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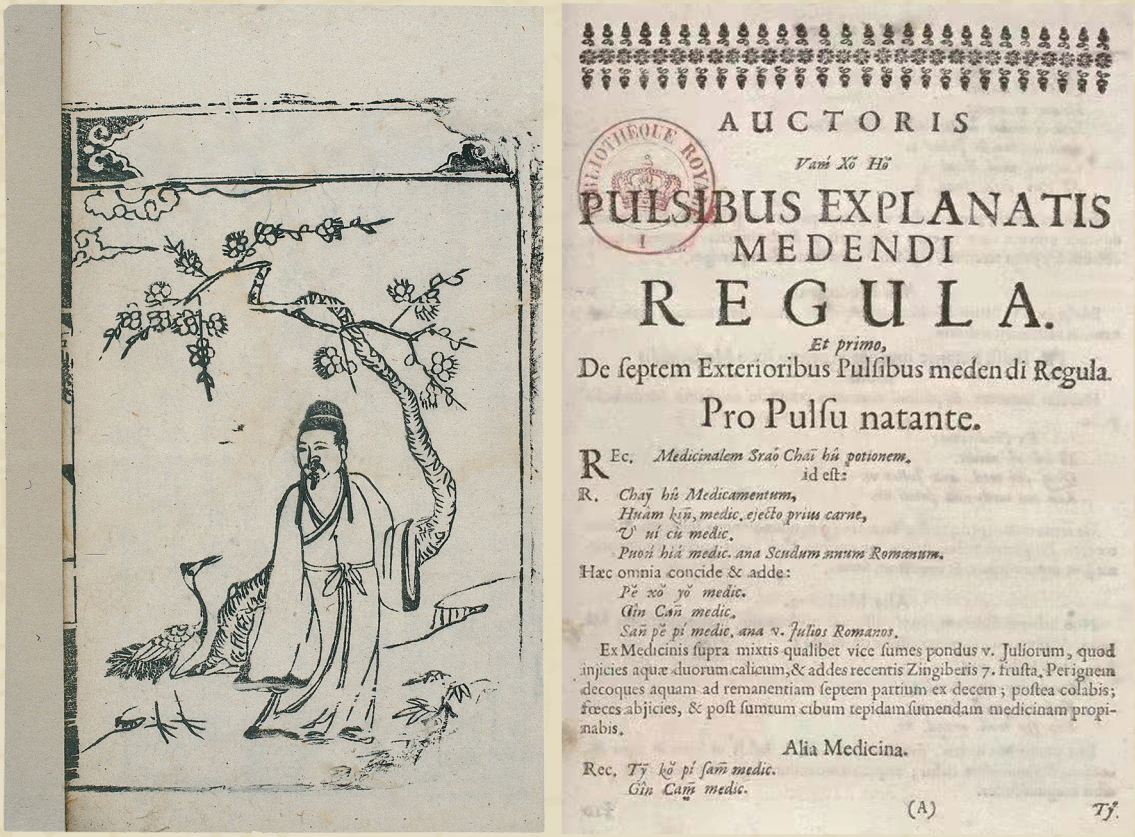

Portrait of Wang Ji from the 1633 edition of *Wang Shishan Yi Shu Ba Zhong* (《汪石山医书八种》 *Collections of Medical Books by Wang Shishan*) and the chapter "Medendi Regula" (Method of Healing) in the 1682 edition of the *Specimen Medicinae Sinicae* (*A Sample of Chinese Medicine*)

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CHINESE 中医药文化 MEDICINE AND CULTURE

OPEN

Epistemic Genres as a Conceptual Tool in the History of Chinese Medicine

Marta Hanson✉

Abstract

This article summarizes the collaboration between two historians of medicine on Sino-European medical exchanges. Gianna Pomata researches the history of medicine in early modern Europe and Marta Hanson researches the history of medicine in early modern China. The following covers the concept of epistemic genres that Pomata first developed out of her research on the history of the genres *historia, observationes,* recipes, medical cases, and the commentary in Europe. She connected these genres variously to empiricism, erudition, scientific observation, norm-making, and recording practice. The paper then evaluates how Pomata and Hanson used epistemic genres as a method for doing cross-cultural research on 17th–18th-century Sino-European medical exchanges. Pomata then wrote a comparative history of the medical case in Europe and China. The article concludes with how Hanson applied the distinction of epistemic genres to analyze the history of Chinese medicine from a new perspective.

Keywords: Case; Commentary; Comparative medical history; Cross-cultural medical history; Epistemic genre; Recipe

1 Introduction

What differentiates literary types of narrative genres from epistemic ones? Surprisingly, no one had asked this question until Gianna Pomata began publishing on the issue in the early 2000s. She wrote about it from the perspective of a medical historian engaged with both literary studies and the history of science. She was most concerned with how to differentiate the types of genres aligned with scientific practices such as "the treatise, the lecture, the commentary, the encyclopedia, the textbook; but also, less obviously, the aphorism, the dialogue, the essay, the medical recipe, the case history."[1]

First, she asked how literary scholars have understood genres as the most fundamental narrative forms within which people both formulate their thoughts and read about other's thoughts. She pointed out as well that genre categories are significantly both emic (i.e., what contemporary readers and writers used to differentiate literary practices) and etic (i.e., what later literary scholars and historians use to describe and analyze various literary practices of the past and present) (Note 1).

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Then, she addressed what makes some genres literary, others didactic, and still others epistemic. Related to this concern, she proposed "epistemic genre" as a new general term for the types of genres that authors self-consciously used for new knowledge.[2] Epistemic genres thus were those genres that were "deliberately cognitive in purpose."[1] Through her inquiries she helped clarify "epistemic genres" as an analytical concept that could be used, as she originally had also articulated, as "tools for the cultural history of knowledge."[1] Using the concept of epistemic genres as a conceptual tool for doing both the history of knowledge and cross-cultural history of medicine has been productive in our collaborative research. I have found it just as illuminating to reexamine the two-millennium history of the Chinese medical archive itself.

2 Epistemic genres and the medical case

2.1 Distinguishing epistemic genres

For 10 years (2009–2019), Gianna Pomata and I had the great fortune to work in the same Department of the History of Medicine at Johns Hopkins University. Before coming to Johns Hopkins, she had published a monograph on the relationship between the law and medicine in early modern Italy in *Contracting a Cure: Patients, Healers, and the Law in Early Modern Bologna* (1994),[3] which gave her a foundation in seeing narrative similarities between legal and medical cases. She had also started her collaboration with historian of science Lorraine Daston on the various interpretations and representations of Nature in their co-edited book on The Faces of Nature in Enlightenment Europe (2003).[4] Related to this collaboration, she published a series of essays on the history of scientific observation and related genres in the early 2010s, which will be introduced shortly. Another important collaborator was historian of medicine Nancy

Siraisi. Pomata also co-edited *Historia: Empiricism and Erudition in Early Modern Europe* (2005)[5] with Siraisi, which focused on the history of *historia* (generally meaning inquiry, which can be indifferently on natural or human phenomena) as an epistemic genre.

In early modern Europe, *historia* covered the domains of both natural history and civil history, thus straddling the western present-day distinction between the natural and social sciences. The genre called *historia* in early modern Europe, they argued, was a type of epistemic genre in that it contained a descriptive method that connected the study of nature as well as culture with that of the epistemic values of empiricism and erudition.

2.2 History of medical cases in China

During the same decade, some historians and literary scholars also used a comparable analytical method. They focused on the Chinese emic term *yi'an* (医案 medical case records) as a distinct genre with a unique history in Chinese medicine. I had published a short essay on 16th-century medical publishing that mentioned medical cases as a new genre among others.[6] It was Christopher Cullen, however, who wrote the first historical analysis of the origins and development of medical case records over the long duration of Chinese history.[7] Although Cullen had previously published an article using medical cases as integrated into the narrative of the famous 16th-century novel *The Plum in the Golden Vase*,[8] he explicitly cited as his predecessors, historians of China who worked with medical texts—Charlotte Furth,[9] Francesca Bray,[10] and Joanna Grant.[11] These scholars had been working specifically with Chinese medical case records to access issues not only about how medicine was practiced but also how such sources provided a lens into gendered understandings as well as experiences of illness and treatment. For example, Cullen identified the 1531 edition of *Shi Shan Yi An* (《石山医案》 *Medical Cases of Shi Shan*) of Wang Shishan (aka Wang Ji, 汪机) published by his disciple Cheng Zeng (程曾) as the first collection of the medical cases of a single physician that used *yi an* to designate the genre. Joanna Grant ended up writing about how Wang Ji considered male and female gender within his individual cases and how he used case records as evidence to situate his views within broader debates about therapeutic strategies. He thereby augmented his authority in the medical marketplace.[12] As if to tighten the connection between the individual physician and his medical cases, Cheng Zeng included a portrait of his teacher Wang Ji (Fig. 1).

In this portrait, Wang looks directly ahead, sits formally with a hat on, shows a serious expression, and keeps his hands tucked inside his sleeves. His pose resembles the ancestor portraits made during same the period. As such it visually communicates Wang's ancestral-like kinship vis-à-vis his student Cheng Zeng. Above the portrait is a rare example of an entirely different genre, the "self-eulogy" (zizan 自赞), that poetically describes the character of the man portrayed.

Within the same edited volume by Elisabeth Hsu on *Innovation in Chinese Medicine* within which Cullen had published his foundational essay on the Chinese history of case narratives, Bridie Andrews contributed an essay on the modernization of the medical case from the older

Figure 1 Image from the 1531 edition of *Shi Shan Yi An* (《石山医案》 *Medical Cases of Shi Shan*) in the rare book library of the China Academy of Chinese Medical Sciences

records to new histories in 20th-century China.[13] Anthropologists of Chinese medicine, Judith Farquhar[14] and Volker Scheid,[15] had also made particularly good use of both the genres of medical cases and formulas or recipes in their ethnographically rich books based on fieldwork during the 1980s and 1990s in Chinese medical schools, clinics, and hospitals, as both genres were by then often combined together.

2.3 Thinking in and with cases

Influenced by this scholarship both using Chinese medical case records and analysing the history of their changing form and contents, Charlotte Furth, Judith Zeitlin, and Ping-chen Hsiung also drew inspiration from John Forrester's highly influential 1996 article "If p, then what? Thinking in Cases." In this article, he argued that reasoning with cases (namely, thinking from the particular case to a general rule) should be considered a seventh "style of reasoning" added to Ian Hacking's original six (Note 2).[16] They organized a workshop focused on how the Chinese term for "cases" (an 案) could also be considered a specific genre term. They also analysed how it was used for thinking through things not just in medicine but also law, religion, and philosophy. Their edited volume was aptly titled *Thinking with Cases: Specialist Knowledge in Chinese Cultural History*.[17]

They broadly argued that the case genre in China not only structured a style of reasoning (for instance, as evidence in arguments) but also was inflected by culturally

specific assumptions (for instance, in different disciplines or at different times that encouraged more individual details or conversely valued conciseness). Judith Zeitlin's contribution, for example, demonstrated that the case genre was flexible enough for the 16-century literatus physician, Sun Yikui (孙一奎 ca. 1522–1619), to integrate a high literary style into his often entertaining medical stories as means to burnish his reputation and establish his medical authority among the lay elite.[18]

3 Observation and the medical case in Europe

3.1 Scientific observation in early modern Europe

Meanwhile just when Cullen, Furth, Bray, and Grant were publishing about gender and medicine in China using medical cases, Pomata was engaged with gender in the history of European medicine. She published, for example, a translation of one of the earliest European medical texts attributed to a woman, Oliva Sabuco (1562-c. 1646), and titled *The True Medicine* (published in 1587), which also dealt with the historically complex issue of female authorship during this period.[19]

During the early 2010s, Pomata returned to her concern with the history of epistemic genres in three separate publications. First, she wrote an article about the early modern European genre called *observationes* (collections of case-histories).[2] She argued that this genre first appeared in the second half of the 16th century as a new narrative form. Court as well as town physicians could develop it to advertise their clinical successes over their academic credentials and thereby construct their professional identity.

Then, Pomata contributed a chapter to the edited volume on *Histories of Scientific Observation* that further connected this new genre of *observationes* to the rise in value placed on first-person observation (*autopsia*) as distinct from second-person observation from other physicians (*historía*), in early modern Europe from 1500 to 1650 (Note 3).[20]

For example, the front page of this *Observationes Medicinæ* suggests to readers that the contents contain some of the physician's own observations of language problems resulting from brain injuries (Fig. 2). A case anthology more than a case collection, von Grafenberg excerpted cases from ancient to modern authors and included his own first-hand observations.

Pomata argued that doctors developed reliance on firsthand observation against book knowledge was new and it developed simultaneously in medical case collections and in anatomical research. For the first time, physicians described cases that they had personally seen, as was the case in Schenk von Gratenberg's 1584 *Observationes Medicinæ* (*Medical Observations*). Concurrently, observation developed as a new epistemic category.

She followed up this chapter on *observationes* as an epistemic genre with an article on the genealogy of observation as a philosophical concept.[21] This article exemplified the method in conceptual history of tracing a concept through time to determine its periodization. Namely, she traced when the terms for first-person observation first emerged, waxed, and waned, and re-emerged. She also examined what their use and changing

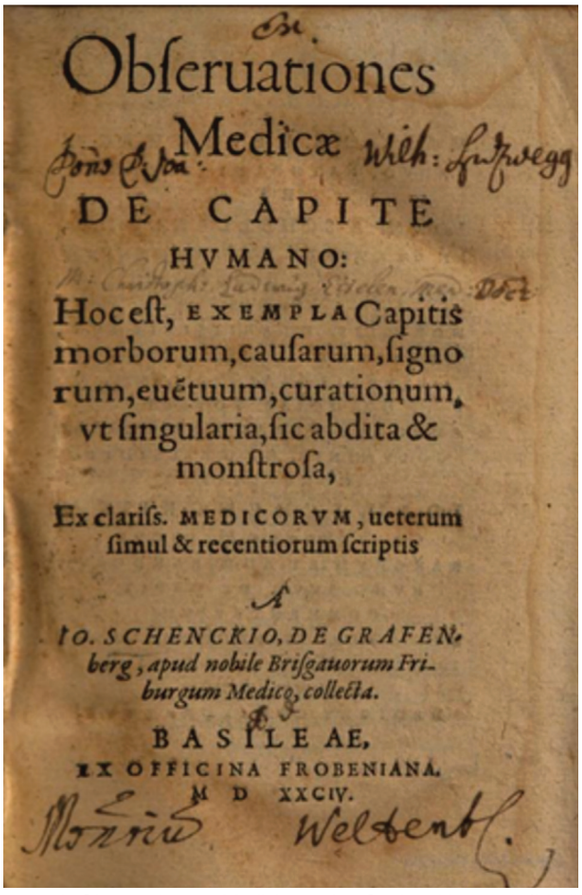

Obſeruationes
Medicæ
DE CAPITE
HVMANO:
Hoc eſt, EXEMPLA Capitis
morborum, cauſarum, ſigno
rum, euētuum, curationum,
vt ſingularia, ſic abdita &
monſtroſa,
Ex clariſs. MEDICORVM, veterum
ſimul & recentiorum ſcriptis
A
IO. SCHENCKIO, DE GRAFEN-
berg, apud nobile Briſgauorum Fri-
burgum Medico, collecta.
BASILEAE,
EX OFFICINA FROBENIANA.
M D XXCIV.

Figure 2 *Observationes Medicinæ de Capite Humano* (*Medical Observations on the Human Head*, Basel, 1584), Johannes Schenck von Grafenberg (1530–1598), Wikimedia Commons, Public Domain

meanings revealed about the ways of thinking and doing things of the people who used them. She thus traced concepts for observation from the ancient Greek *tērēsis* (i.e., observation or observance) in the medical works of the Empirics and Sceptics of Hellenistic antiquity to the absence of any comparable concepts during the Middle Ages. She then charted the recovery of the ancient *teresis* starting from 14th-century medical texts up to the new use of *observatio* (the Latin rendering of *tērēsis*, emphasizing observation) as an entry in early modern philosophical dictionaries.

3.2 History of epistemic genres in Europe

This early work on the history of *observationes* as an epistemic genre, its connection to increased value placed on first-person observation, and its conceptual links to the origin, rise, fall, and recovery of the ancient Greek term *teresis*, directly contributed to Pomata's later publications on the case and recipe. She argued that these two epistemic genres (case and recipe) were integral to new developments in early modern European medicine. The literary scholar André Jolles had identified nine elemental "Simple Forms" (legend, saga, myth, riddle, proverb, case, the memorabilia, fairy tale, and joke) underlying the developments in literature.[22] Inspired by Jolles, Pomata sought to identify the most basic epistemic genres—for example, the recipe, the case, and the commentary—that constituted scientific practices.

3.3 The recipe and the case

Her first article along this intellectual trajectory focused on the recipe, commentary, and the case as basic epistemic genres that informed authors on what as well as how to write in a range of scientific practices. She demonstrated that the two more ancient and so fundamental genres—the recipe and the commentary—were brought together only in the second half of the 16th century in the new hybrid genre of collections of medical case narratives (i.e., the *observationes* of her earlier scholarship).[1]

The first published case collection that represents this new hybrid genre, for example, was the *Centuriae Curationum* (*Hundreds of Cures*, 1551–1566), which the Portuguese Jewish physician Amatus Lusitanus (1511–1568) published in seven installments over 15 years. In the Middle Ages doctors could refer to medical cases preserved in *consilia* (medical case collections), but this genre was not yet based on what doctors had seen themselves and focused on the disease more than the individual patient's case of it. Whereas descriptions in *consilia* of individual symptoms were minimal, references to authority of previous commentaries were considerable. Furthermore, doctors did not previously publish their own *curationes* (i.e., cures, treatments), though Pomata has found evidence in mid-sixteenth century Europe of medical training including a new habit for students to keep records of cases (Note 4).[1] Lusitanus, however, published his own cases and kept them very short —how he had cured a viper bite or treated gastro-intestinal pain, for instance. He typographically separated them as well from newly italicized commentary. Most case collections afterwards followed this format.

3.4 The case and the commentary

We thus see again how using epistemic genre as a historical method allows the historian to discern important transformations in the cultural history of knowledge that might have otherwise gone unnoticed. Pomata focused on the connections between the recipe and the case as distinct genres in her 2013 article. In her 2014 article, however, she examined what she considered to be the less-obvious association as well as related tension between the case and commentary.[23]

Commentary is a genre that is normally high-status, formalized, often philosophical, and directed to authoritative readings of an already established canon. The case, however, is on the other side of the genre-spectrum in its low-status, informality, non-theoretical nature, and closeness to practice. The case is more closely aligned with the rule; namely, reading from case to case is a means to guide actions in future cases and thereby to find general rules for practice in medicine as in law or business. In other words, whereas the commentary focuses on philology (i.e., the correct interpretation of an authoritative text), the case develops out of personal practice.[23]

And yet by following the separate histories of commentary and of cases as distinct genres, Pomata was able to extend further André Jolles's original insight that evidence of case-based knowledge writing tended to be inversely related to the absence or authority of normative canons. She thus argued that when there is no normative canon (i.e., in the *Hippocratic Corpus* of the Greek classical period), or there exists skepticism toward a normative canon (mid-16th-century Europe), then case-based knowledge thrives but when there are no challenges to a normative canon then it wanes (medieval period). Thus, when medical doctrine became standardized and even dogmatic in both medieval Arabic and medieval Latin medicine, the originally epistemic genre of the case could morph into a literary form when its entertainment value as medical anecdote in a story became more valued than its earlier cognitive functions.[23]

Derived from using the distinction of epistemic genres as a method in historical research, Pomata was then able to use these insights to argue that not only was the *observationes* a new medical genre in the late European Renaissance (mid-16th century) but also that it newly subordinated the commentary to the case narrative. Even more importantly, she demonstrated that this reversal of cases as primary vis-à-vis commentary found in the new *observationes* genre occurred precisely when, as one would now expect, "the traditional medical canon was no longer unassailable and the search for a new canon was well under way."[23] Thinking historically with epistemic genres can indeed be a powerful means for refining periodization within the constantly moving pendulum of time between continuity and change.

4 Cross-cultural history of medicine

Because of all these previous scholarships—namely, 1) on the case as an important genre to think within Chinese history and 2) Gianna's own work on the history of epistemic genres—the recipe, case, and commentary—in European medical history—we found common ground intellectually when we were both faculty members in the history of medicine department at Johns Hopkins (2009–2019). Both of us liked learning languages as well so initially we thought we would exchange language lessons. I would study Latin and she Chinese. I bought a primer on Latin grammar for myself and a book on basic Chinese characters for Gianna. I taught a calligraphy session on the basic principles of writing Chinese characters. We playfully gave our first informal meetings a grand name, the Academia Latino-Sinica. I affectionately referred to our meetings as the Sino-Latin Academy of Two.

While doing research during the fall of 2012 in the Bibliothèque de Génève (Public Library of Geneva) on what would become her 2013 "Recipe and the Case" article, Gianna found a text we could work on together. This was the *Specimen Medicinae Sinicae* (*A Sample of Chinese Medicine*, 1682), the first important translation into Latin of Chinese medical texts for European readers. Gianna suggested we start by reading together the recipe section of this text. She recommended this entry point not only because the Latin was simpler but also because she was then researching the history of the recipe as an epistemic genre. In this text we had, in fact, the first case of Chinese recipes translated into Latin for a broader public readership. Later for the *History of Science Society Newsletter,* we had the opportunity to discuss this initial beginning to our collaboration with fellow historian of medicine (and of recipes), Elaine Leong.[24]

4.1 The recipe as a commensurate epistemic genre

Our first publication was about the Sino-European medical exchange as manifested in the Regula (recipe) section of the *Specimen*.[25] Pomata noted in her 2013 article that earlier scholarship had established the recipe as a good medium for global trade and exchange of knowledge across Eurasia.[1] For example, how foreign medicines traveled along the Silk Road to medieval China,[26] how medical knowledge went between China and the Arab world in the late medieval period,[27] the role of Islamic pharmacy in exchanges between the Mamluk and Mongol Realms,[28] and the story of how European recipes for the panacea Theriac traveled to early modern China.[29]

What we sought to do differed in that we applied the method of a "distant reading of an epistemic genre" (Note 5) to determine that the Chinese, Arabic, and Latinate cultures all had specific terms to differentiate standardized recipe-formulas (derived usually from a canonical text) from individually tailored recipe-prescriptions (embedded in a specific clinical context). In Chinese, for example, *fang* (方)—when it refers to standardized formulas—was contrasted with *ji* (剂) indicating individual prescriptions or individual dosages of formulas. As for Latin and Arabic terms, standardized formulas were conveyed in the Latin *antidotaria* and the Arabic *aqrabadhin* but individualized recipes were differentiated from these in the Latin *experimenta* and the Arabic *muyarrabat*. In short, these three cultures recognized the same key distinction between the standard or the general and the individual or the specific case.

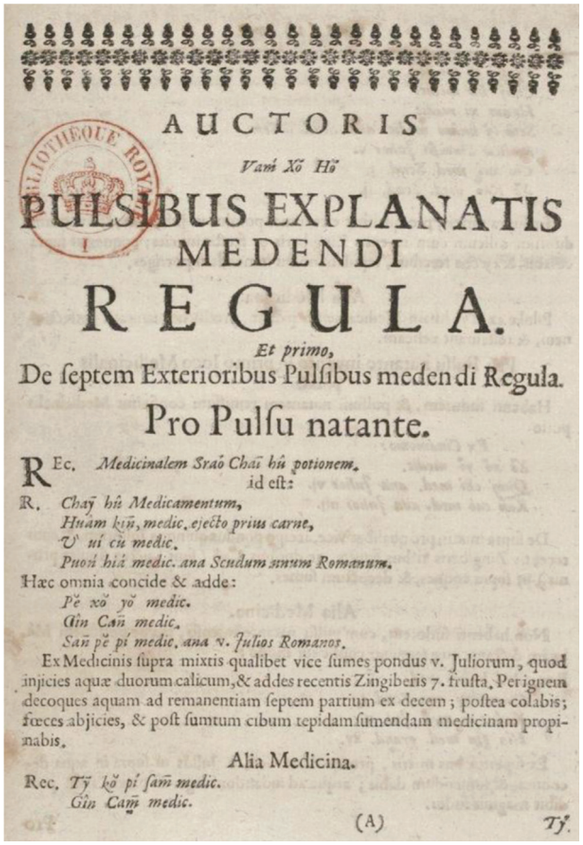
Furthermore, the standardized recipe (Chinese *fang* and Latin *regula*) functioned as a commensurate epistemic genre with a shared modular textual structure (Fig. 3). This shared modularity—title, list of drugs, instructions—facilitated noteworthy exchange of medical knowledge between China and the Latinate West in the late 17th century. Both cultures also valued experience-based knowledge, of which recipes were exemplary.

We could then ask how does the recipe genre as a cross-culturally recognized textual form successfully transmit, or not, medical knowledge and practices from one language to another? Measurements translated easily from one language to another, for example, as did the medicinals that had reached Europe via global drug markets and so had already been identified with Latin names, such as *Zingiber* for fresh ginger (Sheng Jiang 生姜), *Radix Chinica* for China root (Chi Fu Ling 赤茯苓 or red *Poria cocos*), and *Cinnamomum* for Chinese cassia (Gui Zhi 桂枝).

In short, we concluded our case study in cross-cultural history of medicine by arguing that scholars should go beyond the model of competing civilizations and conceptual incommensurability to consider the commonalities as well in the conceptual and textual tools that people from different cultures use to make sense of their experiences and transmit knowledge from one language to another.

4.2 Genre-mixing of the recipe and the case in 17th-century China

Later the same year, historian of China, He Bian, published an article directly influenced by the 2007 *Thinking with Cases* book, Gianna's 2014 article on


AUCTORIS

Vani Xŏ Hŭ

PULSIBUS EXPLANATIS MEDENDI

REGULA.

Et primo,

De septem Exterioribus Pulsibus medendi Regula.

Pro Pulsu natante.

R Ec. *Medicinalem Srao Chai hú potionem,* id est:

R. *Chay hú Medicamentum,*
Huam kin, medic. ejecto prius carne,
V ui cu medic.
Puoi hiá medic. ana Scrupulum unum Romanum.

Hæc omnia concide & adde:
Pe xŏ yŏ medic.
Gin Can medic.
San pe pi medic. ana v. Julios Romanos.

Ex Medicinis supra mixtis qualibet vice sumes pondus v. Juliorum, quod injicies aquæ duorum calicum, & addes recentis Zingiberis 7. frusta. Perigues decoques aquam ad remanentiam septem partium ex decem; postea colabis; fœces abjicies, & post sumtum cibum tepidam sumendam medicinam propinabis.

Alia Medicina.

Rec. *Ty kŏ pi sam medic.*
Gin Cam medic.

(A) Ty.

