arises for a number of historical, geographical and nomenclatural reasons, which will be described in this paper. The current situation in the Hong Kong market and some suggestions for alleviating the problem are also discussed.

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Introduction

At the beginning of the 1990s, there were repeated reports on cases of people in Europe experiencing detrimental side effects after taking slimming drugs with the Chinese herb *Fang Ji* (防己).¹ The side effects included extensive and indirect nephrofibrosis, renal tubule atrophy and depletion, and renal failure.¹ Investigations revealed that the problems were probably caused by a confusion of species. The source plant of *Fang Ji* for slimming drugs should be *Stephania tetrandra* S. Moore; it should not be — but probably was — *Aristolochia fangchi* Y. C. Wu ex L. D. Chow et S. M. Hwang. A similar situation, concerning the herb *Bai Mao Teng* (白毛藤), described as the “Aristolochic Acid Incident” where *Aristolochia mollissima* Hance (*Herba aristolochiae mollissimae*) was mistaken as *Solanum lyratum* Thunb. (*Herba solani lyrati*), arose a few years ago. These 2 crude drugs have the same common names “*Bai Mao Teng*”. At that time, there was a shortage of *Akebia quinata* (Thunb.) Dence. (*Mu Tong*, 木通), which was a key ingredient in the commonly used patent drug *Long Dan Xie Gan* Pill (龍膽瀉肝丸). *Aristolochia manshuriensis* Kom. (*Guan Mu Tong*, 關木通) was substituted, with dire consequences for some patients, who experienced renal failure.

In spring, 2004, a reported case of poisoning was traced back to confusion over a name in an herbal prescription.² A 60-year-old man was diagnosed with kidney failure and cancer of the urinary tract. He had been taking an herbal prescription that called for “*Bai Mao Teng*” (白毛藤). Investigations by the HKSAR Department of Health revealed that the patient had been mistakenly given *Aristolochia mollissima* Hance (*Xun Gu Feng*, 尋骨風) (its main action is to relieve rheumatic conditions, promote blood circulation and remove obstruction of collateral vessels, and alleviate pain) instead of *Solanum lyratum* Thunb. (*Bai Ying*, 白英) (its main action is to remove damp-heat, remove toxic materials and promote the subsidence of swelling). *Aristolochia mollissima* Hance is known to contain the toxin, aristolochic acid (AA).³ Upon tracing the source of the herbs, it was found that *Aristolochia mollissima* Hance was erroneously substituted for *Solanum lyratum* Thunb. at the wholesale level. It was also found that there is recurring confusion with regard to the names *Xun Gu Feng*, *Bai Ying* and *Bai Mao Teng*. In light of this, the HKSAR Department of Health called for a suspension of the use of these 3 Chinese herbs: *Xun Gu Feng*, *Bai Ying* and *Bai Mao Teng*. The Department also announced subsequently that the importation and sale of all Chinese herbs containing AA would be prohibited.²

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In all of the above cases, confusion caused by different herbs sharing the same Chinese Materia Medica (CMM) names had serious — even fatal — consequences for innocent consumers. Therefore, in order to resolve existing ambiguities and to prevent any such future confusion, it is necessary to ensure that one herb has one pharmaceutical name and that each pharmaceutical name corresponds to one species of materia medica. This review summarises the facts and reasons for confusion in the current Hong Kong medicinal herb market, and suggests a few solutions to this growing problem.

Last year, we had launched a full-scale investigation on this issue. Between January and December 2004, we undertook a thorough investigation of 86 pairs of the most commonly and most seriously confused species of CMM in Hong Kong. Thousands of specimens were collected from over 100 retail herb shops in Hong Kong and Macau. All samples were identified and authenticated by experimental methods such as TLC and HPLC, and are lodged in the HKBU Bank of China (HK) Chinese Medicines Centre. Comprehensive information was published in the book *Easily Confused Chinese Medicines in Hong Kong*.⁴

Commonly Confused Chinese Medicine in the Hong Kong Market

The investigation shows that confusion appears under particular circumstances for a number of historical, geographical and nomenclatural reasons (Table 1). Details explanations are discussed below.

