Combining classic and novel tools in the study of Historical Collections of Chinese Materia Medica in the Netherlands

Jia, Y.

Chapter Three

The catalogue of the Westhoff Collection of Chinese *materia medica* (c. 1870): evidence of interaction between a Chinese medicine practitioner and the Dutch in Indonesia

Yusheng Jia[a,b,c*], Mei Wang[b,c,d,e*], Paul H. Lambers[f], Tinde van Andel[a,c]

[a] Naturalis Biodiversity Center, Darwinweg 2, 2333 CR, Leiden, the Netherlands

[b] LU-European Center for Chinese Medicine and Natural compounds, Institute of Biology, Leiden University, Sylviusweg 72, 2333 BE, Leiden, the Netherlands

[c] Institute of Biology, Leiden University, Sylviusweg 72, 2333 BE, Leiden, the Netherlands

[d] SU BioMedicine, Galileiweg 8, 2333 BD Leiden, the Netherlands

[e] Center for Drug Discovery & Technology Development of Yunnan Traditional Medicine, Kunming 650217, China

[f] Universiteitsmuseum Utrecht, Lange Nieuwstraat 106, 3512 PN Utrecht, the Netherlands

* Corresponding authors: Mei Wang; Yusheng Jia

Published in *Journal of Ethnopharmacology 318: 116987; 2024*
(https://doi.org/10.1016/j.jep.2023.116987)

Abstract

Ethnopharmacological relevance: The Westhoff collection of Chinese *materia medica* (c. 1870) at the Utrecht University Museum in Utrecht, the Netherlands, contains an original, handwritten catalogue, which was putatively ascribed to a Chinese medicine practitioner. It provides a detailed record of the Chinese names, plant parts, preparations, and applications of the specimens contained in glass bottles, which probably reflects the physician's personal interpretation of Chinese medicine in Indonesia at the end of the 19th century. Such individual catalogues can reveal historical changes and regional variations in the use of traditional Chinese medicine, which can lead to a better understanding of the history and development of this field.

Aim of the study: We addressed the following questions: 1) What are the contents of the Westhoff catalogue? 2) What medicinal preparations and applications were recorded in the catalogue, and which ones are dominant? 3) How similar is the use of Chinese *materia medica* in Westhoff catalogue compared to the modern Chinese Pharmacopeia? 4) What other specific information is contained in the Westhoff catalogue?

Materials and methods: The catalogue had been digitized previously, and all handwritten Dutch text has been transcribed and translated into English. The information for each entry was summarized and analysed, the medicinal applications were compared to modern Chinese pharmacopeia or other monographs on Chinese *materia medica*.

Results: The catalogue contains 436 entries, for which 395 corresponding specimens still exist in the Westhoff collection of Chinese *materia medica*. Each entry contains a serial number, a Chinese name, a phonetic Dutch transcription of the Chinese name, a description of the plant, animal, or mineral origin of the medicinal product, the preparation method, and the medical indication for which it should be used. The dominant preparation method is decoction (79% of the entries). The most frequently mentioned applications are fever, skin diseases, strengthening and wounds. Around 80% of the medicinal applications in the catalogue were also listed for the same CMM in modern monographs. The catalogue also sheds light on typical characteristics of popular medicine, their geographic origin, and social aspects of traditional Chinese medicine in Indonesia around 1870.

Conclusion: The Westhoff catalogue is a valuable record of Chinese *materia medica* and its practice in a specific time and space. It reflects an individual physician's interpretation of Chinese medicine, shows the difficulties in the interpretation of cultural-bound health issues between the Dutch and the Chinese, and provides evidence that traditional Chinese medicine spread not only in East Asia but also to the distant Western world.

Abbreviations: CMM, Chinese *materia medica*; TCM, traditional Chinese medicine; ChP 2015, Chinese Pharmacopoeia 2015 edition.

Introduction

Traditional Chinese medicine (TCM) has a long history, with thousands of years of practice, experimentation and adaptation. Although most of these ancient practices are continued nowadays, Chinese *materia medica* (CMM), including product names, natural ingredients, processing methods and clinical applications have also changed over time (Brand et al., 2017; Jia et al., 2021; Jia et al., 2022; Zhao, Z. et al., 2006). A tremendous body of TCM treatises has been compiled in the past centuries, which not only recorded the medicinal materials' taxonomical identity, the place of origin but the methods of collection, processing, preservation and identification (Teng, 2019). One of the earliest monographs, the *Divine Husbandman's classic of materia medica* (Eastern Han Dynasty, 25-220 AD) contains 365 product names, their geographical origins, processing, preservation and identification methods. The *Collective commentaries on the classic of materia medica* (Tao Hongjing, c. 500 AD), recorded 730 medicinal products, established the concept of using the same medicine to treat varieties of diseases, and introduced more than 80 interchangeable *materia medica* (Teng, 2019). The *Newly revised materia medica* (Su Jing et al., 659 AD) was the first monograph to include illustrations, which were extremely important to identify the biological origin of the *materia medica*. These monographs were meant to be comprehensive, containing as much information as possible at that time, which meant that compiling these classic works was labor intensive and time-consuming. For instance, the *Newly revised materia medica* was written and revised by 23 persons and depended on the administrative power of the Tang dynasty (618-907 AD). Li Shizhen, the author of *Compendium of materia medica* (1578 AD), had read more than 800 medicinal books and spent 27 years compiling his monograph (Teng, 2019). With such a large body of documented knowledge, it is almost impossible for physicians who practice traditional Chinese medicine to precisely follow all the information and instructions provided in these monographs when making diagnoses and prescriptions. In addition, in various geographic regions, the use of Chinese *materia medica* is also influenced by the type of plants, animals and minerals that can be collected or grown locally. Therefore, there can be a gap between a physician's interpretation of TCM and the information in the professional monographs. Being aware of physician's personal interpretations of Chinese medicine in the past can help us discern the changes and developments over time with regard to ingredients, processing and application of Chinese medicine. However, there are few historical sources that reflect physicians' personal interpretations and viewpoints about Chinese *materia medica* and its application.