Figure 3 First Page of "Medendi Regula" (Method of Healing), as printed in *Specimen Medicinæ Sinicæ* (*A Sample of Chinese Medicine*), Francofurti: Sumptibus Joannis Petri Zubrodt, 1682. Bayerische StaatsBibliothek (State Library of Bavaria, Germany)

medical case narratives,[30] and our 2017 article on the recipe as a commensurate medium for cross-cultural exchange of knowledge. Through a close reading of a multi-authored text titled the *Xian Xing Zhai Yi Xue Guang Bi Ji* (《先醒斋医学广笔记》 *Extensive Notes on Medicine from Xian Xing Studio*), Bian explored how two originally separate genres in Chinese medicine—the *fang* (案 recipe) and the *an* (方 case)—came to be combined in this text. No one before had noted that this text was multi-authored: it combined detailed recipes collected by a retired official named Ding Yuanjian (丁元荐 1560–1625) and also case records of one of the physicians, Miao Xiyong (缪希雍 1546–1627), who had treated Ding for a minor stroke and other illnesses.

Mr. Ding had first published in 1620 under his studio name a formulary of effective medical recipes, many of which doctor Miao had prescribed for him, with some case histories. Miao then expanded upon Ding's original formulary with his own case narratives. Bian argues that not only physicians but also their elite patients were interested in producing cases and circulating recipes. They did this not just for the public good but also so that they could make them at home themselves.

The resulting recipe-case hybrid text thus represented the interest of patient Ding and his cohort in learning how to make prescriptions themselves at home. And it included the physician Miao's adaptation to his patients' demands by demonstrating his medical virtuosity through how he

prescribed recipes within his case narratives. By the 18th century, similar recipe-case collections would become common. But still in the early seventeenth century, Bian argues that, the *Extensive Notes on Medicine from Xian Xing Studio* represents the phenomenon when both patients and doctors were experimenting with not just formulas but textual forms.

4.3 Using the medical case as an epistemic genre in comparative history of medicine

Thus, by the end of 2017, historians had published over a decade of groundbreaking scholarship on the history of epistemic genres. This was true especially for the recipe and medical case, in both China as well as in Europe. This scholarship formed a solid foundation from which comparisons could now be made. Pomata accomplished it in a chapter she wrote for an edited volume titled *A Historical Approach to Casuistry*. Casuistry derives from the Latin noun *casus* (case, or occurrence). It refers to case-based reasoning (namely, when a general rule is applied to specific situations or people's reasoning from case to case). This type of thinking was particularly important in religion and moral theology but also in jurisprudence, ethics, and medicine.

Pomata contributed the article "The medical Case Narrative in Pre-Modern Europe and China: Comparative History of an Epistemic Genre."[31] She started from the knowledge that has a culturally specific emic term (i.e., historical actors' category) for a distinct genre-meaning medical cases in both cultures. The term was *observationes medicinales* (medical observations) in early modern Europe and the phrase was *yi' an* in early modern China. Then she could ask an important comparative question: "in Europe as in China, what kind of medical practice formed the backdrop for the emergence of the case narrative? "[31]

The comparative method also allowed Pomata to discern interesting similarities in the history of the recipe and the case as epistemic genres in China and Europe. The recipe as a distinct genre, and the formularies that collected recipes, had remarkable continuity from antiquity to the early modern period in China and in Europe. Case narratives, however, followed a very different trajectory in both cultures. The case narrative originated in both Greek (ca. 410–350 BCE) and Chinese antiquity (ca. 216–150 BCE), but they became latent more-or-less for centuries, appearing only sporadically within other types of genres. Then independently in the mid-16 century, the medical cases became recognized as a distinct genre in China and also in Europe. The medical case narrative was no longer an appendix, anecdote, or example embedded within another type of genre such as a medical treatise, biography, or formulary, but rather their collection had become a genre in its own right.

Pomata then asks what kind of medical practice in mid-16th-century China and Europe found textual expression in this new epistemic genre? Pomata argues that both the *observationes* and the *yi an* emerged when physicians focused more on the individual patient than the disease they suffered from. The medical traditions from both cultures, she argued, "have been marked by a fundamental tension between two concepts of disease—disease as ontological entity and disease as individual illness."[32] In Chinese medicine, another historian phrased this tension between a disease concept and a person as the existence between categorizing and individualizing notions of disease.[33] Thus, the medical case as a distinct genre that focused on the specificity of individual experiences of illness marked a period, as Pomata had previously argued, when normative canons were being questioned. Furthermore, here she argued that the new popularity of medical-case writing occurred when "the pendulum swung from the ontological view of disease toward a notion of illness understood as an individual configuration of modular factors."[33]

The significance of Pomata's comparative approach to the history of the medical case as an epistemic genre, however, was not just this new periodization. More broadly, she also revised how to understand the epistemic value and social significance of casuistry or case-based thinking. Jolles, Forrester, and others had argued that the primary epistemic value of the case was inductive, which is used toward making typologies, generalities, and abstractions. Conversely, Pomata argued that the case was also an important counterweight to generalist thinking in their attention to the particular, the exceptional, and the singular. As a means of individualization then, the case was an essential cognitive tool not just in the history of medicine in Europe and in China but also for other scientific disciplines generally. Pomata argued that the individuating case is connected as well "to the representation of individuality in literature and art."[33]

4.4 Using epistemic genres as method in cross-cultural medical history

Meanwhile Gianna and I continued our collaboration in cross-cultural history of medicine. Instead of the synchronic approach to Sino-European medical exchange we took with our first article, which focused on just the recipe chapter in one Latin text (*Specimen Medicinae Sinicae,* 1682), we decided to take a diachronic approach to compare translation choices made in three texts from the early 14th century to the early 18th century concerned with Chinese sphygmology.[34] These texts were in Persian (The *Treasure book* of Rashīd al-Dīn, 1313), Latin (*Specimen Medicinae Sinicae,* 1682), and French ("Secrets du Pouls," *Description de la China,* 1735). All three translations focused on the same lineage of rhymed pulse texts called *Mai Jue* (《脉诀》 *Pulse Rhymes*) that had become more popular than the original *Mai Jing* (《脉经》 *Pulse Classic*) as they were versified, well-illustrated, and in other ways made more easily usable.

By comparing these three translations across five centuries, we realized that the translators had to have a knowledge of how to read ("savoir lire") the genre conventions structuring the original text. In other words, they could rely upon commensurate distinctions of verse and prose, original text versus commentary on it, and the interplay between text and illustration to help them navigate the original Chinese source. In fact, we suggested that a precondition of the very possibility of translation may well be commensurable textual forms. From this vantage point, we could then easily see that each translator made different translation decisions related not just to individual words and images but, especially important, to distinct textual forms.

The Persian version, for example, was the only one of the three texts to translate the oral quality of the verse in the Chinese original by using transliteration. Neither the Latin nor the French version, by contrast, transliterated the originally versified text. The Latin version collapsed the distinction of original text and commentary in favor of a continuous translation. However, the French version honored the text-commentary distinction but selectively translated the Chinese commentary when it served the translator to clarify unusual concepts in the original text. As for the Chinese illustrations, both the Persian and Latin versions chose to include several images to accompany the textual translation. The French version, however, did not include any of the original illustrations but rather created a new image to summarize for readers the novel Chinese concept Wu Xing (五行 five elements).

Finally, only the French translator used a separate " Notes" section that had both commentarial and epistemic functions. He used the "Notes," for example, to reflect critically both on the translated text and on the translation process itself. Neither the Persian nor the Latin versions shared this textual means for meta-reflection. As a result, we do not have comparable access to how their translators thought as they translated beyond the choices that they made in the final translations that have been preserved over time.

What we can say is that they all found Chinese pulse medicine worth translating—first in the early 14th-century Ilkhan court in Persia (modern-day Iran) and then in late 17th- and early 18th-century Europe—but they made significantly different translation choices. These differences were because of historical and cultural variations in value placed on verse or a preference for prose, distinguishing original text from commentary or combining both, and deciding to translate images or to create new ones.

5 Conclusions

Inspired by our two co-authored publications in cross-cultural medical history, and especially Pomata's work on the history of epistemic genres, I decided that it would be productive to apply her concept of epistemic genres as a conceptual tool to the rich Chinese medical archive. I had the opportunity to do this when I joined a research project on the history of handbooks. I then agreed to contribute an article on the shared theme of "learning medicine by the book" but in the history of Chinese medicine. The resulting article focused on metaphor and genre distinctions in medical book titles from the 4th to 14th centuries in China. These metaphors signaled to readers not only what books contained but also how publishers and editors conveyed to readers their books' qualities of conciseness, portability, and possibility to master the subject by reading the book.[35]

Book titles do considerable work. They contain thematic (topic-related) and rhematic (genre-related) titling strategies. I first focused on the rhematic strategies to determine the earliest distinctions among epistemic genres made in health-related excavated texts as well as bibliographic references in received texts in late antiquity (3rd c. BCE–3rd c. CE). From this foundation, I could then differentiate thematic- and metaphoric-titling strategies from the genre-distinguishing rhematic ones.

Furthermore, I could show that in contrast to the European preference for hand metaphors in several genre terms for "handy" books—enchiridions, manuals, and handbooks—finger and palm metaphors were preferred over the hands in new medical genres. Some medical titles in the 13th century signaled, for example, their guidebook (Zhi Nan 指南) quality or potential for mastery (Zhi Zhang 指掌) of the contents within by using pointing-the-finger metaphors. These new genre terms for medical texts were inextricably related to the private publishing boom from the 13th century on that made more texts more widely available in a broader range of epistemic genres as well as textual forms.

Applying this new methodological approach to epistemic genres as a conceptual tool and also to new genre designations in the cultural history of knowledge in human history also opens up new possibilities for future scholars to explore, periodize, analyze, and reinterpret over 2000 years of the history of Chinese medicine.

Notes

Note 1: These analytic concepts originally came from the linguistic distinction between phonemes (a unit of sound that distinguishes one word from another in a language, such as the final d and t in "mad" and "mat") and phonetics (branch of linguistics that studies how humans produce and perceive sounds or the physical properties of speech in the case of sign language).
On the emic/etic distinction, see Headland T, Harris M, eds, Emics and Etics: The Insider/Outsider Debate New York: Sage; 1990.
Note 2: Forrester J. If p, then what? Thinking in cases. History of the Human Sciences 1996;9(3):1-25. See p. 2 for Hacking's six styles of reasoning: "postulation and deduction; experimental exploration; hypothetical construction of models by analogy; ordering of variety by comparison and taxonomy; statistical analysis of regularities of populations; historical derivation of genetic development."
Note 3: For the *autopsia-historía* distinction, see ref 21. Pomata G. The Medical Case Narrative; 2014. p. 10.
Note 4: For evidence of the new habit of keeping records of cases in Ferrara and Padua, Italy and Paris, France, see ref. 2, Pomata G, Sharing Cases, 2010, p. 210.
Note 5: Pomata explained and carried this method out in The Medical Case Narrative. 2014. see ref. 23.

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Ethical approval

This study does not contain any studies with human or animal subjects performed by the author.

Author contributions

Marta Hanson wrote and reviewed the manuscript.

Conflicts of interest

Marta Hanson is an Editorial Board member of *Chinese Medicine and Culture*. The article was subject to the journal's standard procedures, with peer review handled independently of this Editorial Board member and their research groups.

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OPEN

Confucian Medicine: A Medical Handbook of 19th Century England

Yu-Rong Feng[1,✉], Xue-Mei Wu[2]

Abstract

This article takes the "*A Medical Handbook*" as an example to try to reveal how Western missionaries and Chinese translators jointly translated Western medical knowledge when it was introduced into the East during the 19th century. In this process, the fusion of Chinese and Western medical knowledge led to the Chinese version of *A Medical Handbook*. Not only did Western missionaries unilaterally promote their medical knowledge, but Chinese local elites also played an indispensable role in the dissemination of Western medical knowledge. In the early days of Western knowledge spreading into China, Western medical knowledge was incorporated into the knowledge pedigree of traditional Chinese medicine to a certain extent, which enabled the Chinese public to accept the use of Western medicine. The collision between Chinese and Western cultures at the level of medical knowledge affected the integration of Western medical knowledge systems into the local Chinese medical knowledge system.

Keywords: A *Medical Handbook*; Confucian medicine; Frederick William Headland; John Fryer; Zhao Yuanyi (赵元益)

1 Introduction

Written by Frederick William Headland (1830–1875), interpreted by John Fryer (1839–1928), and transcribed (bilu 笔录) by Zhao Yuanyi (赵元益 1840–1902), *Ru Men Yi Xue* (《儒门医学》*Confucian Medicine*) was published by Jiangnan Arsenal in 1876.[1] The source of this book was originally published in London in 1861 as *A Medical Handbook, Comprehending such Information on Medical and Sanitary Subjects as is Desirable in Educated Persons* (Fig. 1).[2] Frederick William Headland graduated with a Bachelor of Arts from London University in 1849 and afterwards obtained a Bachelor of Medicine (M.B.) degree. In 1852, he was appointed lecturer on botany at Charing Cross Hospital and won the Fothergillian gold medal in the same year with *An Essay on the Action of Medicines in the System*. He gave the Lettsomian Lectures on materia medica in 1858. Two years later, he became a Fellow of the Royal College of Physicians. Finally, he was elected physician to Charing Cross Hospital in 1867, where he worked until ill health caused his retirement in 1875 before his early death in the following year.[3]

A Medical Handbook (1861) was a revision of Royle's (1856) *Manual of Materia Medica and Therapeutics*. This British medical manual was later translated into the *Confucian Medicine*. Western knowledge is believed to have entered China intrusively; however, the introduction of Western knowledge into China was not a colonizing process, but a very rich, complex and multifaceted process. When Western medical knowledge was introduced into China, Chinese elites did not have so much anxiety or tension from the foreign culture, but showed mutual tolerance.

Eurocentrism is considered to have overemphasized the rationality and progress of Western medicine in the 19th century and unilaterally emphasized the omnipotence of Western knowledge as it entered non-Western societies. In recent years, researchers have discovered that the translation and introduction of Western medicine books to China reflected a richer and more complex process. In the process of translation, local translators were not only passive "others", they also introduced the knowledge from foreign cultures based on their own local medical knowledge. At the end of the 19th century, the Western medical knowledge introduced by missionaries had more in common with TCM than people at that time and later scholars recognized. In the introduction of relevant medical knowledge, the Chinese peoples' tension and anxiety about foreign cultures were not presented blindly.

In the mid–19th century, Confucian medical knowledge was still the mainstream TCM since the Song and Ming dynasties. The medical books named after the "Confucian" include *Ru Men Shi Qin* (《儒门事亲》*Filial Piety to Relatives in a Confucian Way*), *Ru Men You Yi* (《儒门游艺》*Confucian Recreation*), *and Ru Men Yi Zong Zong Lyu* (《儒门医宗总略》*General Introduction of Confucian Medicine*). Thus, the title of *Confucian Medicine* reflects that the translation of Western medical knowledge from the perspective of TCM knowledge. The translators attempted to use the existing classical terms and concepts of TCM to translate the newly introduced Western medical knowledge into Chinese to attract the attention of Chinese readers.

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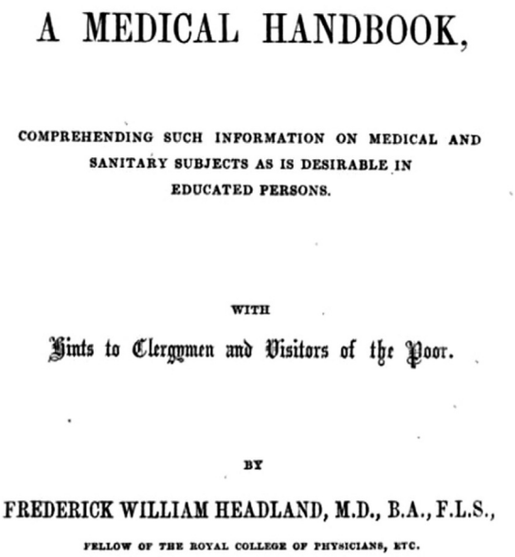

A MEDICAL HANDBOOK,

COMPREHENDING SUCH INFORMATION ON MEDICAL AND SANITARY SUBJECTS AS IS DESIRABLE IN EDUCATED PERSONS.

WITH

Hints to Clergymen and Visitors of the Poor.

BY

FREDERICK WILLIAM HEADLAND, M.D., B.A., F.L.S.,

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS, ETC.

SEELEY, JACKSON, & HALLIDAY, FLEET-STREET.

LONDON. MDCCCLXI.

Figure 1 Inside cover of *A Medical Handbook*

2 Localization and translation

The structure of *A Medical Handbook* was modified in *Confucian Medicine* (Table 1). The structure of original book was divided into two parts and four appendices. Part 1 focused on discussing light, heat, air, water, food and diet, and exercise as the "six principles" of health preservation. Part 2 included an index of diseases and related remedies. Finally, there were four appendices: "Sanitary Advice for the Poor", "Meaning of Symptoms", "Medicine for the Poor", and "Accidents and Emergencies". The translation of *A Medical Handbook* into *Confucian Medicine* was divided into three volumes and appendices. The three volumes were "On the Principle of Self-cultivation", "On the Law of Treating Diseases", and " On the Nature of Prescriptions" respectively. The "Accidents and Emergencies" appendix from the end of *A Medical Handbook's* appendixes was moved to the end of Volume 2, while the other three appendices were retained.

Table 1 Structural rearrangement and catalog

A Medical Handbook	儒门医学
Part 1: On the preservation of health	卷上 论养生之理
Part 2: On the preservation of health	
Index of diseases	卷中 论治病之法 附急救证治
Index of remedie	卷下 论方药之性
The appendices	附卷
Sanitary advice for the poor	慎疾要言
Meaning of symptoms	病症大略
Medicine for the poor	简易良方
Accidents and emergencies	

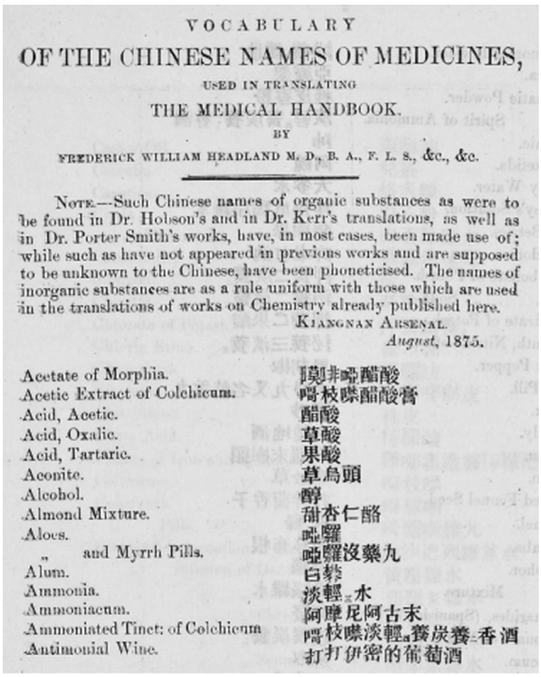
Some adjustments were made to the specific contents of *A Medical Handbook*. For example, when describing some emergencies, the logical order of *A Medical Handbook* was adjusted by John Fryer and Zhao Yuanyi according to the perception of emergencies in TCM. *A Medical Handbook* first discussed the bites of insects, wasps, bees and ants. However, the translation in *Confucian Medicine* put rabies first, while the discussion of concussion or shock in the middle of *A Medical Handbook* was placed at the end of the section on emergency treatment in *Confucian Medicine*.[1]

In the preface (凡例) (*Notes on Translation*), the translator enumerated the rules of writing according to the writing convention used in Chinese medical books:

- When describing the names of diseases and drugs, this medical manual was written in English in alphabetical order. The translator rearranged the medical knowledge classifications according to the sequence of TCM's understanding of diseases: that is, in the order of the internal and external organs of the body, and diseases of women and children. Drug names were divided into 14 categories according to the nature of sweating, vomiting, nourishing, and purging.
- Furthermore, many disease names in Western countries that did not match with diseases in China must be translated with new names. For example, inflammation shows symptoms of redness, heat, swelling, and pain, but there was no equivalent expression to "inflammation" in China. According to *Nei Ke Xin Shu* (《内科新书》 *New Book of Internal Medicine*) and other books, inflammation was translated as "fever" and called *Yan* (炎 inflammation).
- The names of some diseases were the same as those known in TCM, which were inconsistent with the actual diseases after careful inspection. Therefore, the original names were retained. For example, stroke was a kind of brain disease, which was well known to everyone, so the term Zhong Feng (中风 attack by wind) of TCM was used.
- The medicines mentioned in *A Medical Handbook* had originally existed in China, but still used the name of Chinese medicine. If there was no equivalent medicine in China, or if there was a distinction between pure and miscellaneous medicine, or if it was difficult to verify its name, the Western name was retained using transliteration. For chemical drug names, the translation of the drug name should be based on the molecular chemical composition, which could be understood by looking at books on chemistry.
- The medicines contained in this book could be purchased by most Chinese people in Western pharmacies. Therefore, the English names of the medicines were included in the translated book to facilitate the purchase of medicines. Even if Chinese people did not understand English, they could buy them according to their names.[1]

In addition, the Chinese medical terms used in the translated book were mainly created by medical missionaries in China Benjamin Hobson, John Glasgow Kerr, and Frederick Porter Smith[1] (Fig. 2).

According to the logic of TCM about diseases, the internal order of the books was modified to focus on self-cultivation, treatment, prescriptions, and then finally



VOCABULARY

OF THE CHINESE NAMES OF MEDICINES,

USED IN TRANSLATING

THE MEDICAL HANDBOOK.

BY

FREDERICK WILLIAM HEADLAND M. D., B. A., F. L. S., &c., &c.

NOTE.—Such Chinese names of organic substances as were to be found in Dr. Hobson's and in Dr. Kerr's translations, as well as in Dr. Porter Smith's works, have, in most cases, been made use of; while such as have not appeared in previous works and are supposed to be unknown to the Chinese, have been phoneticised. The names of inorganic substances are as a rule uniform with those which are used in the translations of works on Chemistry already published here.

KIANGNAN ARSENAL.

August, 1875.

Acetate of Morphia.	醋非啡醋酸
Acetic Extract of Colchicum.	喟枝噤醋酸膏
Acid, Acetic.	醋酸
Acid, Oxalic.	草酸
Acid, Tartaric.	果酸
Aconite.	草烏頭
Alcohol.	醇
Almond Mixture.	甜杏仁酪
Aloes.	哑囉
" and Myrrh Pills.	哑囉沒藥丸
Alum.	白礬
Ammonia.	淡輕氣水
Ammoniacum.	阿摩尼阿古末
Ammoniated Tinct: of Colchicum	喟枝噤淡輕氣養炭養香酒
Antimonial Wine.	打打伊密的葡萄酒

Figure 2 Vocabulary of the Chinese names of medicine used in translating the *Medical Handbook*

some treatment methods. In the process of creating the translated book, the translator added an understanding of the localization of medicine in the Western medical manual.

3 "Confucianized" medical knowledge

A Medical Handbook emphasized that "the science of health is a science with which all should aim to be acquainted." However, the translator avoided talking about the concept of science, but used a classical Chinese term to express the meaning of " science." The sentence about the science of health was directly omitted and the latter paragraph about the science of the Preservation of Health was translated as: "There are two ways to protect oneself: one can make oneself free from disease, one can make others free from disease, but the principle is the same."[1]

The original definitions of Western concepts, such as science, hygiene and sanitation were not introduced when translating *A Medical Handbook* into *Confucian Medicine*. The preservation of health was translated into Chinese as *yangshen* (养身) in this book, that is, to protect oneself.

The translator deliberately ignored advances in knowledge and hygienic science from the perspective of Confucian medicine. A statement in *A Medical Handbook* emphasized that, "Thanks to the advance of knowledge and hygienic science, the mortality from epidemics is now far less than it used to be, and the deaths from consumption are rarer."[2] This sentence was translated as, "Another example is that there are fewer plagues in Western countries than in the past, and there are fewer deaths due to fatigue than in the past."[10] Furthermore, another statement in *A Medical Handbook* emphasized that, "Many great discoveries have been made in the science of medicine. We have preventive means against small-pox, scrofula, consumption, which avail us far better than our old attempts at cure when the disease had got the mastery."[2] This passage was translated as, "In recent medicine, several things that are beneficial to people have been added, such as attempts to prevent small-pox, scrofula and fatigue and other diseases. In the past, people could only cure diseases that had occurred, but could not cure diseases that had not occurred."[1] Thus, the great progress in hygiene brought about by science in the original text was not mentioned in the translation.

This alternative discourse took shape through mutual definitions between Western hygiene and TCM practices.[4] For example in the original text, " Yet I think it by all means better that men should make the rudiments of so momentous a subject a part of their education, as they do the principles of many sciences of far less moment to them, than that they should be so ignorant of it as to be unable to understand the nature of any disorder which it may need a skilled person to cure, or to appreciate his motives in the remedial measures which he may think it best to advise."[2] This passage was translated as, "If you can administer medicines based on symptoms and signs and have a general understanding of the treatment methods, you will not be mistakenly treated by a quack doctor. Ordinary people don't know the severity of the disease, and they don't know whether they should seek medical attention as soon as possible. Some people may seek medical treatment as soon as possible, but if you don't know how the doctor treats the disease, it is often delayed. If you understand a little medical knowledge and take good care of your body properly, the disease may be cured soon."[1] In this way, the advancement of medicine in China was not because of the developments of modern science, but because of the increase in literacy and reading rates. More people could learn about medicines and their uses. Another related statement was the distinction between quacks who only use popular prescriptions and good doctors who understand the principles of medication. These good doctors' judgment about the quality of medicine is not based on scientific progress, but based on Confucian morality. Chinese doctors tried to elaborate on Western medical knowledge within the framework of their existing TCM knowledge.

As mentioned in the preface of *Ru Men Yi Zong Zong Lüe* (《儒门医宗总略》*General Introduction of Confucian Medicine*), the quack only read simple prescriptions, but did not read the classics, such as Zhang Zhongjing (张仲景)'s books. The vulgar Confucian read only a few words, thinking that the books of sages could be mastered without intensive reading.[5] However, the translator also tried to reconcile Western hygiene and traditional Chinese customs to give Chinese people some new ideas and knowledge.

Until the rise of public health in the 19th century, hygiene in Europe and China still had a lot of similarities in the concept of health preservation, which were based on methods for individuals to avoid illness. After the rise of public health, however, the content of hygiene had undergone major changes. A very similar discussion was the debate surrounding "room ventilation." Family hygiene emphasized that "bedrooms must ensure that each occupant has enough space to dilute the exhaled

exhaust gas." Therefore, *A Medical Handbook* emphasized opening large windows to facilitate ventilation. However, traditional Chinese culture believed that "wind is the root of all diseases," and "closing one's house to avoid the wind" was the sanitary option.[6]

A Medical Handbook concluded that, "All that has been said hitherto on the subject of air must tend to one conclusion. It should serve to impress upon every one more strongly than ever the paramount importance of *ventilation* of a constant supply of fresh air in every apartment intended for the habitation of human beings. There cannot be a greater absurdity, one might almost say wickedness, than to keep such rooms shut up and confined."[2] This passage was translated as, "It can be seen that it is extremely important to have more ventilation in the house. No ventilation is not only against common sense but also harmful to health."[1] A *Medical Handbook* continued that, "I wish strongly to insist upon the fact that of all household arrangements, the most elemental in its importance, the most conducive to health, is the constantly open window. If the air be cold, the heat of the apartment may be supplied by a fire. It is chiefly, after all, a matter of habit. Those who have not been used to it may suffer slightly at first; but when once they have given the plan a fair trial, they will never revert to their closed apartments again. It is, as I have said before, a misfortune of our artificial state of life that we are obliged to spend a great part of our time in houses, instead of living constantly in the open air. We should therefore do everything that lies in our power to assimilate this unnatural existence of ours to that for which our physical structure has best fitted us."[2] This passage was translated as, "Ordinary people regard closing windows as a habit, and they often refuse to open them because they are afraid of getting sick. If you can tolerate minor illnesses and barely open the window for a few days, you will find that it is of great benefit to your body, and you will never close it again. Ordinary people spend a lot of time in the room and very little time outside, which violates the principles of natural persons. Therefore, those who cannot go out to breathe fresh air should try their best to let fresh air into the room."[1] The translator attempted to persuade Chinese readers about the importance of opening windows to breathe fresh air in a way that they might find acceptable.