Table 1. Summary of the Reasons of Confusion in the Hong Kong Market

Reasons of confusion	Examples	
	Origin of source plant	Origin of related species
Substitution of official species	<i>Aquilaria agallocha</i> (Lour.) Roxb.	<i>Aquilaria sinensis</i> (Lour.) Gilg
Traditionally used herbs in certain regions	<i>Cimicifuga heracleifolia</i> Kom.	<i>Serratula chinensis</i> S. Moore.
Confused herbs		
• Confused nomenclature	<i>Clematis armandii</i> Franch.	<i>Aristolochia manshuriensis</i> Kom.
• Confusion related to other name	<i>Potentilla chinensis</i> Ser.	<i>Laccifer lacca</i> Kerr.
• Similarity in shape and appearance	<i>Clematis chinensis</i> Osbeck.	<i>Sinopodophyllum hexandrum</i> (Royle) Ying
• Reversal of names	<i>Albizia julibrissin</i> Durazz.	<i>Magnolia coco</i> (Lour.) DC.
• Mix use of medicinal parts	Root of <i>Belamcanda chinensis</i> (L.) DC.	Aerial part of <i>Belamcanda chinensis</i> (L.) DC.
• Mix use of plants of similar species	<i>Abrus cantoniensis</i> Hance	<i>Abrus mollis</i> Hance
• Mistakes in ancient books	<i>Crocus sativus</i> L.	<i>Carthamus tinctorius</i> L.
Counterfeit products	<i>Panax quinquefolium</i> L.	<i>Panax ginseng</i> C. A. Mey.

I. Substitution of Official Species

There are 2 concepts for “official species”. In one sense, the “official species” indicates the authorised species listed in the latest edition of the *Pharmacopoeia of the People’s Republic of China (PPRC)*;⁵ in another sense, it implies the traditional species that is listed in the *Zhong Hua Ben Cao* 《中華本草》.⁶

Under certain conditions, such as when the official species is not available, one can replace the official herb with another herb of similar function, with the approval of the practitioner. For example, *Aquilaria sinensis* (Lour.) Gilg (*Lignum sinensis resinatum*, *Guo Chan Chen Xiang*, 國產沉香) can be substituted for *Aquilaria agallocha* (Lour.) Roxb. (*Lignum aquilariae resinatum*, *Jin Kou Chen Xiang*, 進口沉香). However, attention must be paid to the dosage when using the substitutes.

Currently, the kinds of herbs that are commonly seen in the Hong Kong market are separately listed in *Pharmacopoeia of the People’s Republic of China*; e.g., *Lysimachia christinae* Hance (*Jin Qian Cao*, 金錢草) and *Desmodium styracifolium* (Osb.) Merr. (*Guang Jin Qian Cao*, 廣金錢草), *Isatis indigotica* Fort. (*Ban Lan Gen*, 板藍根) and *Baphicacanthus cusia* (Nees) Bremek. (*Nan Ban Lan Gen*, 南板藍根). Details information can be found in the *Pharmacopoeia* for herbs those have very similar names or plant sources. Although, in some cases, the functions of the herbs are basically the same and can be used interchangeably, different official names should be used to identify each herb.

II. Traditionally Used Herbs in Certain Regions

In some regions, certain species have a long history of local use. They are usually grown or collected and processed into CMM by the people living in that region. For example, in Guangdong, there are many local species of genera used in other areas of China; some of these species are listed in the *Guang Dong Zhong Yao Zhi* 《廣東中藥志》.⁷