A unique, well-preserved historical collection of Chinese *materia medica* is housed at the Utrecht University Museum in Utrecht, the Netherlands. Almost 400 specimens of CMM are contained in this valuable collection, assumed to have been purchased by the Dutch ophthalmologist Dr. C.H.A Westhoff in Indonesia in c. 1870 and brought to the Netherlands in 1882. The botanical identity, Chinese nomenclature, plant parts, and processing methods

of all specimens in this collection were studied previously and provided new insights into historic changes and local adaptations in Chinese medicine (Jia et al., 2021).

Along with the historic specimens, the Westhoff collection contains a handwritten catalogue that mentions not only the specimens' Chinese names but also their natural origin, the medicinal parts, preparation methods and medicinal applications. Over 400 entries in this document, written in Dutch, with detailed descriptions of each CMM product, indicate that this information may have been sourced from a local TCM physician or pharmacist. In other words, this handwritten catalogue may reflect an individual physician's interpretation of Chinese medicine and can provide unique information about the practices of TCM around 1870 in Indonesia.

By transcribing and translating this handwritten document, we aimed to identify the similarities and differences in the use of Chinese *materia medica* between this individual physician and modern Chinese pharmacopeia. We addressed the following questions:

1. What are the contents of the Westhoff catalogue?
2. What medicinal preparation methods and applications were recorded in the catalogue, and which ones are dominant?
3. How similar is the use of Chinese *materia medica* in the Westhoff catalogue compared to the modern Chinese Pharmacopeia and recent CMM treatises?
4. What other specific information is contained in the Westhoff catalogue?

Based on the medicinal applications in the Westhoff catalogue, we expected to detect historical changes and regional variation in CMM use. By analysing the patterns and frequency of the health issues mentioned in this handwritten source, we speculated on TCM practice in Indonesia in the late 19th century. We hope that our analysis gives more insight into the historical use of Chinese *materia medica* and the changes and variations that have occurred over time and space. Furthermore, the information obtained can be utilized to validate the modern Chinese medicine practice.

Materials and methods

The Westhoff catalogue is preserved as a handwritten table on paper, kept together with the boxes of Chinese *materia medica* in glass bottles by the Utrecht University Museum in Utrecht, the Netherlands. The catalogue had been digitized earlier by the museum, and TIFF images of partially separate records had previously been added to photographs of the corresponding CMM specimens in glass bottles in a digitized document.

The Dutch handwritten texts were transcribed into a spreadsheet and subsequently translated into English, as literally as possible. The Dutch phonetic transcription of the Chinese name of the material objects was transcribed, and the Chinese characters were typed. The

identification of the botanical, animal, and mineral ingredients was already carried out during our previous study of this collection (Jia et al., 2021).

We compared the style and features of Dr. Westhoff's handwriting in the transaction letter of the CMM collection, reported in our previous study (Jia et al., 2021) with the catalogue of this collection. We compared the diseases recorded in the handwritten catalogue with those mentioned for the same CMM ingredients referenced in the 2015 edition of the Chinese Pharmacopoeia (ChP 2015) (Chinese Pharmacopoeia Commission, 2015). For those medicinal products in the Westhoff collection that were not included in the ChP 2015, we searched for corresponding indications in other CMM monographs (World Health Organization, 2007; Zhao, G. et al., 2006; Zhonghua Bencao Edit Committee, 1999). In order to evaluate the correspondence with contemporary uses of the medicinal indication in Westhoff catalogue, defined as the correspondence with the ChP 2015, we have established the following criteria: 1) the indications in Westhoff catalogue match completely or partially with at least one of the indications in the ChP 2015 or other modern works on TCM; 2) the words used to describe the indications in the catalogue are different, but the meaning of indications appears the same.

The complete transcriptions and translation of the handwritten catalogue are listed in Appendix 1, with scientific names, natural origins and product identifications, preparations and applications. For the current scientific names of plant products, we followed the Plants of the World Online (https://powo.science.kew.org/), and for animals the Global Biodiversity Information Facility (https://www.gbif.org/).

Results and discussion

1. General description of the handwritten catalogue of the Westhoff collection

The entire catalogue of the Westhoff collection comprises 436 entries for separate CMM specimens. Each entry contained abundant information in a fixed format. Figure 3.1 shows one entry selected from the handwritten catalogue, along with its transcription and English translation. The entry begins with a serial number (which is not present on the label of the glass bottle with the corresponding specimen), followed by the Chinese name of the *materia medica* represented by the specimen, the Dutch phonetic transcription of the Chinese name, a note whether the specimen belongs to the plant kingdom, the animal kingdom or whether it is a mineral, and type of plant, animal or mineral that produces the drug. The last part of the entry is the drug's medicinal use, which starts with its medicinal part, followed by the preparation method and indication or disease(s) for which it is used. In Appendix 1, we listed the serial numbers, the Chinese names, scientific names, pharmaceutical names, mineral or biological origins, the translated preparation methods and medical applications, and whether these are similar or different from the Chinese Pharmacopoeia 2015 edition or other

published CMM monographs (Zhao, G. et al., 2006; Zhonghua Bencao Edit Committee, 1999).

It is worth noting that the Dutch transcription of the Chinese names for the *materia medica* is based on the Cantonese or Minnan pronunciation. This suggests that either the Westhoff collection or the Chinese physician who compiled this catalogue originated from southeast China, which is consistent with our previous conclusion (Jia et al., 2021).