In terms of exercise, *A Medical Handbook* emphasized that, "The proper development of the muscular system is essential to the health of the body, as well as to the activity and usefulness of the individual. To procure this development one only thing is necessary that each and all of the muscles of the body should be continually exercised."[2] This passage was translated as, "The human body must exercise for a certain period of time every day. Exercising too much, or not enough, cannot make the body healthy and disease-free. The muscles of the body are originally designed for exercise, which is the nurtral principle."[1]

Human bodies are perceived differently in western doctors and TCM doctors. The Western doctors first saw human muscles, while TCM doctors did not pay much attention to muscles[7] and had not considered muscles as an organ system composed of skeletal muscle, smooth muscle, and heart muscle to allow the body to move, maintain posture, and circulate blood throughout the body. The TCM health maintenance philosophy advocated resting, instead of highlighting the necessity to maintain muscle strength.

A good translator must be very familiar with the two cultures to achieve the integration of China and the West. *A Medical Handbook* emphasized that, "Exercise of the mind is as necessary for the development of its natural powers as exercise of the body. It should be regular, and not excessive or protracted, especially with the young. It should be varied in kind, lest it produce weariness. In the right regulation of exercise of the mind the science of education is concerned."[2] This passage was translated as, "The human body needs exercise, so does the human mind. That is to say, one's mind can be trained in reading, chanting poems, writing, playing chess and so on."[1] During the translation process, the Confucian lifestyle was emphasized, for example, reading, chanting poems, writing, and playing chess. The translator considered the thinking process of Confucian intellectuals and tried to adapt to the Confucian reading and learning habits by using medical terminology that was already in the classical Chinese medical literature.

In terms of drug knowledge, opium was classified as a narcotic in *A Medical Handbook,* but as a tranquilizer in *Confucian Medicine*. After opium was imported into China, TCM formed a two-sided attitude toward opium, that is, it could be both helpful and harmful to people's health. During this period, smoking opium was banned, but *Confucian Medicine* emphasized the medical use of opium based on medical knowledge. In the treatment of rabies in the Accidents and Emergencies chapter, the translator also specifically mentioned that opium can be taken to ease pain.[1] The *Manual of Materia Medica and Therapeutics* which was also translated after the Opium War, described opium in a "calm and objective" manner. The *Manual* did not criticize the evil of opium in China at all, nor did it expose the crimes of bad British merchants and military hegemony. The *Manual* only mentioned that "the most abominable profit-making method, which washes out the essentials of opium and sells the remaining dregs as opium," reflected a general mentality existing in the British intellectual circles of the time.[8] Thus, *Confucian Medicine* calmly and rationally presented opium in a rational way, which had an impact on the translation of later health-related books into Chinese. While maintaining localization and Confucianism, *Confucian Medicine* adopted a positive and calm attitude toward Western medicine.

4 John Fryer and Jiangnan scholars

According to Rogaski's research, the first person who translated Western works related to hygiene into Chinese was John Fryer. He had translated a variety of works with hygiene in the title, including *Chemical Hygiene* (1880), and *Beginner Hygiene* (1896).[9]

Fryer was born in Hythe, a coastal town in Kent in England and was educated at Highbury Training College in London. After graduation, he was hired by the Church of England. In July 1861, Fryer arrived in Hong Kong to serve as the Head of St. Paul's College. Two years later he was sent to Beijing to join the Tongwen Guan School (同文馆 Interpreters' College, also called the School of Combined Learning). In 1865, Fryer went south from

Beijing to Shanghai to become the principal of Anglo-Chinese School. Around this time, Zeng Guofan (曾国藩 1811–1872) was considering setting up a translation bureau at the Jiangnan Arsenal to produce technical books to imitate the Western techniques. Zeng received support of Viceroy Li Hongzhang (李鸿章 1823–1901). Three years later, Fryer joined the Department for the Translation of Foreign Books at the Jiangnan Arsenal, where he found his life's chief work.[10]

At that time, foreigners tended to be employed to interpret Western books into Chinese. Dictations of these interpreted books were then transcribed by the Chinese. Although Fryer's knowledge of Chinese was outstanding, he still had difficulty writing Chinese independently. Fryer worked with some of the ablest Chinese scholars of his day, including the mathematicians Li Shanlan (李善兰 1811–1882) and Hua Hengfang (华蘅芳 1833–1902), the natural scientist Xu Shou (徐寿 1818–1884) and his son Xu Jianyin (徐建寅 1845–1901). These men came from the tradition of *kaozheng* (考证 evidential research) scholarship and the last three scholars were engaged in their own scientific studies in the Wuxi area of the Yangzi Valley even before the first translated Western science texts began to appear in the 1850s.[11]

Hua Hengfang was a famous mathematician from the late Qing dynasty who popularized Western mathematics and co-founded the Jiangnan Arsenal in 1865, where he translated a series of books on Western mathematics with Fryer, including some of the most accessible and widely-read texts of the period. Hua's approach was to explain and describe traditional Chinese mathematical techniques and proceed from them to a treatment of Western algebra and the calculus. In this way, he succeeded in making Western mathematical techniques accessible and relevant to his classically educated readership.[12]

Fryer attached great importance to hygiene and the related works that he compiled had a great influence in China during this period. These hygiene books compiled by Fryer brought Western hygiene concepts to China that were completely different from traditional Chinese ideas. In the preface of Fryer's translation of *Chemical Hygiene,* Fryer also mentioned he translated *Chemical Hygiene* with Luan Xueqian (栾学谦). When Fryer edited the *Ge Zhi Hui Bian* (《格致汇编》*Gezhi Compilation*), Luan Xueqian served as his editorial assistant and his tasks included retouching texts.[13] During this period, Hua Hengfang invited Zhao Yuanyi to help him with proofreading and translation. Thus, Zhao Yuanyi also helped Fryer with his translations (Fig. 3).

Most of these Chinese scholars came from the Yangtze River basin and had a tradition of *kaozheng* (考证) scholarship. These scholars showed an interest in Western learning long before they began to translate Western works and they were originally engaged in their own scientific research as doctors. They happily cooperated with Fryer in translating Western works into Chinese because they were also familiar with Confucianism, which could make it easier for classically educated Chinese readers to understand and accept Western writing.

5 Zhao Yuanyi's translations

The translators played an important role in spreading Western medicine to the East. Fryer dictated his translation of *A Medical Handbook* to Zhao Yuanyi, who then

Figure 3 John Fryer (*Gezhi Compilation*), Vol. 4, No. 5, 1881, p. 10

transcribed Fryer's Chinese translation into *Confucian Medicine*.

However, according to Zhao's disciple Ding Fubao's (丁福保 1873–1950) Zhao Yuanyi biography, Zhao had invited Fryer to help translate Western scientific books. Zhao told Ding that, "From ancient times till now, doctors who were good at medicine (*Yidao* 医道) were really rare, with only 22 people. During the Tongzhi period of the Qing dynasty, the Western gentleman Fryer came to our country, who was interested in any and all kinds of knowledge, especially mathematics and medicine. I did not know the principles of Western medicine until I talked to him from day to night. I invited Mr. Fryer to translate and recorded nine Western books over more than 20 years. I like all translated books, especially medicine, which are very effective for treating diseases."[14] (Fig. 4).

Zhao Yuanyi was a native of Xinyi Town (now Zhengyi, Kunshan) of Jiangsu province. His grandfather Zhao Wenbin (赵文彬 1780–1837) passed the provincial civil service examinations and earned the title of *Juren* (举人 a successful candidate in the imperial examinations at the provincial level) in 1813. Zhao Wenbin learned from famous hometown scholars Wei Sigai (魏思陔)and Xu Xiting (徐西亭), who were the rising stars of the local Xingxi Poetry Society (星溪诗社). Zhao Wenbin read widely, including the classics, histories, philosophies, and anthologies.[15] Therefore, Zhao Yuanyi grew up in the Confucian family (Fig. 5).

Zhao Yuanyi's grandfather-in-law Hua Peien (华沛恩) was the patriarch of the Hua family, a distinguished family in Wuxi, Jiangsu province. Hua Peien was proficient in medicine and he collected hundreds of TCM classics, from *Ling Shu* (《灵枢》 *Spiritual Pivot*) and *Su Wen* (《素问》*Plain Questions*) to the four famous doctors of the Yuan dynasty.

He also personally edited and recorded them. When Zhao Yuanyi was 8 years old, his father Zhao Zhiji 赵之骥 (1804–1847) died. Zhao Yuanyi went with his mother to live at his grandfather-in-law's house. Since young, Zhao


儒門醫學卷上

英國海得蘭撰　英國　傅蘭雅　口譯
新陽　趙元益　筆述

論養身之理

天下之人莫不好生而惡死若無罹法網蹈水火等事壽命未終可不至死昔人云人壽可至七旬稟賦素盛者可至八旬然人壽至八旬者甚少而一生無病之人絕無而僅有推原其故蓋由於不明養身之理或吸污穢之氣或食害人之物或常居暗室中或坐定不行動或令身體過於出力或常勞神思慮或爲狹邪之事則不免於夭札不

儒門醫學上 十

Figure 4 *Ru Men Yi Xue* (《儒门医学》 *Confucian Medicine*)

Figure 5 Statue of Zhao Yuanyi (*Biographies of Scholars in the Qing dynasty*, edited by Ye Gongchuo and painted by Yang Pengqiu, Vol. 2)

Yuanyi had watched his grandfather treated patients. Unfortunately, Zhao Yuanyi's mother died because of a mistake made by a quack doctor. Subsequently, Zhao Yuanyi became eager to study medicine and especially believed in Zhang Zhongjing's medical philosophy. Zhao Yuanyi became famous for his miraculous treatment of illnesses. His grandfather-in-law was a great influence on Zhao Yuanyi's medical skills and noble medical ethics.[16]

When he was 20 years old, Zhao Yuanyi earned the title of *Shengyuan* (生员 examinees passing prefectural tests). During the Taiping Heavenly Kingdom Movement, Rare treasures collected by Suzhou aristocrats were sold on the market. From their collection, Zhao Yuanyi purchased secret books from the Song and Yuan dynasties that had originally been collected by families such as Huang Raopu (黄尧圃 1763–1825) and Wang Langyuan (汪阆苑 1786-uncertain). During this period, Zhao's cousin Hua Hengfang, the son of Hua Yilun, was translating Western books at the Shanghai Translation Center. Hua Hengfang invited Zhao Yuanyi to work with him on proofreading and translation. Zhao then worked at the Jiangnan Arsenal in Shanghai and collaborated with Fryer and Alexander Wylie (1815–1887) in translating Western medical textbooks.[16]

Between 1881 and 1882, Empress Dowager Cixi (慈禧 1835–1908) was ill and ordered the governor to recommend a doctor. Li Wenzhong (李文忠) recommended Zhao Yuanyi. However, when Zhao arrived in Tianjin, the Empress Dowager Cixi had recovered from her illness, so he returned home. In 1888 he ranked 26th in the Jiangnan provincial civil service examination. However, he failed in the Chinese imperial civil service examinations in the following year. Zhao accompanied the Chinese minister Xue Fucheng (薛福成 1838–1894) on a diplomatic tour of Europe, including England, France, Italy and Belgium. According to Ambassador Xue Fucheng's diary, he sent Zhao Yuanyi and an interpreter to Berlin to visit the famous German bacteriologist Robert Koch's laboratory and learn about Koch's new vaccine against tuberculosis. Living in the UK for three years, he suffered from abdominal problems because he was unaccustomed to the bacteria in the water and soil. After returning to China, Zhao Yuanyi continued to work in the translation bureau. In the winter of 1902, Zhao died of dysentery in Beijing. He was survived by two sons: his eldest son Yichen (赵诒琛 1869–1941) and his second son Yijing.[16] Before he died, Zhao Yuanyi and Zhao Yichen built a library called Qiaofanlou (峭帆楼) in the western wing of Jiangnan Arsenal during the Xuantong period. Zhao Yichen was a great book collector and he had engraved the *Qiao Fan Lou Cong Shu* (《峭帆楼丛书》*Qiaofanlou Library Series*) and *You Man Lou Cong Shu* (《又满楼丛书》*Youmanlou Library Series*).

Zhao Yuanyi was not only a prominent classical scholar, but also a scholar in both Chinese and Western medicine. However, at the time of the translation of *Confucian Medicine,* he had not yet gone overseas. According to the book *Xinyang Zhao's Qing Fen Lu* (《新阳赵氏清芬录》 *Xinyang Zhao's Family Biograph*), Zhao came from a Confucianist family and was proficient in medical principles. He was a typical Confucian doctor, with a pure appearance, a happy smile, and a broad mind. His translations of Western medical works expressed his strong Confucianist knowledge. He tried to make Western medicine accessible and relevant to his classically educated readership, just like Hua Shifang's translations of mathematical works. According to Ding Fubao's *Mr. Zhao Jinghan's Family Biography,* Zhao Yuanyi hoped to collect as many excellent Western medical books as he could find, especially essential and extensive books, translate them, and publish them to save Chinese people. Zhao Yuanyi said, "For certain untreatable diseases, our people may use Western medicine to solve them. Our prescriptions can learn from the medical principles of Western countries. The exchange of Chinese and Western medicine will revitalize our country's medicine."[14]

Liang Qichao (梁启超 1873–1929) also spoke highly of *Confucian Medicine*. Liang believed that among the medical books translated in the late Qing dynasty, *Nei Ke Li Fa* (《内科理法》*Internal Medicine*) *and Xi Yao Da Cheng* (儒门医学 *A Manual of Materia Medica and Therapeutics*) were complete. However, Liang considered that the first book to be translated, *Confucian Medicine,* was particularly important because it discussed the principles of health preservation.[17]

Ding Fubao's *Li Dai Ming Yi Lie Zhuan* (卷上 论养生之理 *Biographies of Famous Physicians Through the Ages*) includes biographies of Chinese and Western doctors, such as Zhao Yuanyi and John Glasgow Kerr. In his biography of Zhao Yuanyi, Ding Fubao mentioned that Zhao Yuanyi was an outstanding scholar who published books Zhao Yuanyi was described to have treated peoples' illnesses and saved their lives throughout his life.[18]

Among the intelligentsia, especially those who flourished in the Lower Yangtze Valley, usually called *Jiangnan* (卷中 论治病之法), there was a special group of individuals whose real identity as scholars was concealed in their personas as medical practitioners. The Lower Yangtze River was one of the economic and cultural centers during the Qing empire and had more Confucian physicians than other areas. These physicians practiced medicine to make their living according to their moral ideals. Therefore, their roles as scholars and doctors were blended together. Confucian physicians were qualified to transmit TCM heritage during the tremendous social changes in the late Imperial China. As such, their occupation and social roles were very important. Confucian physicians emphasized the importance of textual knowledge as the sole avenue to the art of medicine and constructed genealogies of physicians parallel to that of the Confucian tradition.[19] During this epoch, Zhao Yuanyi was one of the most outstanding interpreters of medical knowledge; however, even in the interpretation of Western medicine, he emphasized the necessity of TCM knowledge.

Confucian Medicine was the first book Zhao and Fryer translated together; therefore, it was deeply influenced by Confucianism. However, this Confucianization of Western medical knowledge gradually faded with the subsequent large-scale translations of Western medical literature and the improvement in Chinese people's understanding of Western medicine. Nevertheless, when Western medicine entered China in the 1870s, its translations adopted Confucianism's adaptive strategies.

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Ethical approval

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Author contributions

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Conflicts of interest

None.

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OPEN

Edward H. Hume's Contributions to Introducing Chinese Medicine to the West

Ting Gui[1,2,✉]

Abstract

Known as the founder of Xiangya School of Medicine and Xiangya Hospital, Edward H. Hume is frequently praised for his pioneering work in bringing Western medicine to China. Some researchers have investigated his efforts in introducing Chinese medicine to the West; less known is the role that he later played as a lecturer on medical history at Johns Hopkins University. This paper presents an exhaustive review of Hume's English writings on Chinese medicine, thus revealing what Hume did to introduce Chinese medicine to Western academia, and how he pioneered research into Chinese medicine from cultural and philosophical perspectives.

Keywords: Chinese medicine; Edward H. Hume; Medical history; Medical missionary; Medical philosophy

Contacts between civilizations bring about exchanges of ideas and knowledge. As noted by David Hollinger, missionaries were changed by their cross-cultural experiences, and when they went back to America, they changed America.[1] Similar changes also happened to medical missionaries. When they came to China in the late 19th century in the hope of spreading Christianity and Western medicine, they did not foresee the kind of effect Chinese medicine would have on them. However, previous studies on medical missionaries usually emphasized their roles in spreading Western medicine to China,[2] thus consciously or unconsciously ignoring the roles they played in spreading Chinese medicine to the West. Some medical missionaries came to China with a strong background in Western medicine, and a formidable belief in its superiority to Chinese medicine, but came to discover the wisdom of an ancient medicine. One of the representative figures is Edward H. Hume.

Known as the founder of Xiangya School of Medicine and Xiangya Hospital, Edward H. Hume is highly praised for his pioneering work in establishing medical education in China. Before he came to China, Hume had completed a first-rate medical education. He received his B.A. from Yale, and in 1901 earned an M.D. from the School of Medicine of Johns Hopkins University under the guidance of the great physicians William H. Welch and William

Osler. After that, he received a 1-year training at the University of Liverpool. Out of strong love for and indebted to India, where his father and grandfather had both worked as medical missionaries, he accepted the offer of working as an acting assistant surgeon in India from 1903 to 1905. But after 2 years of service and a thorough investigation, he realized that it was impossible to fulfill his dream of opening medical colleges there. So, in 1905, when he was offered the chance to work with Yale-in-China (now known as Yale-China) to establish a medical school, he accepted the opportunity and set out to Changsha, where he established the Hunan-Yale Medical College (now known as Xiangya School of Medicine) and Yale Mission Hospital (now known as Xiangya Hospital), and went on to make the college one of the best medical schools in China. In 1927, he resigned his position as dean and returned to America.

That part of his life, narrated as stories in his well-received autobiography *Doctors East, Doctors West* (Fig. 1),[3] has been remembered and repeatedly told as a part of the history of Xiangya School of Medicine. But the book mentions nothing of his work back in the America; little was known about the efforts Hume made in exploring Chinese medical history.

The main source of our knowledge about Hume's connection with Chinese medicine is from his friend, the Chinese medical historian K. Chimin Wong, who kept in touch with Hume and recorded some episodes of their interactions. Wong wrote a highly complementary review for Hume's book *The Chinese Way in Medicine* (Fig. 2) in 1942,[4] and another two reviews for Hume's autobiography and *Doctors Courageous*, in 1951 and 1952, respectively.[5] In Wong's *Catalogue of Publications on Medicine in China in Foreign Languages: 1656–1962*, Hume's *The Chinese Way in Medicine* was also listed.[6] Based on Wong's introduction, for many years researchers frequently mentioned Hume's autobiography and *The Chinese Way in Medicine*, but few probed into them.

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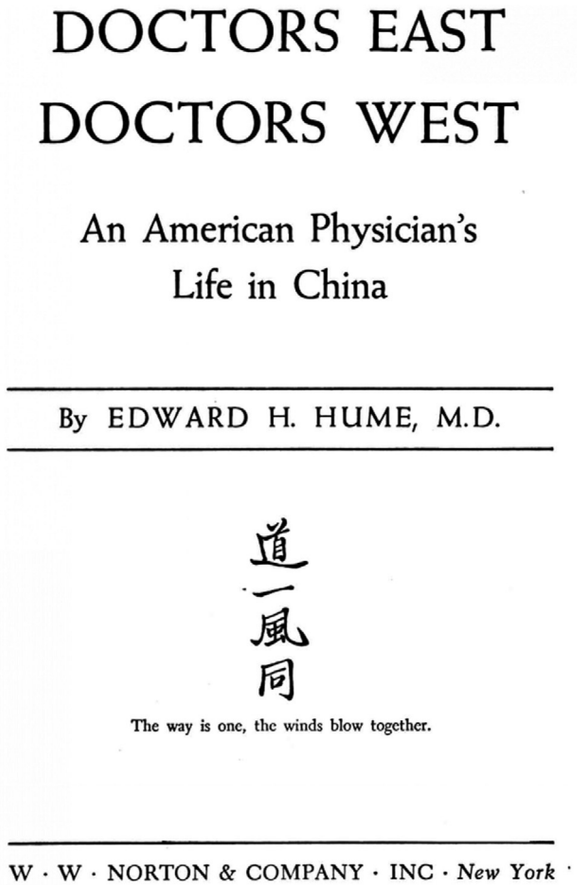
DOCTORS EAST
DOCTORS WEST

An American Physician's
Life in China

By EDWARD H. HUME, M.D.

道一風同

The way is one, the winds blow together.

W · W · NORTON & COMPANY · INC · New York

Figure 1 *Doctors East, Doctors West* (1946) by Edward H. Hume

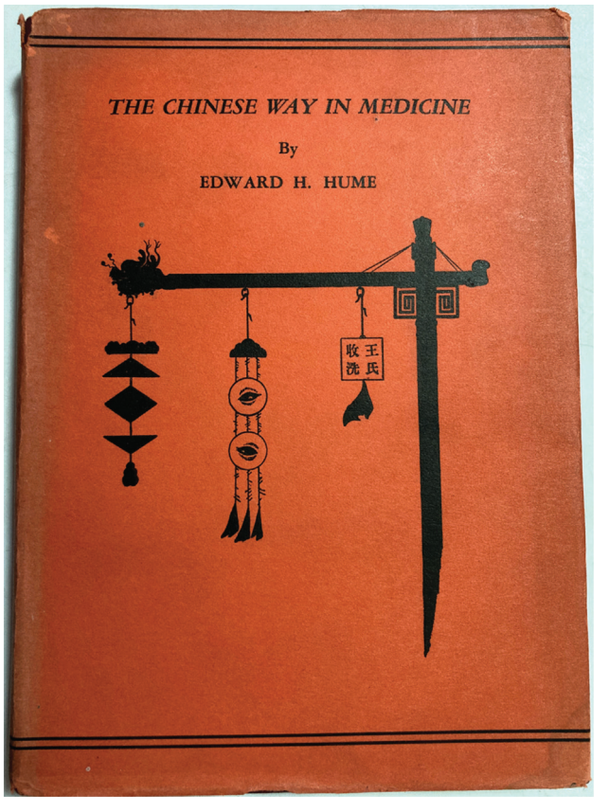

Figure 2 *The Chinese Way in Medicine* (1940) by Edward H. Hume

Recently, as the global influence of Chinese medicine has risen, the long-neglected stories of Western physicians interactions with Chinese medicine have captivated more academic interest. While analyzing the changes in missionaries' attitudes toward Chinese medicine, Tao Feiya suggested that among all the medical missionaries, Hume might have done the most in building bridges between Eastern and Western medicine.[2] Fan Yanni dedicated more pages to discuss *The Chinese Way in Medicine*, which she categorized as a general introduction to Chinese medicine. She concluded that Hume's main contributions to Chinese medicine was his writing of the two books.[7] However, both Tao and Fan fail to note Hume's articles published in the America, and they were not apparently aware of Hume's work as a lecturer in Chinese medicine. It was Lian Xi who explored the personal writings and publications of Hume while writing the book *The Conversion of Missionaries: Liberalism in American Protestant Missions in China, 1907–1932*.[8] He chose Hume as one of three representative examples to show how missionaries' contacts with Chinese culture and religion finally led to their conversions to liberalism. Lian observed that Hume's growing understanding of Chinese medicine partly contributed to his changed perception of religion. Lian's work gives us an insight into the influences of Chinese medicine on Hume. But limited by its religious perspective, his research was unable to reveal Hume's contributions in introducing Chinese medicine to the West. Hume's explorations in Chinese medicine, together with the role that he would later play as a lecturer in medical history, are still largely untapped field of research. Therefore, by presenting an exhaustive review of Hume's English writings on Chinese medicine, this paper will provide a more complete picture of Hume's contributions in introducing Chinese medicine to the West.

1 Interest in Chinese Medicine

Hume's autobiography was published in 1946, but the events in this book happened in his early life as a physician in Changsha, China. Through his vivid recollections, readers can easily sense Hume's positive attitudes toward Chinese medicine. In the prologue, he writes: "Yet within the lifetime of doctors from the West who came and lived understandingly and sympathetically in China, there came about a gradual change in this attitude."[3] The two keywords "understandingly and sympathetically" are frequently quoted by researchers to represent Hume's attitudes toward Chinese medicine. However, Hume's attitude toward Chinese medicine was more than "understanding and sympathetic." The autobiography explains how Hume's strong interest in Chinese medicine began.

He tells the stories of how he encountered Chinese medicine in clinical practice and marveled at its effects. Gradually he also learns to practice pulse diagnosis like Chinese physicians and to administer local Chinese medicine to patients. He expresses his appreciation of ancient Chinese medical classics and wonders at how ancient Chinese physicians "realize the social and religious and economic factors behind the external manifestations of disease."[3] He also befriends a famous

local Chinese doctor, Wang, when they are both invited to treat an important patient. He expresses his admiration for this Chinese physician and warmly invites him to lecture on Chinese medicine in Xiangya. As his wife Lotta Hume recollected later in *Drama at the Doctor's Gate*, "During his years in China, Dr. Ed's absorbing interest had been the study of this ancient traditional Chinese medicine, and his friendship with Dr. Wang was just the opportunity he had been looking for to further his knowledge and appreciation of its basic philosophy and practice."[9]

From 1910 to 1919, Hume also served as an editor of and active contributor to *China Medical Journal*. His 15 articles published in the journal from 1907 to 1919 were mainly related to missionary medical work, especially medical education in China. His interest in Chinese medicine may have already started, but his own understanding of Chinese medicine was yet unpublished.