In many cases, the names of the herbs derived from the local species are the same as the names of the common herbs used throughout China. This is a potential source of confusion. Those herbs have different chemical constituents and clinical functions and therefore should be clearly distinguished. *Serratula chinensis* S. Moore (*Guang Sheng Ma*, 廣升麻) and *Cimicifuga heracleifolia* Kom. (*Sheng Ma*, 升麻), *Ficus pumila* L. (*Guang Dong Wang Bu Liu Xing Ke*, 廣東王不留行殼) and *Vaccaria segetalis* (Neck.) Garcke (*Wang Bu Liu Xing*, 王不留行), *Alocasia macrorrhiza* (L.) Schott (*Guang Dong Lang Du*, 廣東狼毒) and *Euphorbia fischeriana* Steud. (*Lang Du*, 狼毒), *Gentiana loureiri* (D. Don) Griseb. (*Guang Di Ding*, 廣地丁) and *Viola yedoensis* Makino (*Zi Hua Di Ding*, 紫花地丁), *Torilis scabra* (Thunb.) DC. (*Hua Nan*

He Shi, 華南鶴虱) and *Carpesium abrotanoides* L. (*He Shi*, 鶴虱), *Kadsura heteroclita* (Roxb.) Craib (*Guang Dong Hai Feng Teng*, 廣東海風藤) and *Piper kadsura* (Choisy) Ohwi (*Hai Feng Teng*, 海風藤), *Artemisia lactiflora* Wall. ex DC. (*Guang Dong Liu Ji Nu*, 廣東劉寄奴) and *Artemisia anomala* S. Moore (*Liu Ji Nu Cao*, 劉寄奴) are some examples.

III. Confused Herbs

A. Confused nomenclature: Confused nomenclature refers to a situation where one herb has more than one common name, or where one common name is used for more than one herb. Common names have always been and still are notoriously unreliable as a means of identifying plant material. In the preface to *A Compendium of Materia Medica* (Ming Dynasty, 16th century), Li Shizhen, the author, includes an entire section on confused nomenclature, with many examples.⁸ Clearly, the problem of different herbs being referred to by the same Chinese name has existed for centuries, although it is much more acute today. Such confusion exists even in the *PPRC*, which is used as the ultimate and final authority on matters of nomenclature. Specific examples are given below.

1. One herb (plant) with more than one common name

The index to the *Chinese Pharmacopoeia* is rife with examples of this. Many names are used for more than one species within a genus, as well as plants belonging to entirely different families. *Bai Mao Teng* (白毛藤) is a typical example, as mentioned in the introduction section.

2. One common name used for more than one herb (plant)

This sort of problem derives from geographical and historical causes. For example, in the days when transportation was slow and delivery uncertain, local species had to be used as substitutes for the true, non-local species when the latter were not available — but the same name was generally used for both. *Ban Lan Gen* (板藍根) is a case in point. In northern China, when *Ban Lan Gen* is prescribed, *Radix isatidis* (the dried root of *Isatis indigotica* Fort. of Fam. Cruciferae) is given. But in Hong Kong, when *Ban Lan Gen* is prescribed, *Rhizoma et radix Baphicacanthis cusiae* (the dried root of *Baphicacanthus cusia* (Nees.) Bremek. of Fam. Acanthaceae) is often given instead. In the *PPRC* (2000 English Edition), the 2 herbs are listed separately, but under the same common name, *Ban Lan Gen*.⁹

Another example is the common Chinese name, “*Mu Tong*” (木通), which is associated with 3 different herbs. These are: *Akebia quinata* (Thunb.) Decne (*Caulis akebiae quinatae*), *Clematis armandii* Franch. or *Clematis montana* Buch.-Ham. (*Caulis clematidis armandii*) and *Aristolochia manshuriensis* Kom. (*Caulis aristolochia*