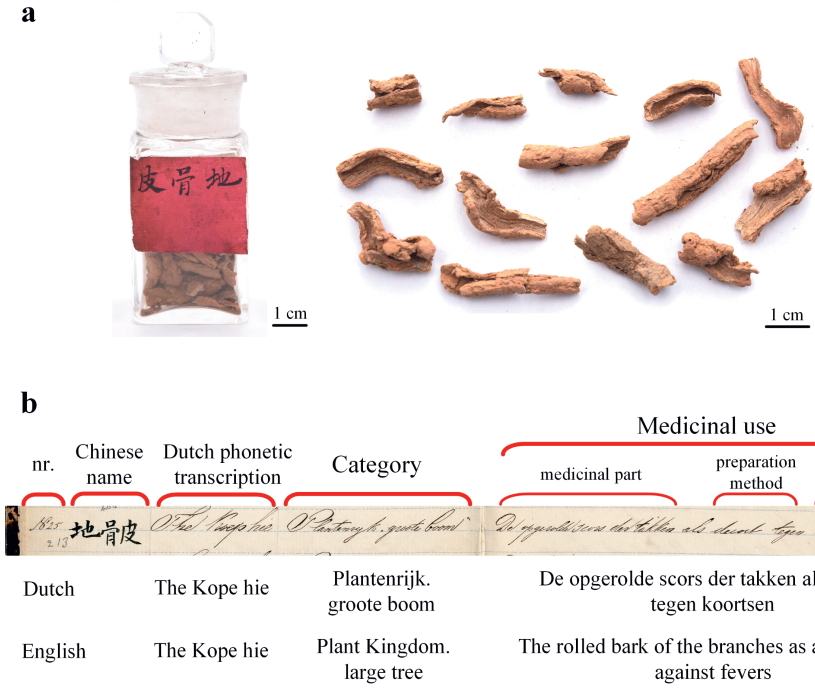


Figure 3.1 Specimen (a) and entry (b) of *Lycium chinense* Mill. in the Westhoff collection. The Dutch transcription and English translation are attached to the entry.

The handwritten catalogue consists of a total of 436 entries. The Westhoff CMM collection contains 395 specimens preserved in glass bottles, suggesting that 41 CMM specimens are no longer retained in the collection. Some of these CMM specimens were separated from the collection in the past due to damage to the glass bottles, but the remaining specimens were lost over the course of c. 150 years.

2. Medicinal preparation methods

All entries were analyzed for their preparation methods (Figure 3.2). The majority of the entries, which accounts for approximately 79% (346 out of 436), mention that the material should be taken in the form of a decoction. In the clinical practices of traditional Chinese medicine today, the practitioner usually prescribes multiple herbs to combine into one formula, instead of a single-species medicine (Jia et al., 2004; Qiu, 2007). Decoction of multiple herbs based on TCM formulae is the most important and most commonly used method, and more than 100,000 TCM formulae have been accumulated over the past 2000 years (Qiu, 2007).

Topical application was the second most frequent preparation method, with 46 entries (11%), most drugs were used in powdered form for open wounds and skin diseases (e.g., scabies, sore or itchy skin), such as Realgar (main component As_2S_2, entry nr. 218). Powdered medicinal material was sprinkled on infected parts (e.g., Haematitum, main component Fe_2O_3, nr. 415) or blown on the body part, in the case of the powder prepared from the leaf or stem of *Baphicacanthus cusia* (Nees) Bremek. or *Polygonum tinctorium* Ait or *Isatis tinctoria* L. (entry nr. 427). Powdered Calamina (main component $ZnCO_3$, nr. 429) was dissolved in water as an eyewash solution or eyedrops against eye disease. Only a few drugs were inhaled through the nose, such as the powdered fruit of *Gleditsia sinensis* Lam. (nr. 392) and the powdered flower of *Rhododendron molle* G.Don (nr. 400).

In the Westhoff catalogue, infusions were not often mentioned, comprising only 20 entries (approximately 5%) (Figure 3.2). Exceptions were the fruits of *Illicium verum* Hook.f. (nr. 96) and fruit of *Foeniculum vulgare* Mill. (nr. 97), used to treat testicular pain. The infusions above are all recorded in modern CMM monographs (ChP 2015, Zhao, G. et al., 2006; Zhonghua Bencao Edit Committee, 1999).

A total of 24 entries (approximately 5%) mentioned more than one application method, such as the intake of a decoction and a topical application, direct oral intake, fumigation or lacked specific preparation methods (Figure 3.2).

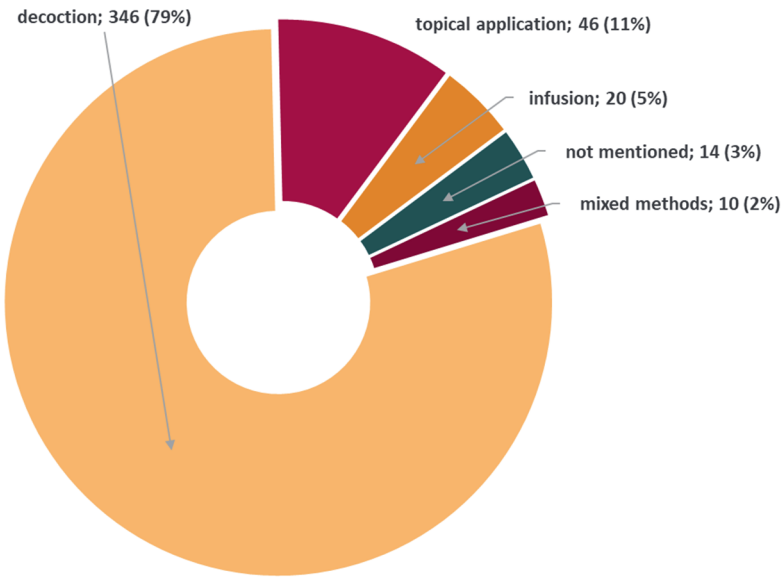


Figure 3.2 Proportion of preparation methods mentioned in the 436 entries in the handwritten catalogue of the Westhoff collection.

3. Medical applications

A valuable aspect of the Westhoff catalogue is that for each drug the medical indications and health issues are documented in detail. Most of the entries (79%) in the catalogue mention only one medical indication, and there are only a few multi-purpose medicines (Table 3.1).

Table 3.1 Versatility of medical applications per CMM entry in the Westhoff catalogue.

Number of health issues mentioned in each entry	Number of entries
1	343
2	79
3	7
4	1
not mentioned	6
Total number of entries	436

Among the 436 entries, there were a total of 526 mentions of diseases or health conditions. Fever was the most predominant indication of all drugs, with 49 entries recorded as appropriate medicines for fever treatment (Figure 3.3). These entries do not represent 49 taxonomically different CMM objects; the bark of *Phellodendron chinense* C.K.Schneid. was processed with salt in entry nr. 137, while the same bark was carbonized in entry nr. 292. From the perspective of TCM, these two are different drugs, as the processing method is not the same.