On June 1, 1923, Hume was invited to give a commencement address at the Jefferson Medical College,[10] where he delivered a speech titled "The Contributions of Eastern Asia to the Science and Art of Medicine." This speech was published in *Science* in 1924 with the revised title "The Contributions of China to the Science and Art of Medicine."[11] In the speech, he introduced Shen Nong (神农), Huang Di (黄帝), Fu Xi (伏羲), He (和), and Huan (缓), highlighted the similarities between Western and Chinese medicine, and led audiences to reflect on the possible links between the development of Eastern and Western medicine. In the third part, he summarized three main sources to explore Chinese medicine: patients' families' knowledge of medicine, ancient Chinese ideographs, and Chinese medical classics. The first of these sources is clearly related to his clinical experience in Changsha. The second source reveals his interest in the cultural aspects of medicine, which would re-appear in his discussions about archaic Chinese characters like "(國)"[12] In the fourth part, he analyzed the supernatural beliefs in Chinese medicine, including animism, and magic and exorcism. Though this part is largely quoted from J.J.M. de Groot, sinologist and historian of religion, Hume's special attention on the supernatural and religious aspects of medicine run through almost all of his writings about Chinese medicine. The fifth part focused on the progress of medicine in China after 250 BCE, and introduced Bian Que (扁鹊), Zhang Zhongjing (张仲景), and Hua Tuo (华佗). The sixth part summarized contributions of Chinese medicine; Hume claimed that China's contributions to the science of medicine include, at the very least, dissection, studies of the circulation, the doctrine of the pulse, and systematic methods of physical diagnosis; further, China's contributions to the art of medicine include massage, acupuncture, cold baths, catheters, inoculation, organotherapy, materia medica, and minerals. His discussion in these last two parts broached the subject of Chinese medical history.

A further analysis of those claims may find Hume's knowledge of Chinese medicine to be largely second-hand information extracted from English articles written by K.M. Wong. But Hume is skillful in cross-cultural communication. He is adept at breaking cultural barriers by relating Chinese medicine to Western medicine and using a vivid and easy-to-understand style to convey to Westerners the greatness of Chinese medicine. This was the first time he introduced the achievements of Chinese medicine to Western audiences. Hume's eloquence and position as a scientifically trained physician and president of Xiangya Medical School made those compliments to Chinese medicine more convincing.

In 1927, owing to the disputes regarding turning over control rights of the Hunan-Yale Medical College to the Chinese, Hume resigned and returned to America. His career as a Western physician and president of Xiangya Medical School ended, but his work in exploring Chinese medicine continued. As Ellsworth C. Carlson comments about Lotta Hume's memoir, "Although they believed that Western medicine had a great contribution to make in China, they were also convinced that the West had much to learn from China."[13] Formerly a pioneer in bringing Western medicine to China, Hume became a pioneer in exploring Chinese medical history and striving to help Westerners learn from Chinese medicine.

2 Exploring Chinese medical history

Back in the America, advocating Chinese medicine became an important part in Hume's life. On May 8, 1929, Edward Hume read his article "Medicine in China, Old and New" at the Meeting of the Section of Historical and Cultural Medicine, N.Y. Academy of Medicine.[14] The article was later published in Volume 2 of *Annals of Medical History* in 1930 and reprinted in *The Open Court* in 1934.[15] In this article, Hume adopted Dr. C.M. Wang of Hangchow's method of dividing the history of Chinese medicine into four periods: the ancient period, the classical period, the controversial period, and the modern period. By describing the achievements, representative works and figures of each phase, he concluded that "modern education is well launched," "the day of Western leadership in medicine in China has well-nigh passed by," and "Westerners need to cooperate with the Chinese in clinical work."[15] Clearly, his growing understanding of the Chinese way in medicine enabled him to see the necessity of medical cooperation; this may explain why, when his suggestion of handing over control rights to Chinese people was refused, he was so disappointed that he resigned.

From 1931 to 1933, Hume worked as the Director of the New York Post-Graduate Medical School. He still actively participated in academic work in medical history. On November 1, 1933, he read another article on Chinese medicine at the Meeting of the Section of Historical and Cultural Medicine, N.Y. Academy of Medicine. This article, titled *A Note on Narcotics in Ancient Greece and Ancient China*,[16] used a comparative perspective to discuss the narcotics found in *The Odyssey* as well as those used by Bian Que and Hua Tuo. He further used his knowledge in pharmacy, Greek and Latin etymology to analyze the possible identity of the narcotics used in ancient China, showing Hume's profound knowledge in both Western and Chinese medicine. His keen interest in exploring the relationship between them may be seen as a continuation of his 1923 speech.

"The Square Kettle," published in *Bulletin of the Institute of the History of Medicine* in 1934, is a better illustration of Hume's deepening understanding of the

value of Chinese medicine. In this paper, he starts his discussion of Chinese medicine by referring to some medical allusions like "square kettle," "the well of the oranges," and "the grove of apricots,"[17] then traces some early attitudes of Western practitioners in China toward Chinese medicine. In the second part, he proposes that superstition in Chinese medicine is not exclusive but common in many cultures. In the third part, he introduced interesting parts of *Xi Yuan Lu* (《洗冤录》*The Washing Away of Wrongs*).[17] He concluded that the three parts are related to three fields worth studying in Chinese medicine, that is "the need for wholly objective research as to the medical philosophy of the Chinese," "the need for scholarly interpretation of the elements of myth and superstition that enter into the practice of Chinese medicine," and "the need for discovery and translation of the great documents on which rests China's claim to have evolved a system of medicine marked by precision of observation."[17] Hume's approach to Chinese medicine is visibly philosophical and religious, and while he read and meditated about Chinese medicine, he had already recognized the cultural aspects of Chinese medicine as well as the value of translating medical classics.

From 1934 to 1937, Hume returned to China on the invitation of the Chinese National Health Administration to conduct a survey of China's medical facilities. He also became a visiting professor at the National Medical College at Shanghai, which was then a newly established college that adopted the Western medical education system to teach medicine. During this period, Edward H. Hume, K. Chimin Wong, and Bernard E. Read established the Chinese Medical History Society in 1935.[18]

On April 6, 1937, in Shanghai, Hume read at the Chinese Medical History Society an article titled "Some Foundations of Chinese Medicine," which was later published in *Chinese Medical Journal* in 1942.[19] In this article, he summarizes the four foundations of Chinese medicine: geographic foundations, ethnic and cultural foundations, social foundations, and psychological and religious foundations. It is a comprehensive summary of all the factors that contribute to the distinct features of Chinese medicine, showing that Hume had formed a broad framework for understanding Chinese medicine. He approached Chinese medicine not merely through medical and religious perspectives but tapped into the social, cultural, and philosophical fields.

In 1937, Hume left China. His work in China was done, but his zest in advocating for Chinese medicine remained throughout the rest of his life; his new role as lecturer in the history of medicine at Johns Hopkins University was set to begin.

3 Lecturer of Chinese Medicine at Johns Hopkins University

While still serving in China, Hume was invited by the Institute of the History of Medicine, Johns Hopkins University to deliver the Hideyo Noguchi Lectures on Chinese medicine. The three lectures were originally scheduled in October 1934 but were postponed because Hume was unable to return from China in time.[20] The lectures were finally delivered on March 7, 9, and 19, 1938, focusing on three subjects: "The Universe and Man in Chinese Medicine," "The Founders and Chief Exemplars of Chinese Medicine," and "Some Distinctive Contributions of Chinese Medicine" [18] (Fig. 3). The content of these lectures was later compiled into a single book named *The Chinese Way in Medicine,* which was published in 1940 as volume IV of the series *The Hideyo Noguchi Lectures*.[21]

On the whole, this book is a culmination of Hume's research on Chinese medicine. Part I discusses China's medical philosophy. Compared with his "Some Foundations of Chinese Medicine," this chapter goes deeper into the cultural roots behind Chinese medicine and focuses more on explaining the cosmic philosophy manifested in various aspects of Chinese medicine. He begins by stating " Chinese medicine teaches that the phenomena that make up health and disease are related to the universe as a whole."[22] He believed that it is the combination of the ethical concepts of Confucianism and religious influences, including Taoism and Buddhism, which have formed the Chinese conceptions of the relationship between universe and humans in medicine.[22] Tao Feiya points out that, although medical missionaries were beginning to objectively evaluate the effects of Chinese medicine, they mostly discussed clinical practices and Chinese *materia medica* because they could not understand Chinese medical philosophy.[2] This chapter proved that Hume had already developed a deep understanding of the philosophical foundations of Chinese medicine, although he still preferred to focus on the supernatural or religious elements in Chinese medicine.

Parts II and III are mostly extensions of his previous work. Part II offers a more detailed introduction of Fu Xi, Shen Nong, Huang Di, Bian Que, Hua Tuo, and Li Shizhen (李时珍). Two anecdotes discussed in "The Square Kettle" regarding the oranges and the well, and the apricot orchard were also added to this part. Part III classified China's medical contributions into four groups: medical libraries and monographs, medicaments, physical therapy, and diagnostic methods. Hume also points out that some monographs on leprosy, beriberi, venereal disease such as syphilis, obstetrics and gynecology, and ophthalmology deserved more attention. In the medicaments part, he also lists some drugs of historical interest. He then briefly introduces physical therapies such as acupuncture, massage, breathing and moxa, and the main diagnostic method, that is, pulse diagnosis.

For an audience who knows Chinese medicine well, this book may provide little new information. The references at the end of this book indicate Hume's knowledge of Chinese medicine mainly rely on secondary literature written in English, and this book is heavily based on progress in the field of Sinology as well as Chinese medical history. This is why it received a harsh book review from professional American Sinologist Derk Bodde.[23] But for Westerners who have had little contact with Chinese medicine, this book may nonetheless be a useful introductory work. It introduces Chinese medicine from a cross-cultural comparative perspective, and vivid pictures were added to illustrate the medical cultures in China. For physicians who want to explore Chinese medicine, this book may serve as a preliminary guide.

After the Hideyo Noguchi Lectures, Hume was appointed lecturer at Johns Hopkins University. He was

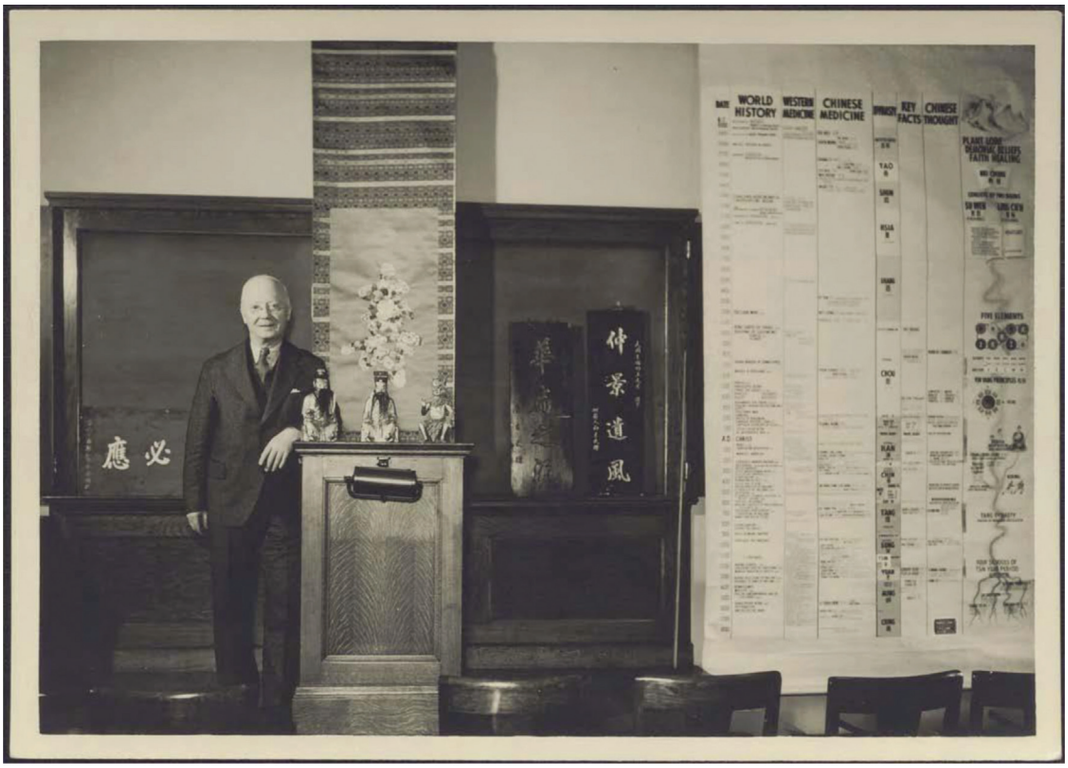

Figure 3 Edward H. Hume delivering Hideyo Noguchi Lectures at Johns Hopkins University in 1938. Photographed by Ed Althausen. Image from Edward H. and Lotta C. Hume Papers (MS 787). Manuscripts and Archives, Yale University Library

already 62 years old. As Director of the Christian Medical Council for Overseas Work, Hume lived mainly in New York but would "come every year to the Institute and conduct a seminar."[24] What the Institute cherished most is that Hume " is one of the few experts on the history of Far Eastern medicine" and "his field of research was not yet represented in the Institute."[24] In other words, Hume's research on Chinese medicine was not only pioneering and valuable, but also met the rising interest in Chinese medicine in the American academia, especially in the field of medical history.

As a lecturer of medical history, Hume held seminars on Chinese medicine from time to time. Courses he taught in those years are listed in Table 1.

He also invited Chinese medicine scholars to lecture at the university. On April 28 and 30, and May 1, 1947, Hume arranged and presided over three seminars delivered by Dr. P.C. Hou (侯宝璋).[30] Dr. Hou came from the College of Medicine of Cheeloo University (now known as Cheeloo College of Medicine, Shandong University) and was most famous for his work as a pathologist. He began publishing articles on Chinese medical history in 1942 and explored Chinese medical classics from the perspective of modern medicine. The subjects of his lectures were "History of Syphilis" and "Smallpox and Diabetes in China."[30] Clearly, these topics had been discussed in Hume's seminars before, and Dr. P. C. Hou's first-hand research into Chinese medical classics may have brought some new insights.

Table 1 Courses taught by Edward H. Hume at Johns Hopkins University, 1941–1955

Academic year	Subject
1941–1942	Dietetics in China[25]
1942–1943	Pediatrics in China[26]
1949–1950	Problems of Chinese Medicine[27]
1951–1952	Problems of Chinese Medicine[28]
1954–1955	Aspects of the History of Chinese Medicine[29]

In 1946, Hume published his autobiography, a book that quickly won The Norton Medical Award for that year.[31] He put his heart into writing it, and the whole book is imbued with his deep appreciation of Chinese medicine. In every chapter, the English title is followed by a Chinese title. Most of these Chinese titles are Chinese medical idioms that express profound medical philosophy or conventional medical practices. Hume also asked his Chinese friends to write calligraphy of the Chinese characters for this book. Thus, this autobiography creates a cross-cultural atmosphere that echoes with his aim of showing "how one American doctor discovered that medicine was a builder of bridges between nations and cultures."[3]

In 1950 and 1952, he published two biographies of medical missionaries: *Doctors Courageous* and *Dauntless Adventurer: The Story of Dr. Winston Pettus*. He never again published a book on Chinese medicine. During those years, Hume was preoccupied with managing medical missionary work, such that he could not concentrate on academic research like his colleagues. He also lacked the training of a professional Sinologist, which prevented him from producing more valuable academic work. Luckily, the next generation of researchers on Chinese medicine had emerged.

In 1943, the Director of the Institute of the History of Medicine at John Hopkins University, Henry E. Sigerist, also an "orientalist," [32] admitted Ilza Veith as his first doctoral candidate and suggested that she takes advantage of her " reading knowledge in Chinese in the translation and analysis of the *Huang Ti Nei Ching Su Wen*."[32] In 1946, Ilza Veith completed her doctoral paper on *Huang Di Nei Jing* (《黄帝内经》 *Huangdi's Internal Classic*). Her analytic work together with the translation was later published as the first English translation of *Huang Di Nei Jing*.[33] In this book, she acknowledged the assistance from Hume and quoted Hume's principal articles on Chinese medicine. English translation of Chinese medical classics, as once envisioned by Hume in 1934, had come true.

Hume wrote two different book reviews for Ilza Veith's *Huang Ti Nei Ching Su Wen: The Yellow Emperor*'s *Classic of Internal Medicine*. One was published in 1951 in *The Far Eastern Quarterly*,[34] a journal specializing in Asian Studies, and the other in the *Journal of the History of Medicine and Allied Sciences*,[35] a medical journal. In these reviews, he tried to exert his influence to raise appreciation of the first English translation of the most important Chinese medical classic in both fields.

Starting with Hume, the Institute of Medical History of Johns Hopkins University maintained an interest in Chinese medicine. In 1950, Joseph Needham was invited to be the ninth Noguchi Lecturer and delivered three lectures on Chinese science. This was the second time that a Noguchi Lecturer had discussed Chinese medicine, with Hume being the first. The lectures on April 26, 27, and 28, were respectively " The Fundamental Ideals of Chinese Science," "Human Laws and Law of Nature in China and the West," and "Some Chinese Contributions in Biology and Medicine," [27] all of which were parts of Needham's forthcoming book *Science and Civilization in China* (Volume I), which later published in 1954. Clearly elements of these topics have been discussed previously by Hume on various occasions. In 1955, Hume also wrote a book review titled "An Empire of Learning," highly praising Needham's work as " monumental."[36] Hume had always tried to help the West to appreciate the unrecognized contributions of Chinese medicine to the world, and in this book Joseph Needham surpassed Hume by extending the scope from the medical field to the entire sphere of science.

On January 14, 1953, Hume read his "Relationships in Medicine between Asia and the Western World" at the Section on Historical and Cultural Medicine of the New York Academy of Medicine. That was his last published article on Chinese medicine. Despite the broad scope implied by "Asian," this article mostly focused on Chinese medicine. Contrary to his hesitant speculation in 1923, this time he affirmed the existence of an early relationship in medicine between East and West. By tracing how Ma Huang (麻黄 *Herba Ephedrae*) in Chinese medicine was transformed into the Western drug ephedrine, he illustrated how a "traditional belief has become a rational therapy"[37] through cooperation in the medical field across nations. He again emphasized Western medicine's debt to Asian medicine, and appealed for more appreciation of Asian national medicines. He pointed out clearly that, " Chinese medicine is not to be judged merely by its elements of magic and superstition or by its cosmic and animistic theories. It was a reflective philosophical system, always thinking of man in his relationship to the vegetable and animal kingdoms as well as to man and other animals."[37] Like many other medical missionaries, Hume was obsessed with the superstitious and religious elements in Chinese medicine for most of his life. He frequently associated magic, exorcism and superstition with Chinese medicine in his writings. But now he realized that this widespread preconception hindered people from truly appreciating the valuable part - the philosophical system of Chinese medicine. The latter was what he had hoped people would learn.

In 1957, Hume died at the age of 80. After his death, his family, friends and colleagues supported the establishment of the Edward H. Hume Memorial Lectureship at Yale "to bring to Yale eminent scholars of East Asian studies."[38] The first Hume lecturer, in 1960 to 1961, was John K. Fairbank from Harvard University, the most prominent scholar in Chinese studies at the time. For the next 60 years, the most influential scholars in Chinese studies were invited to Yale, including significant researchers in the field of Chinese medicine like Peng-yoke Ho (1968–1969), Nathan Sivin (1980–1981), Arthur Kleinman (1984–1985), Charlotte Furth (1986–1987), Benjamin Elman (2006–2007), and Angela Leung (2012–2013). The Hume Memorial Lectureship not only follows recent developments in Chinese studies, but also monitors outstanding research on Chinese medicine. Hume pioneered the research into Chinese medicine from cultural and philosophical perspectives, and his efforts in introducing Chinese medicine had a positive and lasting impact. His contributions to spreading Chinese medicine to the West should not be ignored.

Edward H. Hume's reception of Chinese medicine also inspires us to reconsider the value of Chinese medicine. His story challenges the old assumption that anyone with scientific training could not possibly believe in Chinese medicine. In Hume's case, a well-trained Western doctor became an ardent lover of Chinese medicine and actively shared his knowledge of it with Western audiences in academia. Despite the cultural barriers between the East and West, understanding is possible. If we dig further into the history of medical communications between the East and West, we are likely to find more examples of mutual learning. That is why, it is meaningful to rediscover Chinese medicine through the eyes of Western physicians like Edward H. Hume.

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Ethical approval

This study does not contain any studies with human or animal subjects performed by the author.

Author contributions

Ting Gui wrote and reviewed the article.

Conflicts of interest

None.

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Special Section on Sinology

CHINESE 中医药文化 MEDICINE AND CULTURE

OPEN

Tributary Medicine System of the Qing Dynasty: A Preliminary Study

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Abstract

Medicine was one of the articles of tribute paid by other countries and kingdoms to the imperial court of the Qing dynasty (1644–1912). The act of paying tributes and the rituals associated with it enhanced communication and helped establish relationships between ancient China and other nations or territories. The imperial court was generous in return, which attracted many countries to pay tributes. This paper analyzes how medicines as tributes played an important role in consolidating the dominant status of ancient China, and in promoting the exchange of knowledge between Chinese and Western medicine.

Keywords: Sino-western interaction; Medical knowledge exchange; Medicine as tribute; Qing dynasty; Suzerain-vassal relationship

In the current context of globalization, exchanges between China and other countries in the fields of culture, economy, and medicine are pervasive. In ancient times, trade, tribute, and gifts from envoys were arguably the primary means of cultural and economic exchange between countries. "Paying tribute" was employed as a means for the central government to strengthen its management over local governments and officials, to communicate with surrounding countries, and to gather unique products from home and abroad for the imperial court. The domestic provinces, vassal states, officials, and some foreign countries paid tributes to the court, in the form of tea, medicine, animals, cloth, and weapons. Medicine was the most unique article. As this system evolved, a unique tributary system involving medicinal texts and substances was established.

The tributary system of medicine in the Qing dynasty (1644–1912) was an innovative iteration of the system of tribute that existed throughout the dynasties of ancient China. In the Qing dynasty, there was a significant influx of ideas and goods from Western civilization into China (Fig. 1), but it is important to note that these exchanges were mutual in nature, with China also exerting considerable influence on Western countries during this period. All of these medical exchanges enriched the quantities and types of medicines in the imperial court of the Qing dynasty, and became the impetus for innovations in both the theories and clinical practices of Chinese medicine.

1 Sources of medicines as tributes in the imperial court of the Qing dynasty

Medicines as tributes from various places within and beyond China flowed into the imperial court.

1.1 Domestic tribute

As there were many people in the imperial court, the amount of medicine needed for treating sickness and for daily health care needs was considerable. In addition, the emperor often gave medicines to ministers of the political circle. Therefore, the imperial court had to either receive medicines as tributes or buy medicines to meet this substantial demand.

1.1.1 Tributes from provinces and vassal states

In the early days of the Qing dynasty, the imperial court established a tribute system of medicine that stipulated that " each province should pay a certain amount of good-quality medicines as tributes on an annual basis, and if these are insufficient, they should make up the difference with money or grain."[1] This policy continued throughout the Qing dynasty. Even when the country was in turmoil due to famine or military conflict, making it impossible to offer other goods, Qing officials continued to pay tribute to the court with Chinese and Western medicines. This can be confirmed by the imperial edict issued by Emperor Guangxu shortly after the Boxer Rebellion in the 27th year during the reign of Emperor Guangxu (1901), "except for tea and medicinal materials, all other items of tribute shall be stopped forever."[2] According to local

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Figure 1 Part of the painting *Paying Tributes of All Nations.* Note: This is a painting on silk by an anonymous court painter of the Qing dynasty, which now is in the Palace Museum in Beijing. This figure is from the Palace Museum'sofficial website (https://www.dpm.org.cn)

chronicles and related literature, there were medicinal tributes from 21 provinces and vassal states, including Anhui, Jiangxi, Fujian, Guangxi, and Guangdong in China during the Qing dynasty, with Guangxi and Guangdong provinces providing the largest number and varieties of medicines. According to the *Guang Xi Tong Zhi* (《广西通志》 *Guangxi Annals*), Guangxi provided Cao Guo (草果 *Fructus Tsaoko*), Sha Ren (砂仁 *Fructus Amomi Villosi*), Chen Xiang (沉香 *Lignum Aquilariae Resinatum*), Rou Gui (肉桂 *Cortex Cinnamomi*), and Mo Yao (没药 *Myrrha*) each year.[3] The medicines that Guangdong paid as tributes were *Lignum Aquilariae Resinatum*, Jiang Xiang (降香 *Lignum Dalber-giae Odoriferae*), Wu Mei (乌梅 *Fructus Mume*), Gui Zhi (桂枝 *Ramulus Cinnamomi*), and *Fructus Amomi Villosi*.[4] In contrast, tributes from vassal states were primarily cattle, sheep, and melons and fruits, with occasional gifts of Xing Ren (杏仁 *Semen Armeniacae Amarum*) and other medicines. Being the most important sources of medicines in the imperial court, tributary medicines from provinces and vassal states had ensured the quality of medicines and strengthened the management over local governments.

1.1.2 Tributes from officials

Most commonly, officials paid tribute with locally-produced medicines. For example, on August 26 of the 11th year during the reign of Emperor Yongzheng (1833), Er Mida (鄂弥达), governor of Guangdong, paid tribute items, including a box of *Lignum Aquilariae Resinatum* and nine boxes of Dongguan incense.[5]

After quinine provided by missionaries cured Emperor Kangxi's malaria (1661–1722), the emperor's interest in Western medicine grew. The ministers in the provinces often looked for Western medicines to present them to the emperor, hoping to win his favor and thus gain promotion. For example, items presented by Man Pi (满丕), governor of Guangdong, included quinine, *Fructus Amomi Villosi, Lignum Aquilariae Resinatum*, amber, and snuff.[6]

The tributary medicines from the officials in the Qing dynasty enabled the emperors to enjoy rare medicines from all over the country. Since the tribute items were given based on the emperors' preferences, they provided a window on the items they most valued.

1.2 Extraterritorial tribute

To promote communication between countries and maintain friendly relations with the Qing court, both neighboring vassal states and European countries such as Italy and Portugal paid tributes to the court. Individuals or groups of missionaries paid tribute to the imperial court to expand their missionary influence and introduced many Western medicines to ancient China in the process.

1.2.1 Tributary medicine from affiliated countries

During the Qing dynasty, countries such as Joseon (Korea), Ryukyu (Japan), Annan (Vietnam), Siam (Thailand), Nangchao (Laos), Sulu, Nam Chung, Myanmar, Portugal, Italy, and Britain paid tributes to China. The imperial court made rules on the timing of tributes for some countries: 4 per year for Joseon, every 2years for Ryukyu, every 3 years for Annan, every 3 years for Siam, every 5 years for Sulu and Nam Chung, and every 10 years for Myanmar.[7]

During the 60th year of Emperor Qianlong's reign (1795), Siam's tributes included Tan Xiang (檀香 *Lignum Santali Albi*), *Lignum Dalbergiae Odoriferae*, *Lignum Aquilariae Resinatum,* Bai Dou Kou (白豆蔻 *Fructus Ammomi Rotundus*), and Su Mu (苏木 *Lignum Sappan*).[8] Records also show that Siam gave *Fructus Ammomi Rotundus*, *Lignum Santali Albi* and other medicinal substances during the 14th year of Emperor Jiaqing's reign (1810).[8]

A B C

Figure 2 Existing relics of medicine as tribute in the collection of the Palace Museum. Note: A, B and C are San Qi (三七*Radix et Rhizoma Notoginseng*), Ru Xiang (乳香*Olibanum*), and balsam oil (a Western medicine), respectively. All images are from the Palace Museum'sofficial website (https://www.dpm.org.cn)

The foreign tributary medicines varied widely and were given in large quantities. To a certain extent, this satisfied the Qing court's demand for high-quality medicines. Through this process, many new medicines were also introduced to China. This greatly enriched the varieties of medicines available.