manshuriensis). The first name/plant, *Akebia quinata* (Thunb.) Decne, is the one traditionally associated with the name *Mu Tong*. However, the 2000 English edition of the *PPRC* does not list *A. quinata*; in fact, there is no herb listed as simply “*Mu Tong*”. Instead it lists *Clematis armandii* Franch./*Clematis montana* Buch.-Ham. and *Aristolochia manshuriensis* Kom. as including the characters “*Mu Tong*” in their common names (*Chuan Mu Tong*, 川木通 and *Guan Mu Tong*, 關木通, respectively). This has led to serious confusion. In an incident reported in the international press, the herb *Mu Tong* was reported to cause renal failure.¹⁰ Ingestion of AA can have such an effect, but of the 3 herbs discussed here, only *A. manshuriensis* contains AA. Thus, it appears that *A. manshuriensis*, rather than *A. quinata*, was mistakenly given when “*Mu Tong*” was prescribed. Interestingly, the *Japanese Pharmacopoeia* (14th edition) is less ambiguous in this instance — listing only *A. quinata* as *Mu Tong* — because it follows the traditional literature.¹¹ However, this error has been corrected in the supplement of *PPRC* in 2002.

Confusion caused by similar herb names causing confusion is also common in Hong Kong. Examples include *Cyathula officinalis* Kuan (*Chuan Niu Xi*, 川牛膝) and *Strobilanthes forrestii* Diels (*Wei Niu Xi*, 味牛膝), *Pinellia ternate* (Thunb.) Breit. (*Ban Xia*, 半夏) and *Typhonium flagelliforme* (Lodd.) Blume (*Shui Ban Xia*, 水半夏), *Sparganium stoloniferum* Buch.-Ham (*San Leng*, 三棱) and *Scirpus yagara* Ohwi (*Pao San Leng*, 泡三棱), *Menispermum dauricum* DC. (*Bei Dou Gen*, 北豆根) and *Sophora tonkinensis* Gapnep. (*Shan Dou Gen*, 山豆根), *Stephania tetrandra* S. Moore (*Fan Ji*, 防己) and *Aristolochia fangchi* Y. C. Wu ex L. D. Chou et S. M. Hwang (*Guang Fang Ji*, 廣防己), *Fagopyrum esculentum* Moench (*Qiao Mai*, 蕎麥) and *Fagopyrum dibotrys* (D. Don) Hara (*Jin Qiao Mai*, 金蕎麥), *Drynaria fortunei* (Kunze) J. Sm. (*Gu Sui Bu*, 骨碎補) and *Pseudodrynaria coronans* (Wall.) Ching (*Da Sui Bu*, 大碎補), *Typhonium giganteum* Engl. (*Zhi Bai Fu Zi*, 製白附子) and *Aconitum carmichaeli* Debx. (*Bai Fu Zi*, 白附子), *Dryopteris crassirhizoma* Nakai (*Mian Ma Guan Zong*, 綿馬貫眾) and *Brainea insignis* (Hook.) J. Smith (*Su Tie Jue Guan Zhong*, 蘇鐵蕨貫眾), *Fritillaria cirrhosa* D. Don (*Chuan Bei Mu*, 川貝母) and *Fritillaria ussuriensis* Maxim. (*Ping Bei Mu*, 平貝母), *Aconitum kusnezoffii* Reichb. (*Cao Wu*, 草烏) and *Aconitum carmichaeli* Debx. (*Chuan Wu*, 川烏), *Hyoscyamus niger* L. (*Tian Xian Zi*, 天仙子) and *Hygrophila megalanta* Merr. (*Nan Tian Xian Zi*, 南天仙子), *Dendrobium chrysanthum* Wall. (*Shi Hu*, 石斛) and *Ephemerantha fimbriatum* (BL.) P. E. Hunt et Summ. (*You Gua Shi Hu*, 有瓜石斛), *Tripterygium wilfordii* Hook. f.

(*Lei Gong Teng*, 雷公藤) and *Erycibe obtusifolia* Benth. (*Ding Gong Teng*, 丁公藤), *Ampelopsis japonica* (Thunb.) Makino (*Bai Lian*, 白蘂) and *zehneria indica* (Lour.) Keraudren (*Tu Bai Lian*, 土白蘂), *pseudolarix kaempferi* Gord. (*Tu Jing Pi*, 土荆皮) and *Cleistocalyx operculatus* (Roxb.) Merr.et Perry (*Tu Jin Pi*, 土槿皮).