Fever is a common symptom of many diseases, such as parasitical, bacterial and viral infections, as well as neurologic injury and immune-mediated processes (Hines, 2021). Fever as a disease instead of a symptom has been documented from the beginning of recorded history (Moltz, 1993). Among the medicines listed in the Westhoff catalogue, 49 are documented as having fever-treating properties based on the handwritten records, while contemporary CMM treatises note that 53 of them possess properties that relieve fever. (ChP 2015; Zhao, G. et al., 2006; Zhonghua Bencao Edit Committee, 1999). This indicates that fever, either as a disease or symptom, has always been a major health concern addressed by traditional Chinese medicine, whether it was in the 19th century or now.

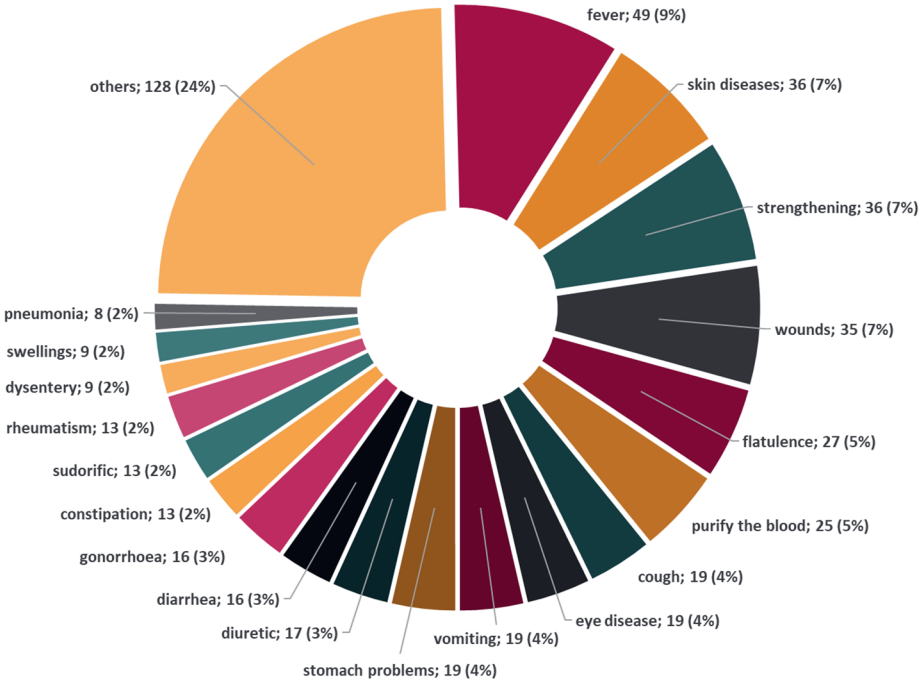


Figure 3.3 Proportion of corresponding medical indications according to the 436 entries in the Westhoff catalogue.

Indications related to skin diseases appeared 36 times in the catalogue. As one of the most common human illnesses (Hay et al., 2014), it is not surprising that skin diseases also occupy an important place in the catalogue of the Westhoff collection. Strengthening, another regular application in the catalogue, is not a frequently used health issue in Western medicine. In traditional Chinese medicine, however, strengthening is a fully recognized term. TCM aims to correct maladjustments and restore the self-regulatory ability of the body, and not solely to antagonize specific pathogenetic targets (Jiang, 2005). So *materia medica* applied within TCM is not only used to inhibit or kill pathogens but also to improve and enhance the body's resilience to adapt to environmental changes and prevent pathogen attacks. This theory is reflected in the catalogue of the Westhoff collection, which merely uses the word strengthening rather than specific symptoms.

The indication of flatulence is also repeatedly referenced, a medical condition characterized by excessive accumulation of air or gas in the stomach or intestines (Price et al., 1988). The corresponding Dutch words in the Westhoff catalogue are "winden" and "winderigheid", both of which have the meaning of flatulence. Meanwhile, "winden" also means "winds", which refers to the natural movement of the air. When comparing the 27 drugs recorded as against flatulence to their medical use in modern CMM books, none of them has the effect of treating flatulence. Instead, 24 of 27 drugs have the ability to dispel "wind" and/or to move "*qi*".

"Wind" in traditional Chinese medicine is an abstract concept of a disease pattern or pathogen. The ancient Chinese observed six different environmental conditions: wind, cold, summer heat, dampness, dryness and fire. When these environmental conditions cause sickness, they refer to six excesses or six climatic pathogenic factors (Wiseman and Ellis, 1996; World Health Organization, 2007). "Wind" as a pathogenic factor can be distinguished as external and internal wind. External wind causes disorders by the meteorologic phenomenon of wind entering the body, resulting in fever, aversion to wind, headache and facial paralysis. Internal wind arises from within the body, for instance, extreme heat engendering wind, which manifests in reversal and convulsion in the limbs (Wiseman and Ellis, 1996; Xie, 2003). The Chinese term "*qi*" can be literally translated as air or gas. The ancient Chinese believed that "*qi*" was the basic element that constituted the cosmos and, through its movements, changes and transformations, and produced everything in the world, including the human body and life activities. In the context of traditional Chinese medicine, "*qi*" refers both to the refined nutritive substance that flows within the human body and to its functional activities (Wiseman and Ellis, 1996; World Health Organization, 2007). "*Qi*" flows smoothly through the whole body under normal circumstances, but if its dynamic is disturbed, the result is a disorder known as "*qi*" stagnation. This is when medication with "*qi* moving effect" is given to restore the balance of the body.

By comparing the medicinal actions and indications in the Westhoff catalogue with the corresponding information in modern CMM treaties, it seems that there has been a

misinterpretation by the Dutch author, who confused the physical meaning of gas or air with the traditional Chinese medicine concepts of "*qi*" and "wind". It is also possible that the Chinese doctor has tried to translate the term "*qi*" and "wind" to the Dutch author, but failed to convey the complexity of the concept.