1.2.2 Missionary tribute

Catholicism was first introduced to China when Matteo Ricci came as a missionary during the Ming dynasty (1582). During the early Qing dynasty, Catholicism developed rapidly in China, and the number of believers increased to as many as 150,000.[9] As the rulers' attitudes changed, Western missionaries were even allowed to extend their proselytizing activities to the court itself. Among all emperors of the Qing dynasty, Emperor Kangxi was the most interested in Western ideas and ways of life. He often asked his ministers about the living conditions and activities of Western missionaries, and he expressed the idea of asking some missionaries to work at the court many times. In his 57th year of reign (1718), he asked Yang Lin (杨琳), the governor of Guangdong and Guangxi, to pay attention to the movements of the Westerners who came to China and send those who possessed Western knowledge and medical skills to his palace.[10]

In order to gain favor and be granted more freedoms for missionary work, the missionaries presented Western items to the emperor. In fact, the medicines they offered as tributes were the main source of Western medicine during the Qing dynasty. Often, the tributary medicines provided by missionaries were unique. For example, in March of the 48th year of Emperor Kangxi's reign (1709), "Jing Mingliang (景明亮) paid a case of wine and a bottle of medicine as tributes."[11] On April 14, the 18th year during the reign of Emperor Qianlong (1753), the Jesuits Lin Deyao (林德瑶) and Zhang Jixian (张继贤) paid of a box balsam incense, and a box of balsam oil as tributes.[12]

It is worth mentioning that the missionaries also made offerings to the emperor in the names of the churches they belonged to. Many items presented were Western medicines, including theriaca (Note 1) and others. On March 26, the 48th year of Emperor Kangxi's reign (1709), "The Ganzhou Prefecture Catholic Church presented six bottles of foreign wine and a box of theriaca."[12]

Missionaries introduced several Western medicines to the court, and their presence promoted the development and use of Western medicine there. This mutual benefit allowed missionary work to reach a peak during the reign of Emperor Kangxi.

2 Types of tributary medicine

Tribute medicine can be divided into three types based on their origins: authentic medicinal materials (medicinals with the most optimal quality), foreign substances already being regarded as a part of Chinese materia medica, and foreign Western medicines (biomedical drugs) (Fig. 2).

2.1 Authentic medicinal materials

The emperors of the Qing dynasty stipulated that each province should provide the tribute of local authentic medicinal materials every year, and these should be graded as excellent in terms of quality and characteristics.[13] This ensured the effectiveness and quality of the medicine used in the court.

Provinces and officials usually paid tribute by offering the authentic medicinal materials that were famous in their areas. Of the medicinal materials paid, Jiangsu and Anhui provinces gave 500 *jin* (a unit of mass equivalent to 596.82 g) of *Fructus Mume* to the Ministry of Households every year. Jiangxi province gave 290 *jin* of Wu Bei Zi (五倍子 *Galla Chinensis*) and Guangdong province needed to pay 300 *jin* of *Lignum Aquilariae Resinatum*.[14] The officials also included many other authentic local medicines as tributary medicines. For example, Sun Shiyi, the governor of Sichuan province, presented authentic medicines such as Niu Xi (牛膝 *Radix Cyathulae*), Bei Mu (贝母 *Bulbus Fritillariae Cirrhosae*), and Chuan Xiong (川芎 *Rhizoma Ligustici Chuanxiong*) during the 59th year of the reign of Emperor Qianlong'sreign (1794).[15]

These tributary medicines were frequently given in large quantities, and were some of the most commonly used medicines in the court.

2.2 Imported Chinese materia medica

From the Eastern Han dynasty (25–220 ACE) to the Qing dynasty, 229 types of foreign medicines were introduced to China and became part of Chinese materia medica. They were clearly recorded in the mainstream herbal monographs of each dynasty.[16] A large number of medicines were introduced into China from abroad, continuously increasing the number of substances that were incorporated into traditional Chinese medicine in the process. These medicines may have no medicinal value in

their countries of origin, but after being introduced into China as tributes and continuous attempts of traditional Chinese medicine physicians, these foreign medicinal substances have become an indispensable part of traditional Chinese medicine and are widely used in daily life.

With the expansion of territorial area and advancement in planting technology, some of these medicines began to be planted locally. However, some medicines could not grow domestically, including Ru Xiang (乳香 *Olibanum*), *Myrrha* that grew in Somalia, Ethiopia, and the Arabian Peninsula. And the quality of domestic *Lignum Aquilariae Resinatum* and Ding Xiang (丁香 *Flos Caryophylli*) was poor. These medicines needed to be brought abroad or got from the tributes of foreign countries to meet the considerable demand. For example, in the 6th year (1667) and 9th year (1670) of Emperor Kangxi's reign (1667), Italy and Portugal sent gifts such as *Olibanum*, *Flos Caryophylli*, and *Lignum Aquilariae Resinatum*.[4,17]

2.3 Western medicine

Western medicine (Note 2) was an important aspect of tributary medicine during the Qing dynasty. Western missionaries, Catholic churches and rulers paid tributes of Western medicine in their names to the imperial court. Through the form of tributary medicine system, many Western medications were introduced into China. The most common tributary Western medicines were theriaca, balsam, balsam oil (incense). For example, Western medicines such as balsam oil were paid in tribute by Portugal during the 59th year of Emperor Kangxi's reign (1720).[4]

The introduction of Western medicine gradually contributed to the transition from traditional Chinese medicine to Western medicine that occurred in China. This paralleled the development of Western medicine and changes in the healthcare systems of neighboring countries in the same period.

3 Application of medicines as tributes in the Qing court

3.1 Substances used to treat diseases

Most medicines that came to the Qing court via the tribute system were used for medicinal purposes. For example, betel nut, which is now used in traditional Chinese medicine, and theriaca, which is used in Western medicine, were introduced to the Qing court via the tributary system. They are discussed below in detail.

3.1.1 Bing Lang (槟榔 Semen Arecae)

Bing Lang (槟榔 *Semen Arecae*) was used to repel parasites, eliminate food stagnation, remove water retention, and invigorate qi. Betel nut was a representative tributary medicine widely used in the Qing court as the court recognized its medicinal value. According to the *Qing Gong Yi An Yan Jiu* (《清宫医案研究》 *Medical Cases Study of the Qing Dynasty*), there are 153 reported cases of using *Semen Arecae* in the Qing court, during the reign of Emperor Guangxu (1872–1908). Frequent use made demand so great that it required tribute from multiple sources to achieve adequate supplies. During the Qing dynasty, betel nut was paid to the court by Guangdong, Guizhou, and Yunnan provinces, as well as Vietnam and Gorkha. Two applications are described below.

When the Emperor Guangxu was near his death, betel nut appeared many times in the prescriptions written for him by his physicians and registered in court records. For example, on October 20 of the 34th year of his reign (1908), the imperial physician used Wu Zhi Sheng Jing Decoction (五汁生津液), which contained *Semen Arecae* juice, to improve Emperor Guangxu's physical condition.[18]

On April 26, the 32nd year of Emperor Guangxu's reign (1906), records say that the empress accumulated heat and dampness in her spleen and stomach and caught a cold. She experienced dizziness, body pain, abdominal pain and suffered five bouts of gelatinous-like diarrhea. She used Jie Biao Hua Shi Zhi Decoction (解表化湿滞饮) which contained *Semen Arecae*.[18]

3.1.2 Theriaca

Theriaca was a Western medicine that was introduced to the Qing dynasty. Domestic officials, missionaries, and Catholic churches all paid theriaca as tribute. It was often used to treat toxins, cold gas, abdominal pain, and weakness of the spleen and stomach.[19] According to records, it was used 11 times in court, as shown below.

In May of the th year reign of Emperor Kangxi (1705), *Baoshou A Ge* (prince) developed symptoms of "weakness of the spleen and stomach, vomiting, pain in the chest and subcostal region, general fatigue, and no desire to eat or drink." Doctors Wang Pei (王培) and Li Yingzi (李颖滋) gave him theriaca and another Western medicine used to treat digestive diseases.[18] In September of the 45th year of Emperor Kangxi's reign (1760), the Eighth *Beile* (prince) had a headache and abdominal pain, and chills and fever similar to malaria. He developed a red rash and felt dizzy. The doctor suggested using theriaca to treat the rash.[6] In June of the 48th year of Emperor Kangxi's reign (1709), a Western visitor named Antoine Thomas became severely ill. Theriaca was requested for him to be administered in combination with a soup recipe.[6]

On August 24 of the 48th year of Emperor Kangxi's reign, the imperial bodyguard Na Ershan (那尔善) asked for medical treatment. The doctor noted, "Na Ershan has pain from the waist to the navel, is vomiting, dizzy and does not want to eat or drink." The physician proposed the use of theriaca for treatment.[6]

In the same month, Zhang Yushu (张玉书), a senior scholar in the cabinet, fell ill with "a mild swelling of the eyes, face, hands, and feet, and a burning sensation on his face." There were also nausea, abdominal distention, abdominal pain, and diarrhea. After taking theriaca along with Shen Shi He Zhong Decoction (渗湿和中汤), "his nausea, distension, pain, and other symptoms were improved slightly, and his diarrhea was also slightly relieved."[6] In June of the same year (1710), assistant minister of the Lifan Department, Jian Liang (荐良) was diagnosed with "deficiency of the spleen and lung, along

with cold, asthma and distention." The doctor suggested treatment with theriaca and Modified Shi Pi Decoction (加减实脾饮).[6]

When someone in the court suffered from an illness, theriaca was usually used to relieve the symptoms. This medication was so effective that people would opt for theriaca as first-line treatment when they heard of a similar disease. A record was found regarding this situation on August 25 of the 51st year of Emperor Kangxi's reign (1712): "Since the beginning of autumn, Commander-in-Chief So Nai (索奈) has been suffering from diarrhea. He has to run to the toilet four or five times day and night. After taking medicine, he did not feel better, so he stopped taking medicine. The Emperor Kangxi replied, 'Have you told him to take theriaca?'"[6]

Although theriaca is very effective for some diseases, there were some cases in which the theriaca failed to have the desired effect. In June of the 43rd year of Emperor Kangxi's reign (1710), second-class bodyguard named Jing Sile (井四勒) became ill. His disease was considered to be due to heat-toxin. However, because a skin rash did not completely erupt on the surface of his skin, the heat-toxin couldn't be expelled from his body. He was vomiting and had diarrhea, thirst, and delirium. His illness was thought to be severe; the royal physician asked three times for a total of six doses of theriaca. After the first dose, the skin rashes gradually spread, but the other symptoms persisted. After the second dose, the subject was given a combination of Modified Yin Chen Wu Ling Decoction (加减茵陈五苓汤), but the treatment was ineffective. The patient developed jaundice and bled from his nose and mouth. The third time, he took Modified Yin Chen Tui Huang Decoction (加减茵陈退黄汤), yet the treatment was still ineffective.[20]

In May 16 of the 49th year of Emperor Kangxi's reign (1710), "Hua Se (华色), the General Secretary of Guangzhou province, sought medical treatment for his carbuncle. Doctor Sun Zhiding (孙志定), Ma Qian (马谦), and others diagnosed Hua Se's disease. They said Hua Se sought medical treatment on the sixth or seventh day ofhis illness. The sore had already become more than 6 inches in size and was very serious. The doctors asked to use theriaca and a Western topical ointment. They promised that they will do their best to treat Hua Se."[6] Nevertheless, either because Hua's illness was too severe or because theriaca did not effectively treat the disease, Hua died on the 22nd.

The application of theriaca within the Qing court was the first time that a Chinese court had accepted Western medicine to be used side-by-side with traditional Chinese medicine.

3.2 Medicines as rewards

Medicines brought to the court were often given as gifts from the emperor to ministers or military troops and officials. A good example is the Western medicine balsam oil used for treating wounds from knife or sword blades. On January 20 of the 12th year of Emperor Yongzheng's reign (1734), Vice General Ce Ling of Khalkha reported that balsam oil was very useful on the battleground and asked the Imperial court to give them more. On February 6th, 40 bottles of balsam oil were sent to the Northwest Military Camp. Balsam oil played an essential role at the battleground. In the 13th year of Emperor Qianlong's reign (1748), a battle between the Qing army and Jinchuan was in its most intense stage. On November 29th, the Qing court gave two bottles of balsam oil to its soldiers. In a separate incident, 12 bottles of balsam oil were sent to the frontline while the Qing army was suppressing the rebellion of Hezhuo in March of the 24th year of Emperor Qianlong's reign (1772).[21]

In addition to Western medicine being sent to the barracks, there are records of ministers asking the emperor for Western medicine. In June of the 55th year of Emperor Kangxi's reign (1716), Zhao Hongxie complained of severe pain in his left leg whenever he was caught in the rain. He wrote a message to the court, "I heard that the emperor has the imperial medicinal wine that can remove the wind dampness and dredge channels and collaterals. I must beg the emperor for this wine." Emperor Kangxi replied, "The original medicine is not a wine. It needs to be soaked for a day and a night. When used with wine, it is best in reducing phlegm; however, it can cause vomiting and diarrhea if used in excess. Do not take more than 2 *qian* (1 *qian* = 3.72 g) of wine. Using the medicine before the wine goes bad." In the same year, on July 11, Zhao Hongxie wrote back to the emperor, "I have been taking this medicine for 7 days now. I feel warmth in my left leg that gradually moves up and extends to my knee. Whenever this effect appears, my pain diminishes. I can also walk a little more. Since I took this medicine, I have been feeling better day by day."[22] Emperor Kangxi's familiarity with Western medicine enabled him to clearly state the cautions and application methods of each medicine when dispensing it to his court officials.

While maintaining the boundary between the emperor and court officials, these rewards reflected both the emperor's love for his courtiers and his concern for frontier defenses. The medicines as rewards are essential for strengthening his rule and consolidating his power.

3.3 Medicines as ornaments

Tributary medicine was also used in the palace for ritual sacrifices, and for producing beads and craft decorations.

Lignum Aquilariae Resinatum and *Lignum Dalbergiae Odoriferae* were often used for worshipping activities in the Qing court. During the Qing dynasty, Tibetan Buddhism was the primary belief system of the imperial court, and Tibetan incense was usually used as sacrifices in Buddhist temples. *Lignum Aquilariae Resinatum* was the most used incense medicine in the Qing court. Thirty-seven years after Emperor Qianlong ascended the throne (1736–1773), records show that more than 105 *jin* of *Lignum Aquilariae Resinatum* had been used in 47 temples in the court.[20] Due to the number of palace sacrifices there was a great demand for these materials, all of which came from tributes paid by foreign countries, missionaries, officials, and local governments. For example, in the 6th year of Emperor Kangxi's reign (1667), Vietnam sent 962 *liang* (1 *liang* = 37.3 g) of *Lignum Aquilariae Resinatum* as tribute.[23]

Articles such as *Lignum Aquilariae Resinatum* and coral presented as tributes to the courtwere often kept in the court as decorations, in the form of beads and ornaments,

or presented to ministers. For example, in July of the 9th year of Emperor Yongzheng's reign (1731), the general manager of the Imperial Household Department, Hai Wang (海 望), conveyed the emperor's instructions to the workers to make five plates of *Lignum Aquilariae Resinatum* beads. In November of the 10th year of Emperor Yongzheng's reign (1732), Liu Yu (刘玉), and Lv Dianchao (吕典朝), Yongzheng's assistants, conveyed the emperor's instructions to the workers to make a plate of balsam incense beads.[24]

4 Characteristics of the tributary system of medicine in the Qing dynasty

4.1 Various forms of tribute

The most distinctive feature of the tributary system is the multiple forms that tributes would take. Tributes can be divided into different types according to payer, region, time, and the medicine offered.

During the Qing dynasty, there were regulations on the types and quantities of tributary goods paid by several regions of China. For example, the annual tributary amount from Guangxi province included *Cortex Cinnamomi*, San Qi (三七 *Radix et Rhizoma Notoginseng*), and Qian Nian Jian (千年健 *Rhizoma Homalomenae*). The Ministry of Rites received 100 *jin* of *Fructus Tsaoko,* 500 *jin* of *Fructus Amomi Villosi*, 16 *jin* of Jiang Huang (姜黄 *Rhizoma Curcumae Longae*), 41 *jin* of talc, more than 16 *jin* of *Rhizoma Homalomenae*, as well as other medicines.[4] The Qing court had also set regulations for official tribute. The officials who were required to pay tribute included governors, generals, salt officials, frontier governors, and weaving governors (an official who supervises the silk weaving and dyeing industry). There were several festivals at which paying tribute was expected, including the Annual Tribute and the Dragon Boat Festival.[14]

Tributes from foreign countries occurred in two forms: formal tribute and extra tribute. During the Qing dynasty, the medicines required to be contributed by vassal states were clearly stipulated, and these were referred to as formal tribute. The Qing government created regulations regarding the items and their quantities to be contributed by vassal states such as Joseon, Annan, and Ryukyu. For Joseon, the Qing court stipulated that it should contribute 200 *jin* of medicine; for Ryukyu, provisions for agate, *Lignum Dalbergiae Odoriferae*, Mu Xiang (木香 *Radix Aucklandiae*) and others were stated; for Annan, it was required to contribute *Lignum Aquilariae Resinatum*, *Lignum Dalbergiae Odoriferae*, and others. The Qing court did not demand other countries to pay tribute, although some did so.

In addition to these formal tributes, some countries would pay tribute whenever important events occurred, which were called extra tribute. When a minister was called upon to state his opinion or explain something to the emperor through an audience or proclamation, he would also give tribute at this time, which are often used to offset the formal tribute of next year. In the 6th year of Emperor Qianlong's reign (1741), gifts of gratitude from Ryukyu could be used to offset the tribute of the 8th year of Emperor Qianlong's reign (1743).[18]

Through the tributary system of medicine, all kinds of genuine and rare medicines from different regions were offered to the court, greatly enriching the types and quantity of medicine in the court.

4.2 Rich variety of medicines as tributes

During the Qing dynasty, various kinds of Western medicines and traditional Chinese medicines were used as tributary medicines, most of them were local specialties (authentic medicines described above). The Dragon Boat Festival tribute of the governor of Sichuan included Fu Ling (茯苓 *Poria*), Huang Lian (黄连 *Rhizoma Coptidis*), Chuan Niu Xi (川牛膝 *Radix Cyathulae*), *Rhizoma Ligustici Chuanxiong*, and Chuan Beimu (川贝母 *Bulbus Fritillariae Cirrhosae*)[14] This tribute primarily included authentic medicinal materials from Sichuan province. Foreign tributary medicines included traditional Chinese medicines and many Western medicines such as theriaca. For example, the Jiangxi governor Tingji Lang presented the emperor with a bottle of Xi Hong Hua (西红花 *Stigma Croci*), balsam, snuff, and others.[25]

4.3 Generous reward for tribute

The tributary medicine system of the Qing dynasty retained the practice of generously rewarding tributes that was established by former dynasties. The imperial court adopted this form of return to show the Qing government's care and consideration for the tributary states and to maintain the dignity of the suzerain state. These rewards often included reciprocal tributes to the tributary states as well as rewards to the royal family and the tributary envoys. Most of the gifts are domestic goods, primarily silk cloth. For example, Ryukyu was presented with brocade, gauze, and silk for their regular tributes.[14]

Additionally, some countries that paid tribute promptly would be given additional rewards, and the number of goods rewarded would increase over time.[26] This kind of rewarding behavior demonstrated the concept of "receive less tribute and send more gifts to other countries in return" in the tributary medicine system of the Qing dynasty.

This custom of reward played an essential role in strengthening the position of the Qing government and improving relationships between China and other countries.

5 Impact of the Qing dynasty tributary system of medicine on the development of medicine in China

5.1 Abundant and growing resources for medicine in China

Over time, newly introduced medicines increased the number of Chinese medicines in use. With the expansion of ancient China's diplomatic efforts, foreign medicines accounted for an increasingly large proportion of Chinese materia medica. There were only six foreign medicines listed in the *Shen Nong Ben Cao Jing* (《神农本草经》 *Shennong's Classic of Materia Medica*), which was published around the Eastern Han dynasty (25–220). By the time of the Ming dynasty (1368–1644), the number of foreign medicines recorded in the *Ben Cao Gang Mu* (《本草纲目》 *Compendium of Materia Medica*) had in-

creased to 181. According to the *Ben Cao Gang Mu Shi Yi* (《本草纲目拾遗》 *Supplement to Compendium of Materia Medica*), 48 foreign medicines were introduced to China during the Qing dynasty alone.[16] In addition, a large number of Western medicines were introduced. According to the *Han Xiu Cao Tang Bi Ji* (《寒秀草堂笔记》 *Hanxiu Cottage Notes*), 122 kinds of Western medicine were stored in the Wu Ying palace (武英殿) at that time.[27]

A large number of Chinese and Western medicines as tributes made the types of medicines in the Qing dynasty grow exponentially. And at the same time, ancient China's pharmaceutical industry was gradually developing.

5.2 Combining Chinese and Western medicine

During the Qing dynasty, Western medicine was introduced to the imperial court for the first time and its actual medical uses were first recorded. After quinine was used to cure Emperor Kangxi of malaria, the status of Western medicine began to rise in the court. When royal officials or ministers could not be cured, they would consider using Western medicine for treatment.

The exchange between Chinese and Western culture also includes the combination of Chinese and Western medicine. During Emperor Kangxi's reign from the 43rd to the 50th year (1704–1711), theriaca was used in combination with Modified Yin Chen Wu Ling Decoction (加减茵陈五苓汤), Modified Yin Chen Tui Huang Decoction (加减茵陈退黄汤), Shen Shi He Zhong Decoction (渗湿和中汤), and Modified Li Zhong Decoction (加减理中汤). The management of cases, mostly diagnosed and treated by the imperial doctor, seems very much in line with the modern concept of integrating Chinese medicine and Western medicine and we can see the similarities in the methodology.

During the 6th year of Emperor Kangxi's reign (1667), Zhang Cheng adopted Fei Xiong Shu Pill (肺胸舒丸) made by himself to treat Emperor Kangxi's chronic cough. He combined 2 *qian* of powdered fine sulfur, 8 *fen* (1 *fen* = 0.37 g) of Jin Yin Hua (金银花 *Flos Lonicerae*), 6 *qian* of Gan Cao (甘草 *Radix Glycyrrhizae*) extract, 4 *liang* and 5 *qian* of powdered crystal sugar, and infused them in flower water imported by a Western doctor. He stirred them into a paste form with some licorice root water, and made them into flat round pills, weighing about 1 *qian* each.[20]

Chinese medicine was also made into alcoholic drinks using Western distillation technology. For example, using Western wine-making technology, Zhang Cheng made a ambergris alcohol drink to treat Emperor Kangxi's cough.[20]

The introduction of Western medicine and its application in the Qing dynasty created a precedent for applying Western medicine in China. It laid a foundation for the subsequent integration of Chinese medicine and Western medicine.

5.3 Enhancing communications between the imperial court of the Qing dynasty and other countries

In the system of tributes and medicine, the ruler took into consideration that the tributes actually cost a great deal of money and manpower, and therefore significant amounts of goods were given as rewards in return. This was also to show the ruler's kindness and generosity.

From the tributes paid by domestic officials, the emperor would accept part of the tributes to show his approval and acknowledge the hard work of the officials. However, at the same time, the emperor would reject part of the tributes and return them to show his compassion. The closeness between the emperor and his ministers was reflected in these tributary gifts of medicine. All the funds needed in the process of paying tribute were paid by state financial institutions, so that the people making offerings did not have to spend additional funds to complete the tribute. To some extent, the expenditure of labor and money were minimized. For foreign tributes, the imperial court returned silk and clothes in exchange for foreign medicines. It promoted friendly exchanges between China and other countries. For certain medicines with increasing domestic production or decreasing demand in the imperial court, the imperial court would often reduce the types and quantity of tribute goods required as a sign of compassion. Through such reduction, the imperial court established friendly relationships with officials of other countries. The tributary system of medicine in the Qing dynasty consolidated the central government's authority and met the royal family's needs while promoting the robust development of Chinese medicine.

Compared with the vigorous development of sea-faring industries during the Ming dynasty, sea trade was prohibited in the Qing dynasty. This policy reduced exchanges between China and the rest of the world. The continuation of the tributary system thus became the primary means of economic and cultural exchange between China and other countries, and the principal way for ancient China to understand the Western world. There were more European countries, such as Portugal, Italy, and Britain paid tribute in the Qing dynasty than those in the Ming dynasty. This tributary system significantly increased exchanges between China and the European continent at a time when sea trade routes were prohibited.

The tributary system of medicine in the Qing dynasty was based on systems established by earlier dynasties. However, over time, the introduction of Western medicine through missionaries' tributes contributed to progress in science and technology. Rulers and their ministers began to accept Western medicine, and this had a substantial impact on the development of Chinese medicine as well as the subsequent development of Western medicine in China. The tributary system of medicine is an outward reflection of the relationship between the court and all parties. In addition to meeting the court's daily needs, tributary medicine consolidated the status of the rulers.

Notes

Note 1: "Theriaca" contained different ingredients, but often included venomous snake flesh, opium poppy, and Japanese gentian. The word comes from ancient Greek and mean "magical antidote. The Manchu word "deriyaka" was used in Qing times.

Note 2: The medicine is Western in origin but it's not a modern medicine, which is true for all the "Western medicine" in this paper.

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Ethical approval

This study does not contain any studies with human or animal subjects performed by any of the authors.

Author contributions

Zi-Long Zhang conceived and designed the study; Yi-Sha Xian, Xiao-Jie Shi, Xue-Qi Wang searched the literature; Yi-Sha Xian, Xiao-Jie Shi, Xue-Qi Wang and Lin-Yi Sun prepared manuscript; Yi-Sha Xian drafted the manuscript; Zi-Long Zhang and Yi-Sha Xian revised the manuscript. All authors have read and approved the final manuscript.

Conflicts of interest

None.

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Research Article

CHINESE 中医药文化 MEDICINE AND CULTURE

OPEN

Survey of the History and Applications of Saffron

Motahareh Asgari[1], Qun Yu[2], Meghdad Abdi[3], Guang-Li Du[1], Yun-Hui Shen[2,✉]

Abstract

Fan Hong Hua (番红花 saffron) is a natural product that has long been used in food and dye industries and fortreating various disorders. Saffron has a long history of applications in traditional Chinese medicine, following its introduction to China in 1979. According to the theory of traditional Chinese medicine, saffron is sweet, slightly cold in nature and enters heart and liver meridians. Moreover, this spice can invigorate blood circulation, eliminate blood stasis, cool blood and eliminate heat toxins. Saffron has been used to treat asthma, phlegm, insomnia, Alzheimer's disease, depression, fright, shock, hemoptysis, heartburn, and pain. Among the almost 70 bioactive ingredients of saffron, major constituents of this herb include safranal, crocin, and crocetin, which are responsible for the unique taste and color of saffron. These ingredients have been investigated using modern pharmaceutical research methods as potential therapeutics to treat disorders such as Alzheimer's disease, cardiovascular diseases, cancer, digestive system disorders, ocular issues, and COVID-19 infections. However, focus and emphasis on understanding the pharmacological effects of saffron in treating diseases are required. This article briefly reviews the history, cultivation processes, different qualities properties, and traditional and modern applications of this unique herb.