B. Confusion related to other name: Another situation leading to confusion is when 2 herbs share one or more components of the common name. In Hong Kong, *Potentilla chinensis* Ser. (*Wei Ling Cai*, 委陵菜) is also called *Bei Zi Cao* (北紫草) and is therefore confused with the herb *Laccifer lacca* Kerr. (*Zi Cao Rong*, 紫草茸) because they have the words “*Zi Cao*” in common. There are several typical examples: *Epimeredi indica* (L.) Rothm. (*Guang Fang Feng*, 廣防風) is sometimes called *Xi Xian Cao* (豨薟草) and is mixed up with *Siegesbeckia pubescens* Makino (*Xi Xian Cao*, 豨薟草); *Paederia scandens* (Lour.) Merr. (*Ji Shi Teng*, 雞屎藤) other name is *Qing Feng Teng* (青風藤), which is confused with *Sinomenium acutum* (Thunb.) Rehd. et Wils. (*Qing Feng Teng*, 青風藤); *Lycium chinense* Mill. (*Di Gu Pi*, 地骨皮) is called *Quan Pi* (全皮) in Sichuan, which is confused with *Jasminum giraldii* Diels (*Quan Pi*, 荃皮) in commercial products; *Datura metel* L. (*Yang Jin Hua*, 洋金花) is called *Guang Dong Nao Yang Hua* (廣東鬧羊花) in Guangdong and is mixed up with *Rhododendron molle* G. Don (*Nao Yang Hua*, 鬧羊花).

C. Similarity in shape and appearance: Sometimes, confusion over Chinese herbs arises simply because they are similar in shape and appearance. Root and bark are the main parts from plants that are used as herbs and it is very easy to misidentify them. For example, *Wei Ling Xian* (威靈仙), the root of *Clematis chinensis* Osbeck., at one time in the Hong Kong market, *Gui Jiu* (鬼臼), the root of *Sinopodophyllum hexandrum* (Royle) Ying was used instead because the 2 roots look alike in shape. This mistake has led to poisoning (2).

Another case is *Spatholobus suberectus* Dunn (*Ji Xue Teng*, 雞血藤) and *Sargentodoxa cuneata* (Oliv.) Rehd. et Wils. (*Da Xue Teng*, 大血藤). They have similar shapes but have different structures. Therefore, without detailed analysis, they are easily confused.

D. Reversal of names: Two herbs are mixed up with one another by reversing their names. In other words, A is named as B thus is mistaken as herb B and B is named as A thus is mistaken as herb A. One example is *Flos albiziae* (*He Huan Hua*, 合歡花) and *Flos magnoliae cocinis* (*Ye He Hua*, 夜合花). *Flos albiziae* is the flower buds of *Albizia julibrissin* Durazz. (Fam. Leguminosae) but its

name is reversed by *Ye He Hua* (夜合花) in Hong Kong, which actually refers to the flowers of *Magnolia coco* (Lour.) DC. (Fam. Magnoliaceae). Other confused pairs include *Cynanchum stauntonii* (Dence.) Schltr.ex Lévl. (*Bai Qian*, 白前) and *Cynanchum atratum* Bge. (*Bai Wei*, 白薇), *Spatholobus suberectus* Dunn (*Ji Xue Teng*, 雞血藤) and *Sargentodoxa cuneata* (Oliv.) Rehd. et Wils. (*Da Xue Teng*, 大血藤), *Lycopus lucidus* Turcz.var. *hirtus* Regel (*Ze Lan*, 澤蘭) and *Eupatorium fortunei* Turcz. (*Pei Lan*, 佩蘭) and vice versa.