The catalogue mentions recipes to "purify the blood" a total of 25 times. Possibly, the name of the medical indication that needed the blood to be purified was simplified or its connotation was lost during the translation by the author of the catalogue. Most herbal drugs (24 out of 25 entries) prescribed to purify the blood are said to have the ability of promoting blood circulation and removing blood stasis properties, as well as relieve (arthralgic) pain, regulate menstruation, heal wounds and relieve swelling (ChP 2015; Zhonghua Bencao Edit Committee, 1999). Nowadays, some of these ingredients are classified as blood-invigorating and stasis-dissolving medicines in traditional Chinese medicine (Teng, 2019). The need to purify the blood is also a frequently occurring concept in other traditional health care systems. Recipes to clean the blood are mentioned in historical documents from Sri Lanka (van Andel et al., 2018), and are still popular in African and the Caribbean (van Andel et al., 2012).

We have also observed that eye diseases are mentioned 19 times in the catalogue. Could it be that because Dr. Westhoff was an ophthalmologist, he was familiar with and interested in diseases related to eye? While the indications and efficacies of several ingredients include both oculopathy but also other diseases, the catalogue focused on the use for eye disease rather than for other medical applications, even if these were known at the time. For example, the fruits of *Leonurus japonicus* Houtt. (nr. 107) are prescribed for red eyes and nebula, but have also been used since the 2nd century AD for menstrual irregularities, dizziness, headache, and distention in the head (ChP 2015; Zhonghua Bencao Edit Committee, 1999), while these ailments are not mentioned in the catalogue. Additionally, the catalogue gives more details about some of eye diseases. For instance, a decoction of the seeds of *Celosia argentea* L. (nr. 101) is prescribed "against eye disease, especially when there is a veil in front of the iris" and the powder of the abalone shell (*Haliotis* sp., nr. 103) is stated as a remedy "against eye disease, especially when eyesight is weakened by age". The typical focus on eye diseases seems to indicate that the Chinese practitioner was aware of Westhoff's specialization and emphasized herbal remedies for eye diseases or that Westhoff specifically asked for such recipes.

4. Consistency between the catalogue and modern Chinese pharmacopeias

As we hypothesized before (Jia et al., 2021), the Westhoff collection and the associated catalogue seem to be compiled based on the knowledge and experiences of a TCM physician or merchant in Chinese medicine in Indonesia during the latter half of the 19th century. To what extent did the diseases and medical applications mentioned in the catalogue match the official Chinese Pharmacopeia or other classical works on Chinese *materia medica*?

The late 19th century Dutch terminology of diseases and health conditions differed substantially from the descriptions in the ChP 2015. However, many of the symptoms, diseases and applications mentioned in the catalogue had a similar meaning, even if using different words and expressions. The majority of the medicinal indications (339, accounting for 78%) in the catalogue matched with at least one of the definitions of symptoms and medicinal applications in the modern TCM literature (Figure 3.4). Considering that the knowledge documented in the catalogue could have come from a TCM physician or a Chinese medicine merchant, such a high similarity rate suggests that this person was very knowledgeable on both the ingredients and the application of traditional Chinese medicine.

A small proportion (53, accounting for 12%) of the medicinal indications did not match with any of the applications for the same drug mentioned in the pharmacopeias. We assume that the few inconsistencies between the catalogue records and the Chinese pharmacopeias were either caused by mistranslations from Chinese to Dutch or by regional differences in medicinal practices or personal preferences of the Chinese doctor by whom the collection of *materia medica* was compiled. This 12% does not exclude mismatches due to misunderstanding of the abstract TCM concepts.

Six of the 18 unidentified drugs were multi-component mixtures, whose indications could not be determined without further information on the CMM ingredients and therefore consistency with pharmacopeias could not be established.

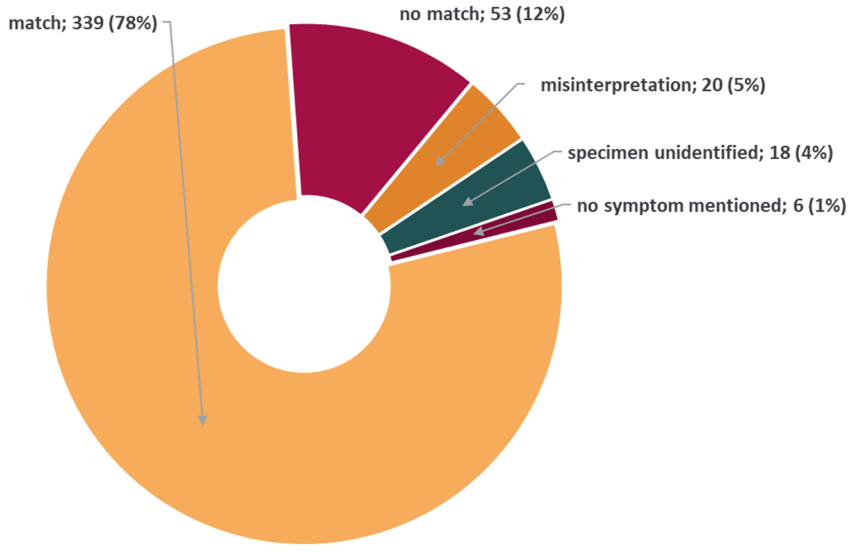


Figure 3.4 Consistency of medicinal application between the Westhoff catalogue and the modern Chinese pharmacopeia for identical natural ingredients.

5. Information beyond the medicinal actions and indications

The information contained in the catalogue of the Westhoff collection is not limited to ingredients, preparation methods and diseases, but also sheds light on typical characteristics of popular medicine, their geographic origin and social aspects. We illustrate this with such examples as licorice, ginseng and several mineral substances.

Licorice root, a drug with the pharmaceutical name Glycyrrhizae Radix et Rhizoma, is used for three different species: *Glycyrrhiza uralensis* Fisch. ex DC., *G. inflata* Batalin and *G. glabra* L. (ChP 2015). Licorice root is the most frequently-used herbal product in China. In the catalogue of the Westhoff collection, licorice root was mentioned in three different entries (nrs. 112, 205 and 237) that differed in processing methods and application (Figure 3.5).