Keywords: Alzheimer's disease; Herbal medicine; Insomnia; Saffron; Chinese medicine

1 Introduction

Crocus sativus L. (saffron) is a perennial spicy herb from the Iridaceae family, widely known as the "Red Gold" in countries that cultivate this herb. Saffron is the most expensive cultivated plant. The word saffron originates from the French term Safran, which derives from the Latin word safranum and originates from the Arabic word for " yellow." This word is different from the ancient Persian word Karkum, used by people living around the Zagros mountain range.[1] Saffron was recorded as a spicy herb or food product for cooking purposes in the Achaemenian Imperial court. This plant has no seed propagation. Thus, the underground parts of the plant, which are termed corms or bulbs, may be used to produce a new plant. The conspicuous colorful flowers of saffron contain three stigmas (25–30 mm long) with hangover petals. Each flower maintains three yellow stamens that lack active ingredients and are typically not collected. Each bulb ofthe plant produces one to seven flowers. Cultivated species were originally selected based on a natural hybrid that contains long stigmas, and these species have been cultivated ever since (Fig. 1). The flower of C. *sativa* has a light purple color; however, the purple part has almost no value. The thread-like reddish-colored stigma is the part that makes saffron the most valuable spice. These reddish stigmas are appreciated as a spice and as a natural colorant.[2] Approximately 36,000 flowers are required to yield just one pound of stigmas. Over 200,000 dried stigmas (obtained from about 70,000 flowers) give 500 g of pure saffron (not mixed with safflower), with a cost as much as 30 USD per ounce in the American market.[3]

Saffron possesses a sterile triploid form, which means that three homologous sets of chromosomes constitute each specimen's genetic complement. C. *sativus* has eight chromosomal bodies per set, which gives 24 bodies.[4] Being sterile, the purple flowers of C. *sativus* cannot bear viable seeds. Therefore, reproduction of the herb requires human assistance, that is, clusters of corms (underground, bulblike, starch-storing and organs) must be dug up, divided and replanted.[5]

A corm survives for one season. It arises from the vegetative part of the plant producing ten "cormlets" that can grow into new plants in the following season (Fig. 2). The packed corms are small, brown globules of about 5 cm in diameter, with a flat base, and covered with a dense pad of parallel fibers. This fibrous cover is termed the "corm tunic." Corms also contain vertical fibers, which are thin, net-like and grow up to 5 cm above the plant's neck. After planting the corms in soil, the plant starts to grow, and a stem appears from the corms. After blooming, a light purple flower with six delicate petals surrounding three stigmas is present. These valuable stigmas are collected and used as the precious spice.[6,7]

Where does the word " saffron" come from? There are some doubts about the origin of the English word "saffron." Studies suggest that the word originates from the 12th century Old French term " safran" that comes from the Latin word " safranum." Tracing further, the

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Figure 1 Cultivation steps of saffron.

Figure 2 Saffron plant at harvesting time.

word "safranum" derives and from the Arabic word "za'faran", which comes from the Persian word "zar-paran," meaning "gold strung" (implying either the golden stamens of the flower or the golden color it creates when used as a spice). Currently, saffron is cultivated primarily in the northeastern part of Iran, which has dry, hot weather.[8,9]

2 Chemical ingredients of saffron

The unique organoleptic quality of saffron, combined with the hardships involved in cultivating, collecting, and handling this herb, makes saffron the most expensive spice worldwide. Consequently, saffron is termed the "red gold" because of the color of the stigma and its high production cost. Different research groups have studied chemical composition and molecular structure of saffron in detail. Chemical analysis has revealed that stigmas of saffron contain more than 150 components.[10] The prepared dried stigmas of the saffron flower contain the saffron spice. Saffron provides color, flavor and aroma to foods and drinks. Saffron contains almost 28 volatile and aroma-yielding ingredients, which are primarily ketones and aldehydes. Among them, three important ingredients make saffron a unique plant. The quality of saffron is evaluated by these three ingredients, with higher percentages of these chemical components indicating better quality and thus stronger properties.[11] These ingredients include (Fig. 3):

- The yellow-orange color of saffron is caused by the presence of a-crocin (this crocin is trans-crocetin di-(β-D-gentiobiosyl) ester), which has the systematic IUPAC name 8,8-diapo–8,8-carotenoic acid. This indicates that the crocin underlying saffron's aroma is a digentiobiose ester of the carotenoid crocetin.[11]
- The bitter picrocrocin ($C_{16}H_{26}O_7$, 4-(β-D-glucopyranosyloxy)–2,6,6-trimethyl-1-cyclohexene-1-carboxalde-hyde) provides the pungent taste of saffron. This compound can constitute up to 26% of the dry mass of saffron. Picrocrocin is the precursor of safranal and has only been identified in the *Crocus* genus, whose only edible species is C. *sativus*.[11]
- The main aroma-active ingredient is safranal. Currently, more than 40 compounds related to the aroma of saffron have been identified, and the major ingredient is safranal (2,6,6-trimethyl-1,3-cyclohexadiene-1-carboxaldehyde).[11]

During dehydration, handling and storage of saffron, safranal is produced by the hydrolysis and dehydration of picrocrocin. According to the International Organization for Standardization (ISO) 3236 standard,[12,13] the safranal level is defined by evaluating the absorbance at 330 nm of an aqueous extract of saffron.

The above-mentioned ingredients are the main components of saffron, which also produce the unique taste and color of this herb. However, the number of saffron bioactive components with pharmaceutical properties is far greater. For example, Asdaq et al. evaluated the hypolipidemic and antioxidant potential of saffron and its active constituent, crocin, in hyperlipidemic rats. They found that there are other potential ingredients in saffron involved in quenching free radicals and ameliorating hyperlipidemia damage.[14]

Liu et al. investigated the effect of the compound saffron formula (CSF), consisting of two animal spices (Moschus, Beaver Castoreum) and C. *sativus,* on cardiovascular diseases. In this study, the authors extracted the bioactive ingredients (those that displayed a level of oral bioavail-ability and drug-likeness to enter the blood circulatory system and reach the site of action) of saffron, which were (3E)-4-[(1R,6S)-2,2,6-trimethyl-7-oxabicyclo [4.1.0]hept-1-yl]-3-buten-2-one, anthocyanins, Foron, β-phorone, campesterol, carotenes, crocetin, isorhamnetin, kaemp-ferol, lycopene, stigmasterol, and a-carotenes.[15]

Saffron is considered high quality when the concentration of its ingredients, which display organoleptic characteristics, are present in higher quantities (Fig. 4). Moreover, the high quality of the product is defined by the absence of other substances, such as any other types of food coloring, and by a low quantity of other substances, such as flower remains, soil and insects. In addition to the three main components in saffron (crocetin esters, picrocrocin, and safranal), this herb also contains carotenoids, raw fibers, carbohydrate, proteins, anthocyanins, fats, flavonoids, minerals, vitamins (riboflavin and thiamine), and many other compounds that have nutritional properties and are beneficial to human health.[16]

Knowing the chemical component ofsaffron, helps us to differentiate this valuable herb from similar herbs. There is another herb with a similar appearance with saffron but different components and therefore different properties and applications.

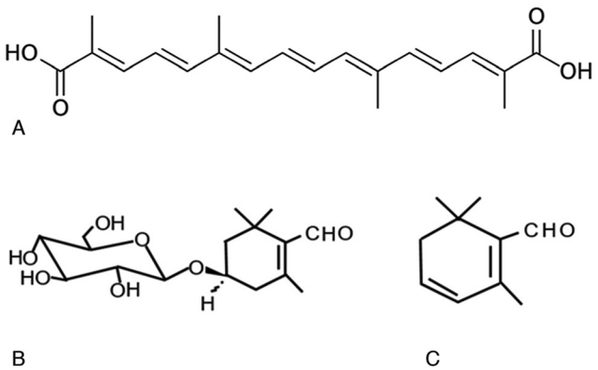

Figure 3 Three different ingredients in saffron.

Figure 4 Saffron threads after drying.

3 Saffron *vs.* safflower

Safflower (*Carthami Flos*) of the Asteraceae family is often used to substitute saffron in Tibetan medical practices.[17] However, there are distinct differences in the efficacy and derived traits between safflower and saffron. Safflower has been cultivated for thousands of years, mainly in Xinjiang and Henan regions of China, with a specific aroma and slightly bitter taste. Safflower is the dried flower of *C. tinctorius*. It can promote blood circulation, remove blood stasis and relieve pain. Safflower is used widely for treating coronary heart disease, angina pectoris, and hypertension. Modern pharmacological experiments have demonstrated that safflower displays various biological activities, including dilating the coronary artery, improving myocar-dial ischemia and analgesia. Many chemical constituents have been isolated from safflower, including flavonoids, alkaloids, and steroids. The flower of high-quality saffron is long and bright red, whereas the tube of safflower is narrow and orange-red.[18]

As modern clinical research has advanced, safflower has occupied an important position in treating and preventing cardiovascular, hepatic, female, and geriatric diseases. In addition, safflower is useful for staining fibrous clothing because it contains volatile components and is known as the "king of linoleic acid." Since safflower is totally different from saffron in many aspects, such as active components and effects, attention needs to be paid when using these two herbs.[19]

4 Applications of saffron

Saffron is used widely in Iranian, Chinese, Indian, European, and Arabian cuisines because of its unique taste and color. Saffron is also used in confectioneries and drinks.

Saffron has a long history of application in traditional medicine. This herb has been used to treat asthma, whooping cough, loosen phlegm, and reduce coughing. Saffron is also used for sleep problems (insomnia), Alzheimer's disease, depression, fright, shock, hemoptysis, heartburn, pain, and dry skin.

Saffron is also used as a fabric dye, especially in Iran, China, and India. In India, it is also used for religious purposes.

Compared with other spices or dried foods, the dried saffron are rich in vitamin B and manganese.

5 Application of saffron in the Persian civilization, traditional medicine and market

Saffron-based pigments have been found in prehistoric (50,000-year-old cave art in Iraq) paintings of animals, which were northwest of the Persian Empire during that period. The Sumerians applied saffron as a component in their medications and magical potions. Sumerians did not cultivate saffron. They collected their stocks by gathering saffron from wildflowers, believing that divine intervention alone enables saffron's medicinal properties. Such evidence indicates that saffron was an abject of long-distance trade before Crete's Minoan palace culture reached a peak in the second millennium BCE.[20]

In ancient Persia, saffron (*C. sativus* "Hausknechtii") was cultivated at Derbena and Isfahan in the 10th century BCE. Persian saffron threads have been found interwoven into Persian royal carpets and funeral shrouds. Ancient Persian worshippers used saffron as a ritual offering to their deities and as a brilliant yellow dye, perfume, and medicine. Saffron threads were also scattered across beds and mixed into hot teas to cure bouts of melancholy. Indeed, foreigners widely suspected that Persian saffron threads, used to spice foods and teas, were a drugging agent and an aphrodisiac. These fears grew to forewarn travelers to abstain from eating saffron-laced Persian cuisine. In addition, Persian saffron was dissolved in water with sandalwood to use as a body wash after heavy work and perspiration under the hot Persian sun. Later, Persian saffron was used heavily by Alexander the Great and his forces during their Asian campaigns. They mixed saffron into teas and dined on saffron rice. Following the footsteps of Cyrus the Great, Alexander sprinkled saffron in warm bath water. Much like Cyrus, he believed it would heal his many wounds, and his faith in saffron grew with each treatment. He even recommended saffron baths for the men under his command. The Greek soldiers, taken with saffron's perceived curative properties, continued the practice after returning to Macedonia.[21]

Persian medicine is one of the most famous traditional and holistic systems of medicine. Saffron is a potent and important drug in this medical system. Many medical applications using saffron are found in traditional Persian medical literature. Here, saffron was used as a bitter, stimulant, fragrant, tonic, aphrodisiac, stomachic, antispasmodic, emmenagogue, diuretic, anti-cancer, laxative, and galactagogue, and was used in treating bronchitis, cephalalgia, pharyngoplasty, vomiting, fever, epilepsy, inflammations, skin diseases, septic inflammations, and stimulating circulation.[22] An important biological function of saffron is its activity as a chaperone. Thus, saffron has been shown to improve the bioavailability of other medicines and the absorption of drugs, especially to the heart.[23,24]

The quality of saffron directly relates to cultivation, harvesting, separation of the saffron flower, and weather. Generally, the quality of saffron is classified based on which part of its threads (strings) is cut and used. Figure 5 shows the threads and parts of saffron that define the quality.

5.1 Negin (jewel) saffron

In Negin saffron, the percentage of safranal (aroma-active compound) and a-crocin (coloring agent) are the highest among the various saffron products. Thus, this saffron is the most fragrant and deeply colored among all saffron products. This saffron consists of only three unbroken stigmas of each saffron string. Thus, it is only red, and all strings are intact and almost in the same shape. This type of saffron is called Negin when three stigma threads are attached and form a cluster. As the production of Negin saffron is an extremely delicate and precise manual skill, it is the most expensive type of saffron, and availability is limited.

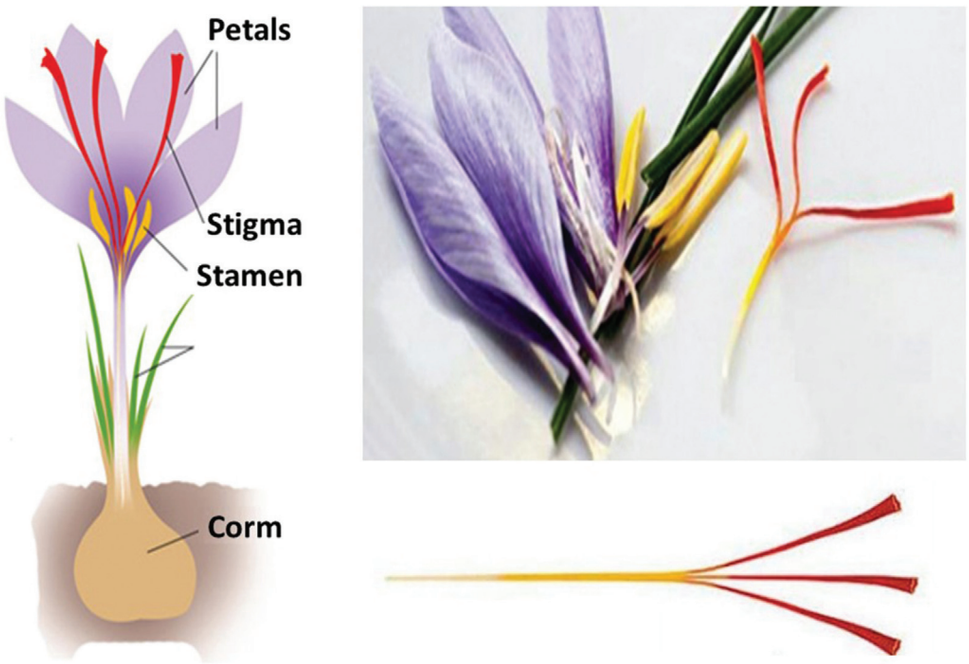

Figure 5 Different parts of the saffron plant.

5.2 Flowerhead (Sargol) saffron

All white or yellow parts of the strings are removed to leave only red strings. Thus, this saffron is termed the " all-red" saffron. This saffron is the most common type on the Iran market.

This grade consists of only dark red stigma tips and has the highest quality when compared with that of other types. Sargol saffron is pure saffron with no broken strands because of the accumulation of active components in the stigmas of saffron. Persian Sargol has a very strong aroma and rich coloring capacity.

5.3 Pushal saffron

To produce straw saffron, a part of the white-colored section of strings is removed such that strings have red-colored stigmas with some yellow-white color at the base of the strings (1–3 mm).

Pushal saffron is the stigma part of the plant attached to a 1 to 3 mm style end. Although Pushal does not have Sargol's pure texture and premium quality, some consumers prefer to purchase Iranian Pushal to ensure saffron's validity and authenticity.

5.4 Bunched (Dasteh) saffron

Stigmas are dried in this type of saffron and are bundled together to make the drying process easier. Bunched or Dasteh saffron consists of red stigmas plus a large amount of the yellow style, which is presented in a tiny bundle.

5.5 Root saffron

This type is only the base of the white saffron strings. This grade consists of only yellow-white styles and has weak aroma and coloring.

6 Introduction of saffron to China

In 1979, crocus corms were introduced from Japan and successfully planted in the Maqiao Township, Shanghai. In addition, because of Xinjiang's unique geographical and climate conditions (suitable temperature), crocus corms were also cultivated successfully in a small batch in the Changji area. This laid a foundation for large-scale cultivation and pharmacological research.

Currently, most of the modern international market exists as crocus bulbs (reproduction spot), and the yield of saffron is low because of a lower proportion of large bulbs. The domestic saffron market yield in China only accounts for 20% of domestic demand. Thus, a large plantation is urgently needed to meet saffron demands. Technology for cultivating non-polluted, high-yields of saffron has been mastered, and this technology has been introduced in some areas, such as Chongming area in Shanghai and Jiande area in Zhejiang province.

Saffron corms were introduced from Dafeng County, Japan, and now 90% of the corms are from Chongming. Chongming has become the only good agricultural practice (GAP) certified base in China because of its unique planting technology and stringent quality standards. Moreover, the plantation methods are different from those in Iran and Spain. This saffron plantation has received an invention patent on the technique of saffron cultivation, realized factory standardization and achieved and promoted scientific research breakthroughs. The amount of the active component "Crocin-I, II" in Chongming saffron is one to two times higher than that found in Iranian saffron. The lower level of Crocin-I, II in saffron from Iran and other regions is primarily because the antioxidant profile of saffron decreases after exposure to the sun, and countries such as Spain and Iran use traditional cultivation approaches that plant saffron in open fields. Future studies on temperature, plant pests and

fertilization techniques during the cultivation of *C. sativus* production are important issues that still need to be explored.

7 Application of saffron in traditional Chinese medicine

Saffron was first recorded in the ancient literature of Jammu and Kashmir and later introduced to China through the Silk Road. The nature of saffron was first recorded in Chinese dietary medicine of the Mongol Era in the book *Yin Shan Zheng Yao* (《饮膳正要》*Principles of Correct Diet*), which was written by Hu Sihui (忽思慧). This book was first published in 1330 A.D. and is the first monograph on food nutrition in China. According to the records taken by the author, saffron is neutral in nature, sweet in flavor and non-toxic. Saffron is used mainly to treat internal blazing of heart fire and qi movement stagnation, which can help people relax when this herbal medicine is taken for a long time.[25]

The name of crocus was first seen in the *Ben Cao Pin Hui Jing Yao* (《本草品汇精要》*Collected Essentials of Species of Materia Medica*), which was written by Liu Wentai (刘文泰) in 1505. Saffron can loosen the chest diaphragm, promote appetite, nourish the lower origin and treat typhoid fever madness after taking the herb for an extended period. It is worth noting that this book documented the best time for planting and harvesting saffron, with seedlings in March and flowering in May. Saffron can activate blood and resolve stasis, cool the blood, detoxify, relieve depression and used as a tranquilizer. Taking saffron with animal viscera can treat lumbodorsal, thoracic and diaphragmatic headaches, as well as enhance the immune system of the body.[26]

Li Shizhen (李时珍), a famous medical practitioner and scientist, recorded saffron in his book *Ben Cao Gang Mu* (《本草纲目》 *Compendium of Materia Medica*).[27] He described saffron as having a specific sedative effect, which can be used to treat fright palpitations and is suitable for patients who are restless and often have fierce heartbeat due to panic attacks. Under poor environmental conditions, Li Shizhen failed to perform a detailed and standardized observation of saffron bioactivities and medical benefits. Saffron was thought to originate from Muslim areas and Iran. However, Hong Lan Hua (*Carthamus tinctorius* L.), planted by Zhang Qian (张骞) in the western regions of China (today's Xinjiang region) and referred to in Zhang Hua's *Bo Wu Zhi* (《博物志》*Historia Naturalis*) (first seen in "Xi Yu Zhuan" of the *Han Shu* (《汉书 西域传》*Western Regions Annals* in *the Book of Han*) was saffron, which is consistent with the description of Jifulan in *Ben Cao Cheng Ya Ban Ji* (《本草乘雅半偈》*Half Verse of Chinese Materia Medica*) *of* the Ming dynasty written by Lu Zhiyi (卢之颐). It has been described that after soaking saffron overnight, this herb relieves typhoid fever and panic trance and potentially promotes appetite and regulates the digestive system. However, pregnant women, women during their menstrual period and patients prone to hemorrhaging should use saffron cautiously.[28]

Ben Cao Gang Mu Shi Yi (《本草纲目拾遗》*Supplement to Compendium of Materia Medica*) written by Zhao Xuemin (赵学敏), recorded that saffron can activate blood and resolve stasis. Saffron has also been shown to improve qi stagnation and weak constitution, taking some light porridge and vegetables instead of a fat-rich and salty diet. Hematemesis is primarily due to qi counterflow and hyperactive heart fire and can be cured by saffron and liquor with remarkable efficacy.[17]

Zhong Hua Ben Cao (《中华本草》 *Chinese Herbal Medicine,* Tibetan Medicine Edition) written in 1999 mentioned the authentic product of Ka Ji Ku Gong (the name of saffron in Tibetan medicine).[29]*Gan Lu Ben Cao Ming Jing* (《甘露本草明镜》 *Mannose Herbal Mirror*) documented that the roots of saffron are similar to garlic roots: white tuberous roots like a ball, with scaly leaves, purplish flowers and a strong flavor. Collected from the alpine region, saffron has been shown to relax sinews, activate collaterals, expel blood stasis for dredging collaterals, disperse swelling to relieve pain and display a strong inhibitory effect on leukemia, dendritic cancer and soft tissue sarcoma.[30]

Saffron, in combination with other herbs, is used as an effective formula in the treatment of amenorrhea, retained lochia, stifling sensation in the chest and diaphragm and the non-expressed rash of measles as follows[31,32]:

- Yi Mu Cao (益母草 *Leonuri Herba*) and Dan Shen (丹参 *Salviae miltiorrhizae Radix*) for amenorrhea due to blood stasis.
- Dang Gui (当归 *Angelicae sinensis Radix*) and Chi Shao (赤芍 *Paeoniae Radix rubra*) for retained lochia.
- Yu Jin (郁金 *Curcumae Radix*) for fullness and a stifling sensation in the chest and diaphragm due to emotional distress.
- Zi Cao (紫草 *Arnebiae Radix/Lithospermi Radix*) and Chi Shao (赤芍 *Paeoniae Radix rubra*) for the non-expressed rash of measles.

In traditional Chinese medicine, this herb is usually not decocted with other herbs in a prescription. Instead, it is separately double-boiled, and the liquid is then added to the decoction or simply consumed by itself.

8 Application of saffron in modern medicine

Although saffron has been used for many years in Chinese medicine and its effects on different diseases were proved experimentally, modern methods have revealed the underlying therapeutic mechanisms of this unique herb. Most parts of modern investigations on saffron have answered the traditional benefits and applications by studying the mechanisms of its components for treatment of various disease.

For example, an investigation examining the mechanisms of saffron in digestive system disorders has demonstrated that saffron cures different digestive system disorders via chemoprevention, inhibition of cell proliferation, induction of apoptosis, antioxidant effects and radical scavenging, geno-protective properties, prevention of lipid peroxidation, and anti-inflammatory processes.[33]

Other investigation was done to study the mechanism of bioactive ingredients of saffron responsible for its effects on non-alcoholic fatty liver disease (NAFLD). Screening

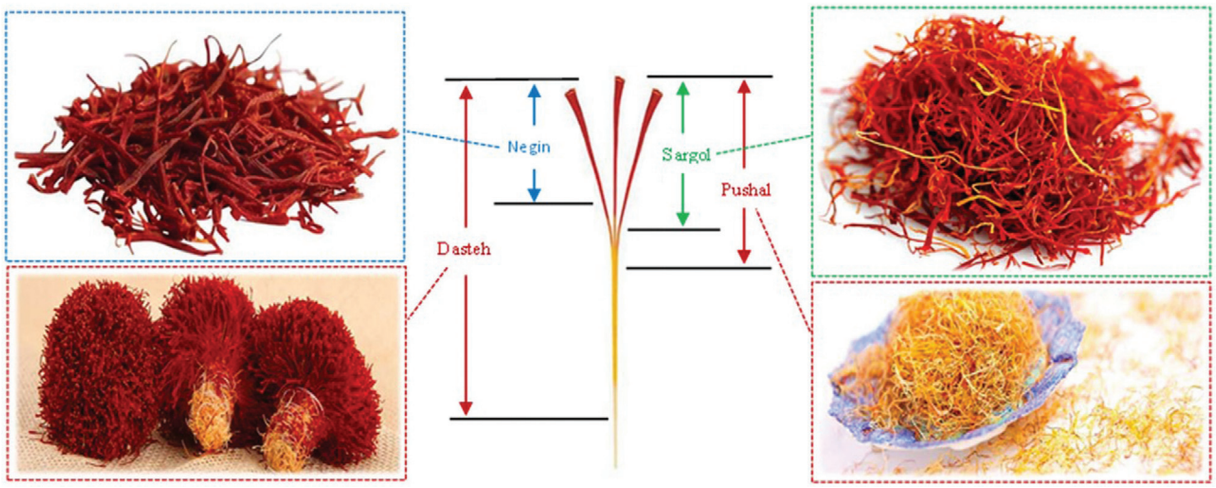

Figure 6 Categorization of saffron by using different parts of saffron threads.

of almost 70 ingredients of saffron, Xu et al. have identified five most bioactive components using criteria of oral bioavailability (≥30%) and drug-likeness (≥0.18). This research team also studied the effects of these five ingredients concluding that crocetin is a potential bioactive ingredient of saffron that can treat NAFLD. The mechanism of action of crocetin involves suppressing oxidative stress, mitigating inflammation, and upregulating nuclear factor-erythroid factor 2-related factor 2 (Nrf2) and heme oxygenase 1 (HO-1) expression.[34]

Mechanism of saffron by its important ingredient-crocetin was also reviewed by Finley et al.[35] Crocetin was studied as a potent water-soluble antioxidant and potential therapy for Alzheimer's disease. It was demonstrated that crocin exhibits multifunctional protective activities in the brain. This suggests that crocetin may be a promising supplement or drug for preventing or treating Alzheimer's disease. Saeedi et al.[36] concluded that the inhibitory actions on acetylcholinesterase activity, aggregation of beta-amyloid protein into amyloid plaques and tau protein into neurofibrillary tangles, and also the antioxidant, anti-inflammatory, and promotion of synaptic plasticity effects are among the possible mechanisms to explain the neuroprotective effects of saffron on treating patients with Alzheimer's disease.