E. Mix use of medicinal parts: Different parts of a medicinal plant have different pharmacological actions, but some people use other part to substitute the one that is unavailable at the moment. In some cases, the user substitutes one part of the plant by another because he/she thinks their pharmacological effects are the same. For example, the aerial part of *Ephedra sinica* Stapf (*Ma Huang*, 麻黃) can induce sweating while its root can arrest sweating. Other parts should not be used without detailed studies on the chemical, pharmacological, and clinical properties. For instance, the aerial part of *Belamcanda chinensis* (L.) DC. (*She Gan Miao*, 射干苗) is replaced by its root (*She Gan*, 射干), the root of *Cynanchum paniculatum* (Bge.) Kitagawa (*Xu Chang Qing*, 徐長卿) is replaced by with its whole plant (*Xu Chang Qing Quan Cao*, 徐長卿全草), pollen with nema of *Typha angustifoliz* L. (*Cao Pu Huang*, 草蒲黃) is substituted by its pollen (*Pu Huang*, 蒲黃), the aerial part of *Aristolochia debilis* Sieb. et Zucc (*Tian Xian Teng*, 天仙藤) is replaced by its root (*Qing Mu Xiang*, 青木香), etc.

F. Mix use of plants of similar species: This situation is caused by herbs whose families are the same, without obvious differences in shape, which make it very easy for confusion to arise. Some examples are *Abrus cantoniensis* Hance (*Ji Gu Cao*, 雞骨草) and *Abrus mollis* Hance (*Mao Ji Gu Cao*, 毛雞骨草), *Polygonum aviculare* L. (*Bian Xu*, 扁蓄) and *Polygonum plebeium* R. Brown (*Xiao Bian Xu*, 小扁蓄), *Hedyotis diffusa* Willd. (*Bai Hua She She Cao*, 白花蛇舌草) and *Hedyotis corymbosa* (L.) Lam. (*San Fang Hua Er Cao*, 傘房花耳草), etc.

G. Mistakes in ancient books: There are various versions of multitudinous ancient books on traditional Chinese medicine. They contained only simple text descriptions, and drawings identified each crude drug without any sample reference. For instance, there were big differences between different versions (Ming Dynasty’s Jinling and Jiangxi editions, Qing Dynasty’s Zhang Shaotang edition) of *A Compendium of Materia Medica* 《本草綱目》.¹² This has led to misunderstanding for later generations.

The herb commonly called “*Bai Tou Weng*” is one example. According to *Ming Yi Bie Lu* 《名醫別錄》 by Tao Hongjing, *Pulsatilla chinensis* (Bge.) Regel (*Bai Tou Weng*, 白頭翁) is described as “found everywhere, white hair near its root, just like an old white-haired man.”¹³ In contrast, *Zhi Wu Ming Shi Tu Kao* 《植物名實圖考》(Qing Dynasty) states that “every plant that has white hair can be named as ‘翁’ (i.e., old man)”.¹⁴ Due to the lack of detailed illustrations, many plants with white hair have been called “*Bai Tou Weng*” until now.

In Li Shizhen’s *A Compendium of Materia Medica* 《本草綱目》,⁸ *Carthamus tinctorius* L. (*Hong Hua*, 紅花) is—mistakenly—said to be the same as *Crocus sativus* L. (*Xi Hong Hua*, 西紅花). These 2 herbs have been confused since the Ming Dynasty. There are similar cases for *Abrus precatorius* L. (*Xiang Si Zi*, 相思子) and *Phaseolus calcaratus* Roxb. (*Chi Xiao Dou*, 赤小豆), *Ilex cornuta* Lindl. ex Paxt. (*Gou Gu Ye*, 狗骨葉) and *Mahonia bealei* (Forti.) Carr. (*Shi Da Gong Lao Ye*, 十大功勞葉), etc.