Entry nr. 112 粉甘草 (fen gan cao) mentioned the removal of the bark of the licorice root. In this entry, no medicinal use or symptom is mentioned. The recipe just says it should be mixed with other herbal ingredients to alter its taste. Additionally, apart from acting as a flavoring agent, licorice root also possesses the ability to harmonize the actions of the other ingredients in traditional Chinese medicine theory (Jia et al., 2004). Modern research has demonstrated its effectiveness in enhancing the efficacy of other ingredients or reducing their toxicity (Wang et al., 2013). Just like in the Westhoff catalogue, historical TCM formulae also use debarked licorice roots (e.g., formula from *Complete works of jing yue* by Zhang Jiebin in c. 1640 AD).

One of the important characteristics of licorice root is described in a general and precise manner in the catalogue. Entry nr. 205 甘草梢 (gan cao shao) refers to licorice root tips and twigs of the plant, while entry nr. 237 甘草粉 (gan cao fen) describes powdered licorice root. Both recipes and their indications match exactly with the information in the modern Chinese pharmacopeias, which indicates the correspondence with contemporary uses of this catalogue. The specific species of licorice root, however, does not become clear from the catalogue. *G. glabra* is native to both China and Europe, while *G. uralensis* and *G. inflata* can be found in China but not in Europe (https://powo.science.kew.org). According to Xie (2008), *G. uralensis* is the authentic species of licorice root in TCM since the 2nd century BC, but *G. inflata* and *G. glabra* (known as European licorice in Chinese) have been increasingly used in the past 30 years due to the shortage of *G. uralensis*.

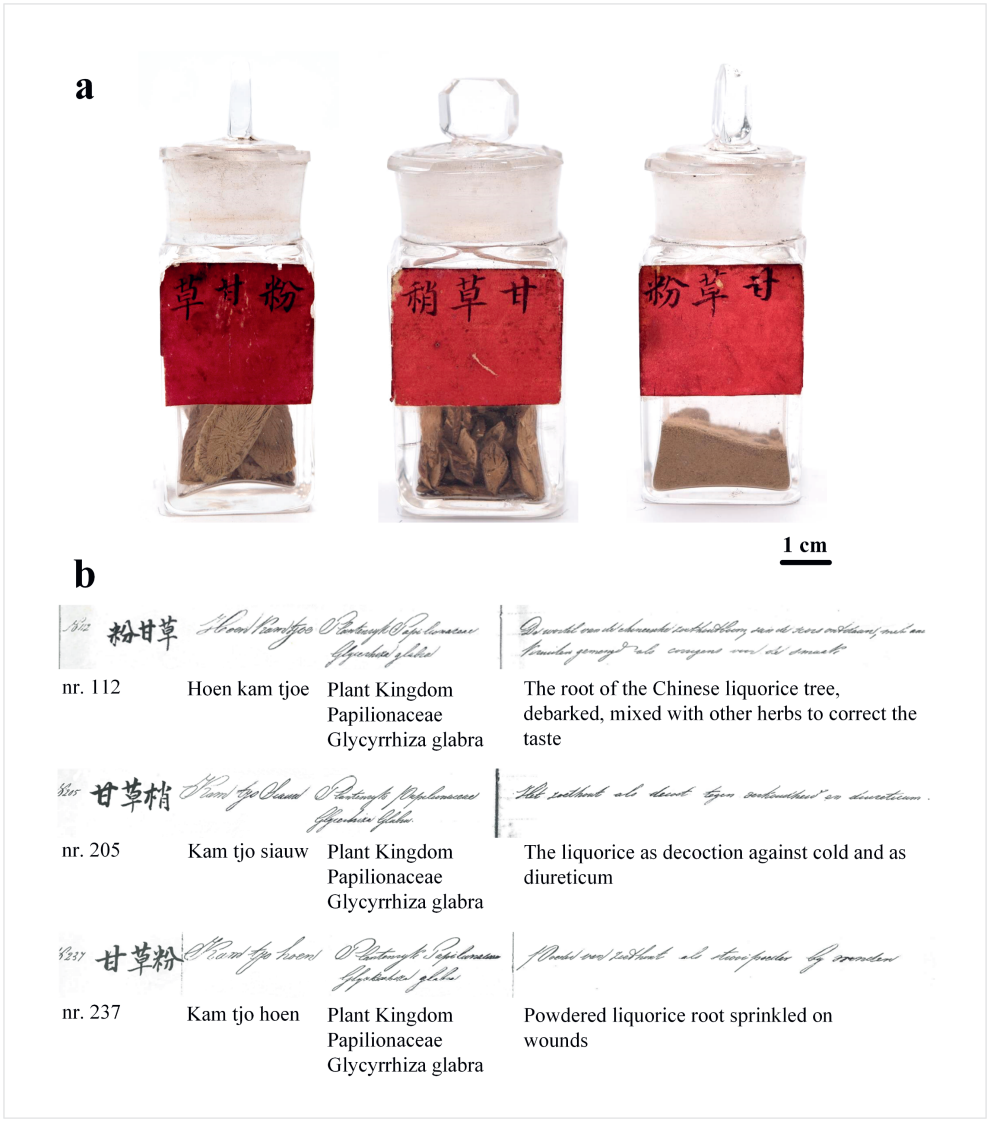
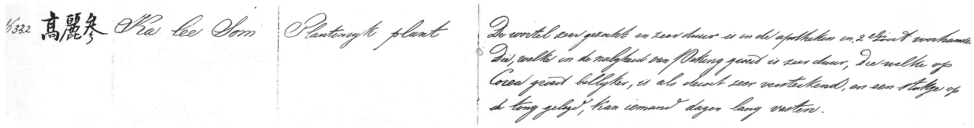


Figure 3.5 The specimens (a) and entries (b) on licorice root in the Westhoff collection, with their English translations. (a) from left to right: the debarked root, root tips and powdered root, with their corresponding entries (b), from top to bottom.

Ginseng root (*Panax ginseng* C.A.Mey.) is one of the most popular Chinese *materia medica* worldwide (Ernst, 2002; Xu et al., 2017). In the catalogue of the Westhoff collection, extra information is devoted to it (Figure 3.6). The entry gives a vivid description to illustrate the medicinal effects of ginseng, together with its geographic distribution and authenticity details of this product.



nr. 332	Ka lee som	Plant Kingdom herb	The root is very popular and very expensive in the apothecaries, a second species is available, which grows around Beijing, and is very expensive, the one growing in Korea is cheaper, as decoction very much strengthening, and with a piece on the tongue, a person can go without food for days.