Some studies focused on the effect of saffron on specific diseases, rather than studying the mechanism of this herb. For example, saffron's potential for treating neurodegenerative diseases was studied and confirmed by a few investigations.[37,38]

The effects of saffron and/or its constituents in treating ocular diseases are also studied. Existing clinical evidence suggests that oral supplementation with saffron or crocin may have positive effects on various vision-related parameters in adults with Age-related macular degeneration (AMD), Primary open-angle glaucoma (POAG), and diabetic maculopathy.[39]

Saffron has also been suggested as a natural product to alleviate severe acute respiratory symptoms of COVID-19 symptoms and manage the post-covid long-term sub-acute and chronic abnormalities associated with COVID-19 patients.[40]

The above-discussed investigations have revealed several potential therapeutic uses of saffron. Nonetheless, more studies and trials are needed to scientifically prove the therapeutic effects of saffron in treating various diseases.

9 Conclusions

Saffron, the dried stigma from the plant *Crocus sativus* L. (a member of the Iridaceae family), has a distinct color, flavor, and smell. Saffron is used widely as a spice and as a coloring and flavoring agent in preparing foods and cosmetics. Pharmacological effects of saffron are mainly attributed to crocin, crocetin, picrocrocin, and safranal. These components, especially crocin, have significant medicinal effects, including antidepressant and anticonvulsant, analgesic, anti-cancer and other therapeutic benefits on different body systems such as the cardiovascular, immune, respiratory, genital-urinary, and central nervous systems. In traditional Chinese medicine, this herb is used to invigorate blood circulation, eliminate blood stasis, cool blood, and eliminate heat toxins. Although some modern investigations have been conducted to reveal the mechanisms of action of saffron, more emphasis needs to be placed on exploring the potential effects of this unique herb in treating various diseases (Fig. 6).

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Ethical approval

This study does not contain any studies with human or animal subjects performed by any of the authors. The authors have no ethical conflicts to disclose.

Authors contributions

All authors have read and approved the final version of the manuscript and agree with the order of presentation of the authors.

Conflicts of interest

None.

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Research Article

CHINESE 中医药文化 MEDICINE AND CULTURE

OPEN

History of the Chinese Medicinal Gelatin

Teruyuki Kubo[1,✉], Zhong-Zhen Zhao[2]

Abstract

This article discusses the history of animal glue (gelatin) used in medical practice in China. In ancient times, gelatin was widely made from cowhide and has been found in excavations and wall paintings older than 2000 years in Egypt, Greece, and China. However, it has been used medicinally almost exclusively in China and other East Asian countries influenced by Chinese medicine. Since 11th century, donkey-hide has gradually been replaced with cowhide in medicinal gelatin. Currently, donkey-hide gelatin is widely used medicinally in China. During the Edo period, medicinal gelatin was imported to Japan from China. Owing to the distaste for eating animal flesh in traditional Japanese culture, the production of gelatin and its medicinal use is not widespread in Japan.

Keywords: Cowhide; Donkey-hide; E Jiao; Gelatin; Japan; Medical history

1 Introduction

The Chinese term E Jiao (阿胶*Asini Corii Colla*) refers to a medicinal gelatin extracted from donkey-hide in Dong'e county, Shandong Province, China. The finest gelatin is made by boiling the hide with water from the Ejing well. The "E" of E Jiao and the county name Dong'e derive from the term "Ejing" ("jing" is the Chinese term for "well"). Perhaps in Chinatowns in the western countries, Chinese turtle jelly is used more often than E Jiao, but E Jiao is quite a popular gift among the middle class. Although E Jiao has more than 2000 years of history in China, it is mentioned rarely in the West. Therefore, the aim of this article was to describe the history of the medicinal use of the animal glue (gelatin) in China (Figs. 1–3).

2 Cowhide glue

The term "jiao" (胶) widely refers to the glue (gelatin) consisting of collagen and other fiber proteins extracted by boiling hide from various animals, such as cows, horses, deer, and donkeys. The animal glue or gelatin is solid at room temperature, but dissolves at approximately 50 °C in hot water. Because of its useful properties, gelatin has been used as an adhesive for centuries in many parts of the world. Its use can be traced back as far as ancient Egypt, where it was used as an adhesive on burial accessories; cowhide glue was also used in colored wall paintings dating back 4400 years.[1] Brightly colored minerals, which generally do not dissolve in water, can be used as pigments if they are ground into powder and mixed with warmed glue. There are similar examples from ancient Greece and Rome, where people used cowhide glue. The glue was called κ ó λλα in Greek, which is the origin of the word "collagen."[2] Similarly, in China, gelatin has been used to make mineral pigments and solid ink by mixing it with the soot of burned pine trees or other materials. The use of glue as an adhesive and pigment spreader is one of the most important ancient inventions.

In China, a vessel containing an adhesive made from cowhide gelatin was unearthed at the Xiaohe cemetery site (1980–1450 BCE), at the eastern end of the Tarim Basin.[3] Gelatin seems to have been invented and first used in ancient Egypt and spread worldwide. This is because Chinese medicinal gelatin was initially made from cowhide, its processing method might have been introduced to China from the West through the Xinjiang region. At the very least, it is clear that cowhide glue was produced by mature manufacturing technology and widely used as an adhesive in prehistoric times.

In Chinese literature, the Chinese term "胶" first appeared in the *Shi Jing* (《诗经》*Book of Odes*), a collection of poetry complied before the 7th century BCE. The radical index of the character "胶" is the moon and it represents a piece of marbled meat, suggesting that *jiao* is associated with animals. The *Zhuang Zi* (《庄子》) states that "Only when the ears of Gu Kuang (瞽旷 a famous blind musician) are plugged, people will appreciate their own ears . . . Only when the eyes of Li Zhu (离朱 an iconic figure with superhuman eyesight) are glued [jiao], people will believe their own eyes (塞瞽旷之耳, 而天下始人含其聪矣 . . . . . 胶离朱之目, 而天下始人含其明矣)"[4] (Chapter "Quqie" 胠箧). Here, the character "胶" is a verb that means "sticking." The use of "胶" as a verb to describe sticking has a long history in China, indicating the widespread use of animal glue as an adhesive.

The *Shui Hu Di Qin Mu Zhu Jian* (《睡虎地秦墓竹简》*Qin-Period Bamboo Texts of Yunmeng*) recorded officials used animal glue to repair ox carts. The section on statutes of public works (Sikong Lyu 司空律) stated that, "If your

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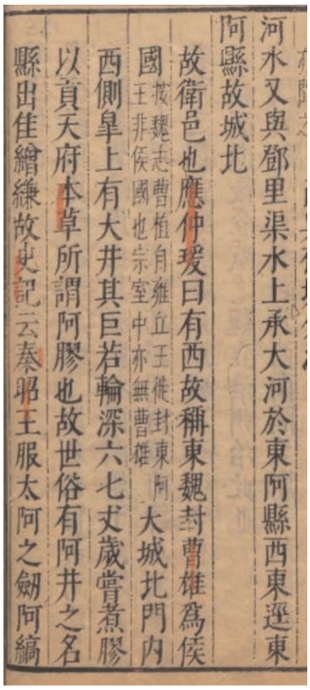
河水又與鄧里渠水上承大河於東阿縣西東逕東阿縣故城北
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魏志曹植自雍丘王徙封東阿王非侯國也宗室中亦無曹雄大城北門內
西側阜上有大井其巨若輪深六七丈歲嘗煮膠以貢天府本草所謂阿膠也故世俗有阿井之名縣出佳繒練故史記云秦昭王服太阿之劒阿縣

Figure 1 Account of the E-Xian county

department has an abundant budget, you purchase glue by yourself.

If facing a small budget, you should claim fat and glue monthly and save them up . . . (to repair a cart) . . . . use one liang (一两, ca. 16 g) of glue and two chui (二锤, ca. 10.7 g) of tallow. If a cart part is distorted and the glue comes off, apply glue to a thickness of a few fen (数分, ca. 4–5 cm) (官有金 钱者自为买脂胶, 毋金钱者乃月为言脂胶, 期毄。一脂攻间大车一两, 用胶一两、脂二锤。攻间其扁解, 以数分胶以之。).”[5] These bamboo slips revealed that glue was so expensive it could not be covered by miscellaneous expenses. The *Kao Gong Ji* (《考工记》 *Records on the Examination of Craftsmanship*), estimated to have been written in the Han dynasty, described in relative detail the varieties of glue and the processing method of making bows (Fig. 4).[6]

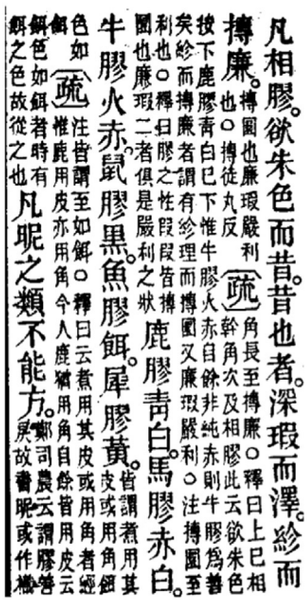
Figure 3 Documents on E Jiao from the Daoguang reign

Animal gelatin in China was an important ingredient used in many processes before it was used for medicinal purposes.

3 Medicinal gelatin

The earliest record of medicinal gelatin is found in the silk-cloth text *Wu Shi Er Bing Fang* (《五十二病方》*Prescriptions for Fifty-two Diseases*) (Fig. 5).[7] Dated from the western Han dynasty, the scroll was excavated from the Ma Wang Dui tomb. Because the *Wu Shi Er Bing Fang* is considered to contain medical knowledge originating before the First Emperor of Qin (246–210 BCE), the medicinal use of gelatin can be traced further back to the Warring States period. Regrettably, there is little medical literature from the Warring States period and earlier; therefore, it is not possible to clarify when the use of medicinal gelatin began. In early China, medicinal gelatin was not extracted from the hide of the donkey. There were six origins of gelatin listed in the *Records on the Examination of Craftsmanship*: deer, horse, cow, rat, fish, and rhinoceros, but donkey had not been mentioned.[6] At that time, donkey had just been introduced to the Yellow River plain, but gelatin was not widely extracted from donkey-hide because of the scarcity of donkeys.

Figure 2 *Ben Cao Pin Hui Jing Yao* (《本草品汇精要》*Collected Essentials of Species of Materia Medica*), in possession of Kyouu Shooku, Takeda



凡相膠。欲朱色而昔。昔也者。深瑕而澤。紾而摶廉。摶圓也廉瑕嚴利也○摶徒丸反 疏 角長至摶廉○釋曰上已相狡下鹿膠青白已下惟牛膠火赤自餘非純赤則牛膠爲善矣紾而摶廉者謂有紾理而摶圓又廉瑕嚴利○注摶圓至利也○釋曰膠之性段段皆摶圓也廉瑕二者俱是嚴利之狀鹿膠青白馬膠赤白。牛膠火赤。鼠膠黑。魚膠餌。犀膠黃。皆謂煮用其皮或用角者經色如 疏 注皆謂至如餌○釋曰云煮用其皮或用角者經惟鹿用皮亦用角今人鹿猶用角自餘皆用皮云鄭司農云謂膠筩餌色如餌者時有餌之色故從之也凡昵之類不能方。昵故書昵或作暱

Figure 4 Variety of glue for making a bow in Gong Ren (弓人 Bowyer)

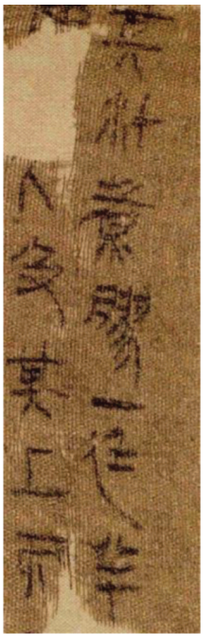


Figure 5 Medicinal glue on the *Wu Shi Er Bing Fang* (《五十二病方》 *Prescriptions for Fifty-two Diseases*)

There are two types of medicinal gelatin, namely E Jiao and Bai Jiao (白胶), listed in the *Shen Nong Ben Cao Jing* (《神农本草经》*Shennong's Classic of Materia Medica*) (Fig. 6). The book is considered as being compiled circa first to second centuries ACE, and the gelatins are found under the high-class medicinal group. This herbal text does not mention any difference between the two types of gelatins and describes their tastes and properties as identical. Both types of gelatin are sweet (甘), have a neutral (中) medicinal property and possess similar medical benefits. This is the first time that the term "E Jiao" appears in Chinese literature. The "E" derives from the name of a

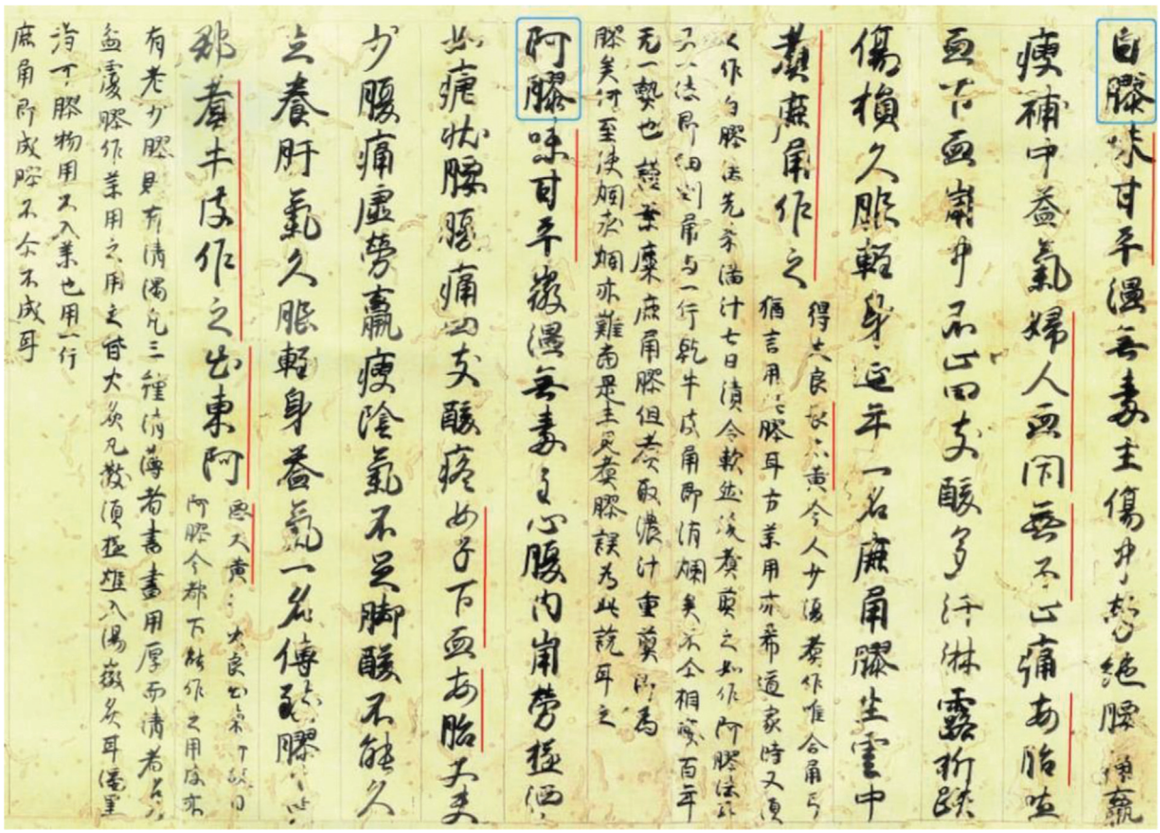


Figure 6 Description of Bai Jiao and E Jiao in the *Xin Xiu Ben Cao* (《新修本草》 *Newly Revised Materia Medica*)

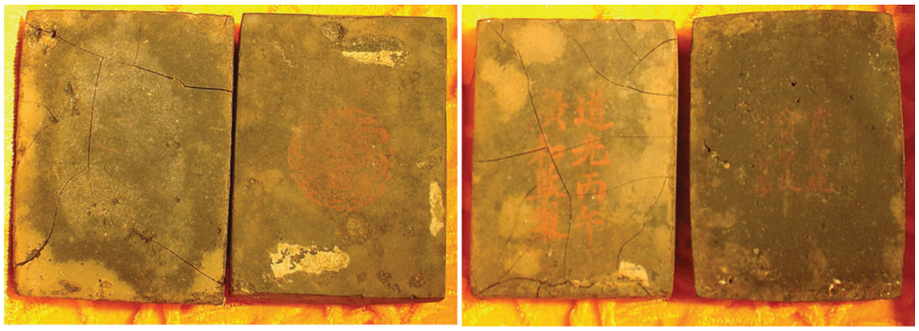


Figure 7 E Jiao from the Daoguang reign (1821-1850)

place. Both E Jiao and Bai Jiao are used to prevent miscarriage and stabilize the condition of unborn babies and pregnant women. In addition, E Jiao can treat abnormal uterine bleeding whereas Bai Jiao can treat amenorrhea and infertility. Pregnant women are prone to anemia because blood is diverted to supply the fetus during pregnancy. Therefore, E Jiao is an appropriate medication to supplement blood during pregnancy (Fig. 7).

Blood coagulation involves the formation of fibrin clots that stop bleeding, create scabs, and repair wounds. This blood function may remind us of the above mentioned description of the cart been repaired with animal glue. It is natural that early societies associated animal glue with blood and regarded it as a substitute for blood. This may relate to the doctrine of signatures. The adhesive properties of gelatin, which help to make a structure stable and solid, may have been linked to stabilization of the fetus in the womb to prevent premature birth, treatment of abnormal uterine bleeding, and easing of blood flow. The *Ming Yi Bie Lu* (《名医别录》*Miscellaneous Records of Famous Physicians*), which first defined E Jiao and Bai Jiao are made of cowhide and antlers, respectively, also stated that E Jiao is good for relieving fatigue and is suitable to treat people with weak limbs, probably because it was believed to have functions of reinforcement for muscles, bones, and tendons.

It is important to note that the medicinal use of animal gelatin is almost exclusive to China. Although a German scholar, Dr J. Liesegang, mentions the historical use of animal gelatin in ancient Egypt and Greece in his thesis *The Gelatin in Medicine,* there are no descriptions of its medical use in the West until the 19th century. The use of gelatin to facilitate the swallowing of medicine was invented by a French pharmacist, François Mothes, in the 19th century and is still in widespread use today.[9] However, this application assumes that gelatin itselfhas no beneficial effect. In 1896, A. Dastre and N. Floresco gave dogs an intravenous injection of gelatin solution as a treatment to promote blood clotting without thrombosis.[10] This is the earliest medicinal use of gelatin in the West.

Gelatin has been eaten for a long time in the West, although there are few records of its culinary use. Aspic, which is produced by boiling fish heads, was introduced as a high-class dish in a cookbook in Baghdad approximately 10th century.[11] The modern use of gelatin for desserts dated from the 18th century, when it became possible to mass production.

After all, the medicinal use of animal gelatin has not been known. It is almost exclusive to China, Japan, and other East Asian countries.

4 Water from the Ejing well

Miscellaneous Records ofFamous Physicians states that E Jiao was produced in Dong'e. The book states that E Jiao is named after Dong'e because it was produced there. Therefore, we can assume that the name E Jiao derives from the name of the region that produces it. Other herbal plants, such as Gao Liang Jiang (高良姜 *Rhizoma Alpiniae Officinarum*), Chuan Xiong (川芎 *Rhizoma Ligustici Chuanxiong*), and Wu Zhu Yu (吴茱萸*Fructus Evodiae*), are also named after the regions where they are produced, but domesticated animals do not require specific conditions for breeding and can be kept almost anywhere. This raises the question of why medicinal gelatin was produced only in Dong'e. In the *Shui Jing Zhu* (《水经注》*Commentaries on the River Classic*), Li Daoyuan, a geography expert, states that, "There is a big well on the west bank inside and near the north gate of the city. Its diameter is as long as a wheel (approx. 1.2 m); its depth is between 13.8 m and 16.2 m. Jiao was once used as a tribute to the imperial court. This is E Jiao described in the herbal texts. Therefore, people also called the well "Ejing" (Ejing was named after E of E Jiao)."[12]

E Jiao was produced much earlier than the sixth century. It has also been suggested that the well water was used in the E Jiao manufacturing process. In 657 ACE, the Tang emperor Gaozong ordered the official Su Jing and others to revise existing herbal texts and to conduct a large-scale nationwide survey of herbal drugs. However, the final report of this survey, *Xin Xiu Ben Cao* (《新修本草》*Newly Revised Materia Medica*) did not mention the water of the Ejing well. In the supplemental work to the *Newly Revised Materia Medica,* Chen Cangqi clearly explained that the E Jiao production process required water from the Ejing well. He wrote in the *Ben Cao Shi Yi* (《本草拾遗》 *Supplement to Materia Medica*) that, "the gelatin is made by boiling it in water from the Ejing well. Most [gelatin] is a vulgar product that is counterfeit."[13] Chen Cangqi was particular about the variety of water; consequently, he listed another 35 varieties of water (including steam and hail) in addition to the Ejing water in the mineral drug section of his work. In the same period, Lu Yu, the Sage of Tea, discussed water sources in as much detail as the variety of tea leaves in his *Cha Jing* (《茶经》

Classic of Tea),[14] and in the 9th century Zhang Youxin compiled the *Jian Cha Shui Ji* (《煎茶水记》*Record of Water for Tea*).[15]

In the eighth and ninth centuries, Chinese intellectuals become more interested in water quality.

This concern for water sources and quality led to the depletion of water resources. In the 11th century, when Su Song and other officials conducted a nationwide survey of herbal medicines by imperial order, they described E Jiao as follows: "The genuine E Jiao is produced with the water from the well in the city Bai Cheng in E-Xian County. To produce it, boil black donkey skin with Ejing water, exactly following the original glue process. Because the well is officially prohibited, it is extremely difficult to obtain genuine E Jiao. Yet it is abundant in the imperial capital, namely Kaifeng (开封). However, these are probably not genuine products." The text tells us that the Ejing water was officially controlled, and a large amount of E Jiao was made using other source of water. As described above, water quality is much more important than the quality of the donkey-hide. Li Shizhen also emphasized the importance of Ejing water, and added it as a new separate entry in his *Ben Cao Gang Mu* (《本草纲目》*Compendium of Materia Medica*). He introduced the medical benefits of E Jiao, such as its anti-nausea properties and ability to increase the flow of phlegm. Furthermore, quoting from the Waterside (Shuidi 水地) chapter of the book *Guan Zi* (《管子》), he also introduced the medical theory that the character and constitution of the human body are affected by the nature of local water. He concluded that water from the Qi region strengthened the body and prevented skin diseases and hangovers.

Does the Ejing well water have any outstanding properties? A water inspection conducted by a local laboratory showed that Ejing water contains more minerals than water from other areas.[16]

5 Donkey-hide gelatin

E Jiao was probably not made from donkey-hide (as it is today) until the early Tang dynasty. Donkey-hide gelatin is not mentioned in the *Newly Revised Materia Medica,* but the book does mention a gelatin made from antlers called " Bai Jiao." However, Chen Cangqi makes a remark that, " the donkey-hide gelatin is best for suppressing wind." The 10th century *Ri Hua Zi Ben Cao* (《日华子本草》*Herbal of Rihua Zi*) stated that, "Donkey, its skin is able to suppress all types of wind if you eat the boiled gelatin."[17] It was believed that donkey-hide gelatin could suppress any type of wind. The transition to donkey-hide gelatin for medicinal purposes is described in detail by Zhang Jinju et al.,[18] Zhao Jiashen et al.,[19] and other authors. This issue has been discussed in detail in these earlier papers, such as the supply of donkey-hide gelatin increased because the deteriorated quality of cowhide gelatin during the Northern Song dynasty (960–1127 ACE).

Li Shizhen mentioned that, "In general, gelatin is manufactured from the tenth to the second or third lunar months. Cowhide, water buffalo hide, and donkey-hide are superior, followed by hide from pigs, horses, mules, and camels . . . Early formulas included cowhide (gelatin) . . . Later, donkey-hide (gelatin) was praised."[20] Li Shizhen's description makes it clear that the reputation of donkey-hide gelatin was growing since the Song dynasty.

6 Medicinal gelatin in Japan

Since ancient time, there have been few donkeys in Japan and almost no production of donkey-hide. However, medicinal gelatin was produced in Japan. According to the *Engi Shiki* (《延喜式》*Procedures of the Engi Era*) in 927 ACE), Musashi Province (present Tokyo Prefecture and Saitama Prefecture) was obliged to give an annual tribute of approximately 30 kg of gelatin together with Ma Huang (麻黄 ephedra) and Ma Zi (麻子 hemp seeds). Although gelatin was listed with herbal medicines such as ephedra and hemp seeds, the amount of glue was much larger than the amounts of the other medicinal materials, probably because it was mainly used for industrial purposes. There is an ancient custom in Japan of abstaining from eating meat because of its "kegare" 秽 impurity); this custom was strengthened by the introduction of Buddhism to Japan. The *Engi Shiki* contains a code of avoiding attendance at any ceremony for 3 days after eating domesticated animals. Therefore, the production and consumption of medicinal gelatin is not popular in Japan. The use of imitation meat became popular in Japan, particularly from 13th to 15th centuries, when Zen Buddhism flourished. For example, the traditional Japanese confectionery "yokan" (羊羹 which is literally translated as mutton soup) has its origins in a specific meat dish from China. However, when the dish was introduced to Japan by Zen Buddhist monks, it became a vegetarian dish containing imitation meat. Yokan is made by mixing powdered adzuki beans, yam, sugar, flour, and arrowroot powder. The mixture is cut to resemble the shape of a sheep's liver and steamed until it solidifies. In the Edo period, agar weed was widely used to solidify food, including yokan. These cooking methods were developed as part of the custom of abstaining from eating meat.[21] While animal meat dishes were avoided, fish dishes were not contraindicated. There were cases when the soup of boiled fish cooled down and hardened spontaneously. It is thought that such gelatin was sometimes eaten, but not for medicine.