IV. Counterfeit Products

The high price of some herbs is an incentive for unscrupulous persons to make a quick profit by manufacturing counterfeit products. The more precious and rare the crude drug is, the more likely that counterfeit products will find their way into the market. *Cordyceps*, the composite consisting of the stroma of *Cordyceps sinensis* (Berk.) Sacc. parasitising the larva of insects belonging to the Hepialidae family, and of the larva corpse, is one of the most common and classic examples. A peculiar combination of plant and animal matter, it is a crude drug found only in a fairly inaccessible region (the Qinghai-Tibet Plateau, in the snow line area 3000 metres above sea level). Both its origin and habitat give it unusual properties and make it as valuable as it is scarce. Nowadays, unscrupulous merchants use *Rhizoma stachydis geobombycis*, rhizome of *Stachys geobombycis* C. Y. Wu, and pass it off as *Cordyceps*. Other counterfeit products of *Cordyceps* that have been found in the market are produced by putting gypsum, wheat flour, soybean flour and corn flour into moulds for compression.¹⁵ Other notorious shams include fake American Ginseng.

Suggestions

Confused nomenclature does not appear overnight, and it will not disappear overnight. It takes time and vigorous identification measures to separate herbs with genuine medicinal functions from those that are useless or harmful to human beings. In order to root out the confusion, academia, government and industry must work together.

I. Establish Standards for Authentication

Establishing a system of official species (i.e., one name for one herb) is the way to clarify the confused nomenclature. In 2003, the School of Chinese Medicine, Hong Kong Baptist University cooperated with the traditional Chinese medicine industry to publish *An Illustrated Chinese Materia Medica in Hong Kong* (Chinese/English edition).¹⁶ This book, along with some other books discussing the authentication of Chinese herbs can serve as valuable public, baseline references on official species.¹⁷⁻²³ The publication of *An Illustrated Microscopic Identification of Chinese Materia Medica* in 2005 further supports this purpose.²⁴ Recently, the HKSAR Department of Health and other experts have set up the “Hong Kong Standard of Chinese Medicines” and this standard has been effective in bringing traditional Chinese medicine to the international level.

Meanwhile, the herbarium located at Hong Kong Baptist University, HKBU Bank of China (HK) Chinese Medicines Centre, is becoming an increasingly valuable reference as it is the hub of much research on the chemistry and morphological characteristics of herbs, and because all authenticated specimens are collected and stored there.

II. Education

The identification of Chinese medicines requires experience as well as knowledge. Lack of professional knowledge and training among herbalists and practitioners is the main factor contributing to confusion of CMM. Therefore, education for those in the CMM industry as well as for the public is very important in solving the various problems of confusion in the long run.

III. Monitoring by the Government and Self-regulation by the Industry

With its heritage of Eastern and Western cultures, its history, and its key location, Hong Kong plays an important role in the trading of Chinese medicines. Chinese medicines have developed rapidly in Hong Kong. It is the government’s responsibility to ensure proper running of the “one name for one herb” system. The industry should also show its support by strictly following the system.

Conclusions

As can be seen from the above, the questionable authenticity of crude drugs in the Chinese Materia Medica market results from, first, a standard nomenclature that has developed over time and throughout the country; and, second, from the existence of counterfeit products. The solution to both problems is to establish a systematic nomenclature and set of specific criteria by which crude

drugs can be identified and authenticated. Therefore, authentication is fundamental for standardisation of Chinese medicines.²⁵ This will ensure the safe and effective use of Chinese medicinal herbs throughout the world. In fact, most of the Chinese medicinal herbs reaching countries outside China are exported through Hong Kong. Thus, Hong Kong is in a unique position to take a leading role in assessing and guaranteeing the identity and authenticity of herbs on the international market. Through our investigations and publications, we hope to help rectify this problem by providing specific details for the identification and authentication of the most commonly confused herbs, particularly those for which confusion can be deadly.