Figure 3.6 Entry of the catalogue of the Westhoff collection on ginseng (nr. 332) with the English translation.

The entry confirms that there are different species of ginseng that differ in price and are sourced in either China or Korea. Unmistakably, the area near Beijing refers to the Shangdang area, which is historically famous for the high-quality production of ginseng roots (Xie, 2008). 'Korea' as mentioned here, implies the current country of North and South Korea and the neighboring northeastern region of China.

Many historical works on traditional Chinese and Japanese medicine mention that the Shangdang region produced better-quality ginseng (Xie, 2008; Zhonghua Bencao Edit Committee, 1999). However, from the 15th century onwards, due to the destruction of the local forests, the Shangdang region was no longer suitable for ginseng collection, as natural resources had been depleted (Xie, 2008). Therefore, some arguments questioning Shangdang as the authentic production region for ginseng have recently emerged (Peng, 2011; Xie, 2008). The catalogue of the Westhoff collection still supported the viewpoint that top-quality ginseng should come from Shangdang. In addition, this handwritten record also specified the method of verifying the authenticity of the ginseng: "With a piece on the tongue, a person can go without food for days". A similar verifying method was reported by Su Song (1061 AD) in his book *Ben cao tu jing* (*Illustrated Classics of materia medica*).

The 'minerals' Borneolum (nr. 293) and Camphora (nr. 348) are both included in the Westhoff collection of CMM and mentioned in the catalogue. Borneolum or natural Borneol ($C_{10}H_{18}O$) is the crystal produced from the fresh branches and leaves of *Dryobalanops aromatica* C.F.Gaertn. The handwritten text mentions that "Borneolum is very popular and expensive". *D. aromatica* is a tree native to west Malesia and therefore Borneolum can only be obtained by import (Zhonghua Bencao Edit Committee, 1999). The earliest written record of Borneolum is found in the *Newly revised materia medica* (Su Jing, 659 AD). The name "dragon brain" was given to Borneolum because of its rarity and preciousness (Zhonghua Bencao Edit Committee, 1999).

Natural camphor ($C_{10}H_{16}O$) is produced from the branches and leaves of *Cinnamomum camphora* (L.) J.Presl by steam distillation (Zhonghua Bencao Edit Committee, 1999). Trees of this species are widely distributed in southern China, and this is why the catalogue

mentions that "Camphora is cheap". In order to meet the growing demand for Borneolum, China began to look for alternative sources in 1980s, rather than relying solely on imports. Around 2000, China succeeded in producing Borneolum from *C. camphora*. As a result, *C. camphora* has been included as source of Borneolum since 2005 (ChP 2005), so both substances now are produced from the same tree (Li et al., 2013).

Another interesting entry in the catalogue is cockscomb, the capitulum of *Celosia cristata* L. (nr. 16). Apart from the medicinal indication against leucorrhea, it states that the flowers on Java are often cultivated by "rich Chinese". *C. cristata* is indeed widely cultivated as a garden ornamental in China (Bao et al., 2003). It is associated with religious significance and ancestor worship by Indian, Burmese and Chinese people, who still plant cockscomb around their temple and in their gardens (Grant, 1954). The catalogue confirms that Chinese immigrants in the late 19th century had brought the tradition of cultivating cockscomb to Indonesia as well.

6. Who wrote the catalogue of the Westhoff collection?

The transaction letter of the Westhoff collection has quite different handwriting than the catalogue accompanying this collection (Figure 3.7). Therefore, we conclude that the catalogue was not written by Dr. Westhoff himself.

The catalogue may have been written by a Dutch clerk, maybe Westhoff's secretary. The Dutch text is written with a dip pen, while the Chinese words are written with a calligraphy brush. Moreover, to adapt to the Dutch writing habits (from left to right) and to keep the catalogue in a uniform format, the traditional Chinese writing direction was changed. Vertical columns written from right to left were replaced by horizontal lines written from left to right. Both the handwritten Dutch and Chinese texts in the catalogue are beautiful and neat. All these facts indicate that the catalogue must be compiled jointly by a Dutch and a Chinese person.

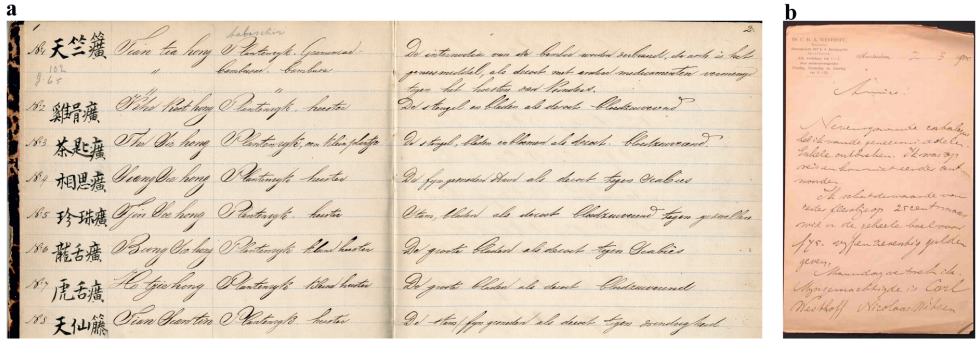


Figure 3.7 (a) section of Westhoff collection catalogue. (b) letter by Dr. Westhoff (dated 1900) on the transaction of the CMM collection. Source: Utrecht University Museum.

Conclusion

The Westhoff collection with nearly 400 specimens and even more medicinal recipes in the handwritten catalogue shows that an extensive and significant communication has taken place between two educated persons from the East and the West on the subject of traditional Chinese medicine in the late 19th century. There were language barriers, differences and misunderstandings of health concepts in Chinese and Western medicine. Still, more than 400 samples of Chinese *materia medica*, a wealth of information on their origin, medicinal parts, preparation method, application, and background knowledge have been recorded in a systematic way. The Dutch writer and the Chinese practitioner must have spent many hours together, meticulously organizing and discussing the CMM collection, its names, contents and uses. The catalogue shows a sincere interest in, and respect for traditional Chinese medicine from a Western-trained professional, but also a clear willingness to share information from the Chinese specialist.

This Westhoff collection, together with its catalogue, can be seen as a time capsule that has been preserved for over 150 years. It is not a perfect, but nevertheless a valuable record of Chinese *materia medica* and its practice in a specific time and space. Moreover, it provides strong evidence that traditional Chinese medicine, by the virtue of its unique charms, spread not only in East Asia but also could count on serious, professional interest from the distant Western world.

Declaration of competing interest

The authors declare that they have no conflicts of interest relevant to the publication of this document.

Acknowledgements

This research was supported by the “Single Cell Foundation”.

Appendix A. Supplement data

Supplementary data to this article can be found online at
https://doi.org/10.1016/j.jep.2023.116987

References

Bao, B., Clemants, S.E., Borsch, T., 2003. Flora of China, in: Wu, Z., Raven, P.H. (Eds.), Science Press & Missouri Botanical Garden Press, Beijing & St. Louis, pp. 425-429.

Brand, E., Leon, C., Nesbitt, M., Guo, P., Huang, R., Chen, H., Liang, L., Zhao, Z., 2017. Economic botany collections: a source of material evidence for exploring historical changes in Chinese medicinal materials. J. Ethnopharmacol. 200, 209-227.

Chinese Pharmacopoeia Commission, 2015. Pharmacopoeia of the People's Republic of China, 2015 ed. China Medical Science Press, Beijing.

Ernst, E., 2002. The risk–benefit profile of commonly used herbal therapies: Ginkgo, St. John's Wort, Ginseng, Echinacea, Saw Palmetto, and Kava. Ann. Intern. Med. 136(1), 42-53.

Grant, W.F., 1954. A cytological study of Celosia argentea, C. argentea var. cristata, and their hybrids. Bot. Gaz. 115(4), 323-336.

Hay, R.J., Johns, N.E., Williams, H.C., Bolliger, I.W., Dellavalle, R.P., Margolis, D.J., Marks, R., Naldi, L., Weinstock, M.A., Wulf, S.K., 2014. The global burden of skin disease in 2010: an analysis of the prevalence and impact of skin conditions. J. Invest. Dermatol. 134(6), 1527-1534.

Hines, C. B., 2021. Herbal medications used to treat fever. Nurs. Clin. N. Am. 56(1), 91-107.

Jia, W., Gao, W., Yan, Y., Wang, J., Xu, Z., Zheng, W., Xiao, P., 2004. The rediscovery of ancient Chinese herbal formulas. Phytother. Res. 18(8), 681-686.

Jia, Y., Lei, L., Luo, X., Zhao, Z., Wang, M., van Andel, T., 2021. Analysis of historical changes in traditional Chinese medicine based on an Indonesian collection of Chinese materia medica from c. 1870. J. Ethnopharmacol. 269, 113714.

Jia, Y., Wang, M., van Andel, T., 2022. Revisiting traditional Chinese materia medica from European historical collections and perspective for current use. J. Tradit. Complement. Med. 12(2), 206-216.

Jiang, W.Y., 2005. Therapeutic wisdom in traditional Chinese medicine: a perspective from modern science. Trends Pharmacol. Sci. 26(11), 558-563.

Li, J., Hu, S., Li, H., 2013. Types of Chinese medicine Borneolum and its historical origins. Mod. Chin. Med. 15(6), 531-534.

Moltz, H., 1993. Fever: causes and consequences. Neurosci. Biobehav. Rev. 17(3), 237-269.

Peng, C., 2011. Zhonghua Daodi Yaocai. China Press of Traditional Chinese Medicine Co. Ltd, Beijing.

Price, K., Lewis, J., Wyatt, G., Fenwick, G., 1988. Review article Flatulence—Causes, relation to diet and remedies. Food/Nahrung 32(6), 609-626.

Qiu, J., 2007. Traditional medicine: a culture in the balance. Nature 448(7150), 126-129.

Teng, J., 2019. Chinese Materia Medica 2ed. People's Medical Publishing House, Beijing.

van Andel, T., Mitchell, S., Volpato, G., Vandebroek, I., Swier, J., Ruysschaert, S., Rentería Jiménez, C., Raes, N., 2012. In search of the perfect aphrodisiac: Parallel use of bitter tonics in West Africa and the Caribbean. J. Ethnopharmacol. 143(3), 840-850.

van Andel, T., Scholman, A., Beumer, M., 2018. Icones plantarum malabaricarum: early 18th century botanical drawings of medicinal plants from colonial Ceylon. J. Ethnopharmacol. 222, 11-20.

Wang, X., Zhang, H., Chen, L., Shan, L., Fan, G., Gao, X., 2013. Liquorice, a unique “guide drug” of traditional Chinese medicine: a review of its role in drug interactions. J. Ethnopharmacol. 150(3), 781-790.

Wiseman, N., Ellis, A., 1996. Fundamentals of Chinese medicine. Paradigm publications, Brookline.

World Health Organization, 2007. WHO international standard terminologies on traditional medicine in the western pacific region. WHO Regional Office for the Western Pacific. https://apps.who.int/iris/handle/10665/206952

Xie, Z., 2003. On standard nomenclature of basic Chinese medical terms (IV). Chin. J. Integr. Med. 9(2), 148-151.

Xie, Z., 2008. Chinese Medicinal Varieties: Theory and Use. People's Medical Publishing House, Beijing.

Xu, W., Choi, H.K., Huang, L., 2017. State of Panax ginseng research: A global analysis. Molecules 22(9), 1518.

Zhao, G., Dai, S., Chen, R., 2006. Dictionary of Chinese traditional medicine (Zhong Yao Da Ci Dian). Shanghai Scientific & Technical Publishers, Shanghai.

Zhao, Z., Yuen, J.P., Wu, J., Yu, T., Huang, W., 2006. A systematic study on confused species of Chinese materia medica in the Hong Kong market. Ann. Acad. Med. Singap. 35(11), 764.

Zhonghua Bencao Edit Committee, 1999. Zhonghua Bencao. Shanghai Scientific & Technical Publishers, Shanghai.