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REFERENCES

1. Stengel B, Jones E. End-stage renal insufficiency associated with Chinese herbal consumption in France (French). *Nephrologie* 1998;19:15-20.
2. Liang ZT, Jiang ZH, Leung KSY, Chan CL, Zhao ZZ. Authentication and differentiation of two easily confusable Chinese material medica: Herba Solani Lyrati and Herba Aristolochiae Mollissimae. *J Food Drug Analysis* 2006;14:36-43.
3. State Administration of Traditional Chinese Medicine of PRC. Compendium of Chinese Materia Medica. Third volume. Shanghai: Shanghai Science and Technology Publisher, 1996.
4. Zhao ZZ, Li YS. Easily Confused Chinese Medicines in Hong Kong. Hong Kong: Chinese Medicine Merchants Association Ltd., 2004.
5. The State Pharmacopoeia Committee of China. The Appendix of Chinese Pharmacopoeia. Volume I. Beijing: The Chemical Industry Press, 2005.
6. State Administration of Traditional Chinese Medicine of PRC. Zhong Hua Ben Cao. Shanghai: Shanghai Science and Technology Publisher, 1998.
7. Committee of Guangdong Pharmacopoeia. Guang Dong Zhong Yao Zhi. Guangdong: Guangdong Science and Technology Publisher, 1999.
8. Li SZ. A Compendium of Materia Medica. Beijing: People's Health Publisher, 1977: 95-102.
9. Board of Pharmacopoeia of China (ed.). Pharmacopoeia of the People's Republic of China. English Edition 2000. Beijing: Chemical Industry Publisher, 2000.
10. Lord GM, Tagore R, Cook T, Gower P, Pusey CD. Nephropathy caused Chinese herbs in the UK. *Lancet* 1999;354:481-2.
11. Committee of Japanese Pharmacopoeia Guide Book. The Guide Book of Japanese Pharmacopoeia. 15th edition. Tokyo: Hirokawa Shoten, 2001:2953.
12. Lu J, editor. The Complete Collection of Traditional texts on Chinese Materia Medica. Beijing: Huaxia Publisher, 1999.
13. Tao HJ. Ming Yi Bie Lu. Beijing: People's Health Publisher, 1986.
14. Wu Q. Zhi Wu Ming Shi Tu Kao. Beijing: Huaxia Publisher, 1999.
15. Hu YN, Kang TG, Zhao ZZ. Studies on microscopic identification of animal drug's remnant hair (1) - Identification of Cordyceps sinensis and its counterfeits. *Natural Medicines* 2003;57:163-71.
16. Zhao ZZ. An Illustrated Chinese Materia Medica in Hong Kong. Hong Kong: School of Chinese Medicine, Hong Kong Baptist University, 2004.
17. Xie ZW. Discussion on Chinese Traditional Herbal Species. Shanghai: Shanghai Science and Technology Publisher, 1988.
18. Xu GJ, Xu LS. Species Systematization and Quality Evaluation of Commonly Used Chinese Traditional Drugs. South-China Edition Volume 1-2. Fujian: Fujian Science and Technology Publisher, 1994.
19. Xu GJ, Xu LS, Wang ZT. Species Systematization and Quality Evaluation of Commonly Used Chinese Traditional Drugs. South-China Edition Volume 3-4. Fujian: Fujian Science and Technology Publisher, 1997.
20. Lou ZC, Qin B. Species Systematization and Quality Evaluation of Commonly Used Chinese Traditional Drugs. North-Edition Volume 1-3. Beijing: Beijing Medical University Press and Peking Union Medical College Press, 1995.
21. Cai SQ, Li SH. Species Systematization and Quality Evaluation of Commonly Used Chinese Traditional Drugs. North-Edition Volume 4. Beijing: Beijing Medical University Press, 2001.
22. Cai SQ, Li J. Species Systematization and Quality Evaluation of Commonly Used Chinese Traditional Drugs. North-Edition Volume 5. Beijing: Beijing Medical University Press, 2001.
23. Cai SQ, Wang X. Species Systematization and Quality Evaluation of Commonly Used Chinese Traditional Drugs. North-Edition Volume 6. Beijing: Beijing Medical University Press, 2001.
24. Zhao ZZ. An Illustrated Microscopic Identification of Chinese Materia Medica. China: International Society for Chinese Medicine, 2005.
25. Zhao ZZ, Hu Y, Liang ZT, Yuen PSJ, Jiang ZH, Leung KSY. Authentication is fundamental for standardization of Chinese medicines. *Planta Med* 2006;72:865-74.