Records from the 18th to 19th centuries show that Japan imported E Jiao from China.[22] At approximately this time, Koho-ha (古方派 the Antiquity School) of medicine was gaining prominence in Japan. Accordingly, the demand for E Jiao increased because it was often used in formulas developed by Zhang Zhongjing, an important physician of the Antiquity School. Zhang Zhongjing uses several formulas that include E Jiao in the *Shang Han Lun* (《伤寒论》*Treatise on Cold Damage*), such as Zhi Gan Cao Decoction (炙甘草汤) for Taiyang disease, Zhu Ling Decoction (猪苓汤) for Yangming disease and other disorders), and Huang Lian E Jiao Decoction (黄连阿胶汤) for Shaoyin disease. Additionally, Zhang Zhongjing's *Jin Gui Yao Lüe* (《金匮要略》*Synopsis of the Golden Chamber*) introduced Wen Jing Decoction (温经汤) and Xiong Gui Jiao Ai Decoction (芎归胶艾汤) in the chapter "Fu Ren Ren Shen" (妇人妊娠 Diseases of Women and Pregnancy). These two formulas accurately reflect the effect of stabilizing the

condition of pregnant women described in the *Shennong's Classic of Materia Medica*. Although these five formulas are often currently prescribed to patients in Japan, E Jiao is not registered in the *Japanese Pharmacopoeia*. For this reason, qualified gelatin (based on the above pharmacopeial standard) is sometimes used instead of E Jiao. In 1989, E Jiao was listed in the *Japanese Standards for Non-pharmacopoeial Crude Drugs* and it has been used in line with this standard ever since.[23] According to this standard, the raw material of gelatin is donkey-hide. In the *Pharmacopoeia of the People's Republic of China*, gelatin made from donkey-hide is called E Jiao, and gelatin made from cowhide is called Huang Ming Jiao (黄明胶). Water from the Ejing well is no longer required for the production of any of these types of gelatin.[24]

The medical effect of E Jiao has also been studied in Japan. In a comparison of six formulas for kidney inflammation in rats, Zhu Ling Decoction showed the most effective anti-inflammatory activity.[25] The researchers focused on E Jiao because Zhu Ling Decoction had a better effect than Wu Ling Powder (五苓散), which does not contain E Jiao. However, they also realized E Jiao itself does not show anti-inflammatory activity. In addition, E Jiao-excluded Zhu Ling Decoction was not as effective as Zhu Ling Decoction. These findings show that E Jiao is essential to obtain an effect from Zhu Ling Decoction. Because E Jiao is an indigestible protein, its addition may slow the intestinal absorption of other ingredients. In other words, the auxiliary action of E Jiao may differ from that of gelatin capsules. If so, this explains the Lei Gong remark that "E Jiao fears Da Huang" as recorded in the *Lei Gong Yao Dui* (《雷公药对》*Leigong Drug Pairing*).[8] Purgative agents like Da Huang (大黄 *Radix et Rhizoma Rhei*) may not only reduce the effect of E Jiao, but may also reduce the effect of other herbal ingredients.

7 Conclusions

In China, animal gelatin has been used as an adhesive since prehistoric time. Descriptions of its medicinal use are found in the *Wu Shi Er Bing Fang* (《本草品汇精要》*Prescriptions for Fifty-two Diseases*), indicating that it is one of the oldest TCM medicines. However, it is likely that its raw material was cowhide; therefore, it differed from modern medicinal gelatin. The name E Jiao first appears in the Eastern Han dynasty text *Shennong's Classic of Materia Medica*, and the ingredient is described as useful for symptoms related to pregnancy and menstruation. Zhang Zhongjing often used E Jiao in his formulas, most of which are still prescribed to patients today. However, Zhang Zhongjing's original formulas presumably contained E Jiao made from cowhide. In the Tang dynasty, E Jiao began to be produced from donkey-hide. During the Song dynasty, some physicians expressed a preference for donkey-hide gelatin over cowhide gelatin. Currently, gelatin made from donkey-hide is called E Jiao and gelatin made from cowhide is called Huang Ming Jiao in the People's Republic of China.

Japan has actively introduced Chinese medicine. However, since the consumption of animal flesh had been forbidden, the use of animal gelatin for medicinal purposes was shunned. When the Koho-ha school became mainstream in the late Edo period, physicians tended to prescribe E Jiao more often to patients because they placed an enormous emphasis on Zhang Zhongjing's formulars. As a result, Japan imported E Jiao from China.

From a historical perspective, cowhide gelatin should be used as E Jiao to authentically reproduce Zhang Zhongjing's formulas. Although there is a certain value in reproducing such ancient formulas, they are not always the best treatments for modern practice. The quality and healing properties of herbal medicines may change over time. Additionally, differences in the constitutions of people between ancient and modern times (owing to changes in food and drink customs) may alter the suitability of some herbal medicines by the change of the common diseases and symptoms. An example is the change from cowhide to donkey-hide as the raw material of E Jiao. To determine whether donkey-hide gelatin or cowhide gelatin is more effective in Zhang Zhongjing's formulas requires controlled experiments.

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Ethical approval

This study does not contain any studies with human or animal subjects performed by any of the authors.

Author contributions

Teruyuki Kubo participated in manuscript review and writing. Teruyuki Kubo and Zhong-Zhen Zhao have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

Conflicts of interest

Zhong-Zhen Zhao is an Editorial Board member of *Chinese Medicine and Culture*. The article was subject to the journal's standard procedures, with peer review handled independently of Zhong-Zhen Zhao and his research groups.

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Research Article

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MEDICINE AND CULTURE

OPEN

Establishment of the First Professional Organization of Traditional Chinese Medicine and Acupuncture in California

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Abstract

The California Chinese Medicine and Acupuncture Research Association, founded on March 25, 1974, is the first Chinese medicine organization registered with the state government in California. It was established after more than a year of arduous preparation and had 15 founding members. Over time, it evolved into the biggest organization of Chinese medicine and acupuncture in California. And in 2015, it became the American Association of Chinese Medicine and Acupuncture with more than 500 members.

Keywords: Acupuncture; Aubrey Grossman; Bea Chi Pien (卞伯歧); Hans Wong (黄天池); Chinese medicine; Medical history

Nonprofit professional organizations in the USA must obtain registration with a government department and must operate in compliance with the relevant laws and regulations. How did immigrant Chinese medicine and acupuncture practitioners become aware of the importance of establishing a professional organization to fight for and safeguard their rights? This article addresses this question, and explores the developmental process of establishing the first professional organization of Chinese medicine and acupuncture in California, the organization's members, and the importance of the legalization of acupuncture in California.

1 Early practice of traditional Chinese medicine and acupuncture in the San Francisco area

In 1848, the discovery of gold in Coloma, California, attracted people from all over the USA and the world and created an unprecedented gold rush.[1] Thousands of Chinese gold mining laborers traveled across the Pacific Ocean to San Francisco. From 1851 to 1860, approximately 40,400 Chinese people arrived in the USA. Chinese laborers continued to flock to the USA after 1860, owing to the construction of the transcontinental railroad. There were approximately 100,000 Chinese people in the USA in 1869,[2] many of whom lived near San Francisco, making it the city with the largest Chinatown in the country.

Traditional Chinese medicine (TCM) was introduced to the USA by Chinese immigrants. Because there was an existing tradition of using herbal medicine to treat disease by the indigenous Americans, the use of Chinese herbal medicine in the USA was legal and public. At that time, most Chinese people in the USA who became ill considered using TCM, because it presented no language or cultural barriers for them. Since 1860s, English language newspapers had published advertisements for TCM to attract more people from outside the Chinese community (Fig. 1).[3] In the 19th century, there was even a Chinese hospital that focused on TCM, which was established in San Francisco Chinatown (Fig. 2). The use of TCM in San Francisco was very common at that time.

Acupuncture is part of TCM but it was regarded as a medical practice, because the needles penetrate the skin. To practice legally, practitioners had to hold a medical license. Therefore, Chinese acupuncturists had to practice acupuncture secretly.

Large changes occurred shortly before and after President Nixon's visit to China in 1972. Some American medical experts, scientists, journalists, and celebrities visited China to watch acupuncture anesthesia and recounted their personal experiences of acupuncture anesthesia and acupuncture treatment. Mainstream US media introduced acupuncture to Americans through images, articles, and videos. The seemingly "magical" images of acupuncture anesthesia amazed people across the USA,[4] and "acupuncture fever" rapidly spread nationwide. Many patients who were dissatisfied with Western medical practice sought TCM acupuncture treatment. For a period, new TCM acupuncture clinics opened in quick succession and treated patients openly. Business was so brisk that an acupuncturist might treat 70 to 80 patients a day.[5]

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Figure 1 Advertisement of traditional Chinese medicine in 1860

2 Arrests of acupuncturists

The sudden popularity of acupuncture also attracted attention from mainstream Western medicine. In August 1972, promoted by the California Medical Association, the first acupuncture bill in California (AB1500) was passed. Its main content was to stipulate that acupuncturists could not treat patients independently; they could only perform acupuncture under the supervision of a physician. Acupuncturists who did not comply with this law were considered to be operating illegally.[6]

After the passage of this bill, George Long (陈佐治) became the first acupuncturist in California to be arrested for treating patients with acupuncture. On December 15, 1972, he was arrested at his clinic at 1865 Post Street in San Francisco and prosecuted for practicing medicine without a license. Long was a Chinese medicine practitioner who emigrated from Hong Kong to the USA, taught Kung Fu in San Francisco, and used acupuncture to treat patients in his clinic. He faced a $600 fine and a 6-month bail sentence. Long was released on bail, pending trial, for $500.[7]

Figure 2 Chinese hospital established in San Francisco Chinatown in 19th century

After Long was arrested, California law enforcement departments continued to arrest acupuncturists and to ban acupuncture clinics. The well-known TCM and acupuncture practitioners Bea Chi Pien (卞伯歧), Hans Wong (黄天池), Noy Cho Lee (李奈祖), and Wai Loy Lee (李卫来), who practiced in San Francisco Chinatown, were all detained or inspected and ordered to suspend their clinics.[8] Throughout the state, acupuncture clinics were closed and acupuncturists arrested; more than 20 cases awaited criminal lawsuits.[9] The entire California acupuncture industry was negatively affected, and many acupuncture clinics pre-emptively closed, moved underground, and/or relocated to the countryside. The acupuncture industry faced an unprecedented crisis.

TCM and acupuncture practitioners were not passive, but faced this serious crisis in the acupuncture industry actively. Some TCM acupuncturists who practiced in San Francisco gathered to discuss countermeasures and to launch actions. They helped Long hire Aubrey Grossman, a famous San Francisco civil rights lawyer, as his defense lawyer.

Aubrey Grossman (1911–1999) had extensive legal experience and a sense of equal civil rights and social justice. He realized that, because of acupuncture's popularity, many patients in California (and across the USA) were keen to obtain an acupuncture treatment by any possible means. Some Western medical doctors believed that acupuncturists and the practice of acupuncture were a threat to their own medical monopoly and economic advantages. Therefore, they pressured the relevant departments of the California state government to ban acupuncture clinics and to arrest and prosecute acupuncturists.

There were three main groups that wanted to ban acupuncture clinics. One group comprised individuals called "weekend doctors" or "instant acupuncturists." These medical doctors learned a little about TCM and acupuncture on a weekend and then promptly began offering acupuncture to patients, charging much higher fees than acupuncturists. The second group comprised medical doctors who hired acupuncturists to perform acupuncture in their Western clinics. These doctors claimed two-thirds to four-fifths of the acupuncture treatment fee for themselves. The third group comprised doctors who were completely ignorant of acupuncture and regarded acupuncture as a type of deception.

To reduce suspicion, misunderstanding, and hostility regarding acupuncture, Grossman sent a letter to more than 20,000 Western medical doctors in California, arguing that acupuncture should not be banned. He gave the following reasons: 1) Acupuncture is a safe and effective treatment method. The therapy has been used for thousands of years in China and more than 100years in California. 2) Acupuncture is not included in the courses offered by American medical schools. It is a treatment developed under a different medical system. Therefore, acupuncture should be performed by TCM acupuncturists who are the most skilled in this treatment. 3) Western doctors should have the right to refer patients suitable for acupuncture treatment to

acupuncturists. The letter from Grossman produced very good results. More than 40 doctors replied that they were willing to testify in court to protect doctors' rights to refer patients to acupuncturists.[10]

In addition, Grossman and the acupuncture community turned defense into offense, and filed three legal actions with the California state government. One was filed by acupuncturists, stating that acupuncture is not part of Western medicine, thus acupuncturists have the right to perform acupuncture. Another case was brought by acupuncture patients, stating that patients have the right to decide which medical services they need, especially if their Western medical doctor is unable to effectively treat them and if acupuncture seems suitable. The third case was filed by Western medical doctors, arguing that doctors have the right to refer patients to acupuncturists for pain relief.[11,12]

Pressure from the public and public opinion contributed to Long's acquittal, prompted law enforcement departments to almost stop arresting acupuncturists, and contributed to the development of the legalization of acupuncture in California.

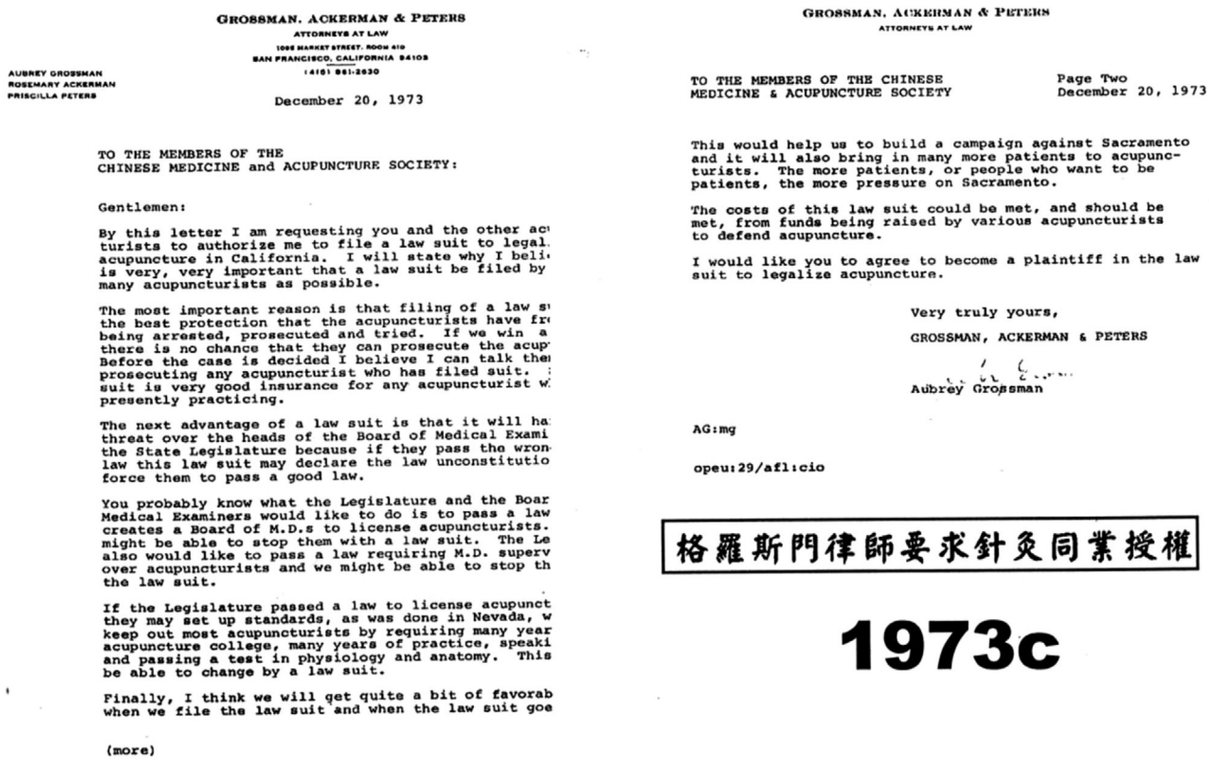
3 Establishment of a TCM and acupuncture organization to safeguard and fight for rights and interests

In addition to fighting for Long in court to obtain a verdict of not guilty, Grossman suggested to the TCM and acupuncture community that acupuncturists must unite and establish a professional organization. He believed that only through unity could they develop strength. He voluntarily became a legal counsel in the TCM and acupuncture industry in northern California (Fig. 3).

Owing to the arrest of Long and the California state government's series of crackdowns on acupuncture, acupuncturists realized that they had to act to save themselves. San Francisco Chinatown had the highest concentration of TCM and acupuncture practitioners in the USA. Because these TCM and acupuncture practitioners usually knew, communicated with, and supported each other through difficulties, they followed Grossman's advice. Individuals such as Bea Chi Pien, Hans Wong, Eva Chau (周敏华), Kang Nan Yue (余庚南), Noy Cho Lee, Wai Loy Lee, Yee Gee Lee (李愈之), and others worked to establish the first TCM and acupuncture organization in California. In 1973, they established the California Chinese Medicine and Acupuncture Research Association (CCMARA). Pien and Wong were instrumental in these developments (Figs. 4 and 5).

Dr. Bea Chi Pien (1910–1998) was born in Changwu, Jiangsu province of China. He studied under Wang Daoping, of the Meng He School lineage, who specialized in laryngology and acupuncture. He practiced medicine in Changwu and Changzhou and served as the president of Changwu TCM Association. In 1949, he moved from Jiangsu to Hong Kong and founded the "Daoshengtang" TCM store, while also practicing TCM. The store became famous throughout Hong Kong in the 1950 s. The Hong Kong *Sing Tao Daily* newspaper created a column for Pien titled "Inquiry on Diseases and Treatments." Pien moved from Hong Kong to San Francisco in 1967 and continued to practice TCM in San Francisco Chinatown.[13]

Dr. Hans Wong (1917–2011) was originally from Taishan, Guangdong province of China. He immigrated to the USA in 1937 and opened a TCM shop in San



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(415) 861-2630

AUBREY GROSSMAN
ROSEMARY ACKERMAN
PRISCILLA PETERS

December 20, 1973

TO THE MEMBERS OF THE
CHINESE MEDICINE and ACUPUNCTURE SOCIETY:

Gentlemen:

By this letter I am requesting you and the other ac
turists to authorize me to file a law suit to legal
acupuncture in California. I will state why I beli
is very, very important that a law suit be filed by
many acupuncturists as possible.

The most important reason is that filing of a law s
the best protection that the acupuncturists have fr
being arrested, prosecuted and tried. If we win a
there is no chance that they can prosecute the acup
Before the case is decided I believe I can talk the
prosecuting any acupuncturist who has filed suit.
suit is very good insurance for any acupuncturist w
presently practicing.

The next advantage of a law suit is that it will ha
threat over the heads of the Board of Medical Exami
the State Legislature because if they pass the wron
law this law suit may declare the law unconstitutio
force them to pass a good law.

You probably know what the Legislature and the Boar
Medical Examiners would like to do is to pass a law
creates a Board of M.D.s to license acupuncturists.
might be able to stop them with a law suit. The Le
also would like to pass a law requiring M.D. superv
over acupuncturists and we might be able to stop th
the law suit.

If the Legislature passed a law to license acupunct
they may set up standards, as was done in Nevada, w
keep out most acupuncturists by requiring many year
acupuncture college, many years of practice, speaki
and passing a test in physiology and anatomy. This
be able to change by a law suit.

Finally, I think we will get quite a bit of favorab
when we file the law suit and when the law suit goe

(more)

GROSSMAN, ACKERMAN & PETERS
ATTORNEYS AT LAW

TO THE MEMBERS OF THE CHINESE MEDICINE & ACUPUNCTURE SOCIETY — Page Two, December 20, 1973

This would help us to build a campaign against Sacramento and it will also bring in many more patients to acupuncturists. The more patients, or people who want to be patients, the more pressure on Sacramento.

The costs of this law suit could be met, and should be met, from funds being raised by various acupuncturists to defend acupuncture.

I would like you to agree to become a plaintiff in the law suit to legalize acupuncture.

Very truly yours,

GROSSMAN, ACKERMAN & PETERS

Aubrey Grossman

AG:mg

opeu:29/afl:cio

格羅斯門律師要求針灸同業授權

1973c

Figure 3 Grossman's letter to the members of CCMARA. CCMARA: California Chinese Medicine and Acupuncture Research Association

Figure 4 Bae Chi Pien (卞伯歧)

Figure 5 Hans Wong (黃天池)

Francisco Chinatown. He received his tertiary education in the USA and obtained a chiropractic license in 1942. He joined the US Army during World War II and won the Bronze Star Medal. After World War II, he worked as a chiropractor in San Francisco Chinatown and ran a TCM shop.[14] Wong was fluent in both Chinese and English, so he was the main communicator with Grossman.

There were many difficulties during the setting up of the CCMARA. Most Chinese acupuncturists were afraid of being arrested and prosecuted by law enforcement agencies for participating in the association, and so were afraid to become involved. However, the founders of the association were not afraid. In addition to constantly highlighting the necessity of establishing a professional organization of TCM acupuncturists and encouraging colleagues in the industry to join the association, they carried out various types of work to fight for and protect the rights and interests of the TCM acupuncture industry. For example, they financially supported Long during litigation; they assisted Grossman to mobilize acupuncturists to jointly sue the California state government for banning clinics and arresting acupuncturists; and (through acupuncturists) they mobilized patients to jointly sue the California state government to ensure that it did not ban acupuncture clinics and deprive patients of

C0711239 CALIFORNIA CHINESE MEDICINE AND ACUPUNCTURE RESEARCH ASSOCIATION

Registration Date:	03/25/1974
Jurisdiction:	CALIFORNIA
Entity Type:	DOMESTIC NONPROFIT
Status:	FTB SUSPENDED
Agent for Service of Process:	*
Entity Address:	*
Entity Mailing Address:	915-A GRANT AVE SAN FRANCISCO CA 94108

Document Type	File Date	PDF
SI-COMPLETE	07/01/1976	Image unavailable. Please request paper copy.
REGISTRATION	03/25/1974	Image unavailable. Please request paper copy.

Figure 6 Registration of California Chinese Medicine and Acupuncture Research Association in 1974

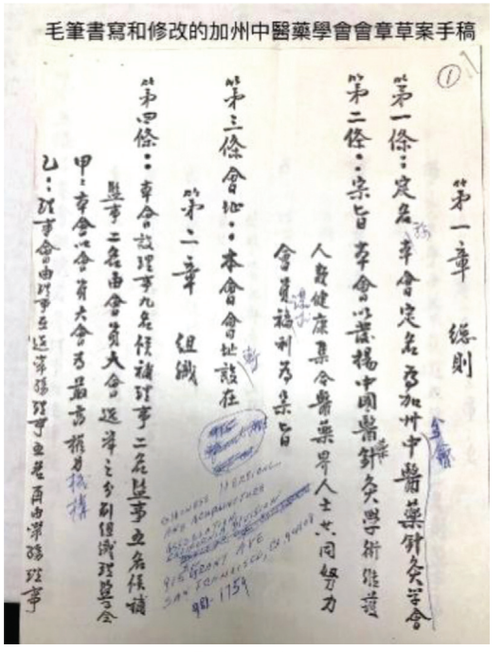

Figure 7 CCMARA bylaws

their rights to seek effective medical treatment. Dr. Eva Chau also testified in court during Long's case.[8]

After more than a year of preparation, the first Chinese medicine and acupuncture professional organization in California, the CCMARA, was registered with the California state government on March 25, 1974 (Fig. 6) The association had formal bylaws (Fig. 7). The

Figure 8 Wong and Grossman during the inaugural ceremony of CCMARA. CCMARA: California Chinese Medicine and Acupuncture Research Association

美國第一個爲爭取針灸合法化而成立的“加州中醫藥針灸學會”第一屆常務理事合照。前排左起：周敏華，李衛來, 黃天池, 趙俊偉, 吳祥瑞, 李奈祖。後排左起: 餘庚南，蔣福林，劉文偉，餘濟仁，李愈之, 譚志全, 劉奕鳴。（1974年攝）

Figure 9 Members of the first CCMARA board. CCMARA: California Chinese Medicine and Acupuncture Research Association

加州中醫藥針灸學會第一屆全體理監事宣誓就職。左起: 黃德馥，蔣福林，劉文偉，譚志全，李愈之，吳祥瑞, 餘濟仁，黃天池, 餘庚南, 周敏華, 李衛來, 李奈祖, 劉奕鳴, 趙俊偉。(1974年攝)

Figure 10 Swearing-in of the board members

inaugural ceremony was held in May 1974, and a board of directors and supervisors was elected. The first president was Hans Wong. The directors and supervisors were Bea Chi Pien, Eva Chau, Kang Nan Yue, Noy Cho Lee, Wai Loy Lee, Yee Gee Lee, John Wu (吴祥瑞), Defu Wong (黄 德馥), Junwei Zhao (赵俊伟), Chi Yus Yee (余济仁), William F.L. Chiang (蒋福林), Norman Lew (刘文伟), David Tam (谭志全), and E.K. Meng Lau (刘奕明). There were 15 board members in total[8] (Figs. 8–10).

During andafterits establishment, theCCMARAbecame the leader, organizer, and most important force in promoting the legalization of acupuncture in the state. Together with acupuncture professionals and enthusiasts in the community, it successfully promoted the SB86 bill for the legalization of acupuncture in California. In July 1975, California became the eighth state in the USA to legalize acupuncture.[15] California was and is an influential state because of the large number of TCM and acupuncture practitioners and patients. The founders of the CCMARA, including Hans Wong, Bea Chi Pien, Kang Nan Yue (余庚南), Eva Chau, Wai Loy Lee, and others, made many important contributions in the legalization process.

In September 1976, the CCMARA merged with other acupuncture groups to form the United Acupuncturists of California.[16] The United Acupuncturists of California ceased operation in the early 1980s. Most of its members in Northern California successively formed the California Certified Acupuncturists Association (CCAA) in 1983 and United California Practitioners of Chinese Medicine (UCPCM) in 1995. In 2015, CCAA and UCPCM merged into American Association of Chinese Medicine and Acupuncture and became the largest TCM Acupuncture Association in the USA, the early leaders and members of the CCMARA, such as Hans Wong, Eva Chau, Benson You (丘德扬), Miriam Lee (李传真), Lam Kong (江林), and others, worked tirelessly for decades to promote the acceptance and development of TCM and acupuncture in California and across the USA, and made important contributions that TCM practitioners in the USA will always remember. Of the 15 founding members of the CCMARA, Norman Lew (刘文伟) is the only one who is still alive. He is honorary advisor of the AACMA.

4 Conclusions

The arrest of George Long was a turning point in the legalization of acupuncture in California. The establishment of the CCMARA was a milestone in the development of TCM and acupuncture in California. Long's lawyer, Aubrey Grossman, initiated legal proceedings to counter the unjust law enforced on the George Long and other acupuncturists. He was a key figure in the legalization of acupuncture in California. The TCM and acupuncture community united to fight for and protect their legitimate rights and interests.

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Ethical approval

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Author contributions

Sam Xian Sheng Huang wrote and reviewed the manuscript. Jun Hu edited and reviewed the manuscript. Da-Ren Chen and Jackson Chau provided the original information. All authors have read and approved the final manuscript.

Conflicts of interest

Jun Hu is an editorial board member of *Chinese Medicine and Culture*. The article was subject to the journal's standard procedures, with peer review handled independently of this editorial board member and their research groups.

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Research Article

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OPEN

A Comparative Research of Two English Translations of the Chapter "Comprehensive Discourse on Phenomena Corresponding to Yin and Yang" in *Huangdi's Internal Classic*

Zhi-Wei Zhou, Yan-Qing Li, Hai-Ying Li✉

Abstract

Culture-loaded words refer to words with specific cultural connotations that can express an abstract or a specific concept, which may be related to religious beliefs or social customs, but do not exist in other languages and cultures. Therefore, culture-loaded words bring some difficulties to translation work. *Huang Di Nei Jing* (《黄帝内经》*Huangdi's Internal Classic*) is the foundation of traditional Chinese medicine (TCM) theory, and is listed as the first of the four classics of TCM. It contains a large number of culture-loaded words, which embody the ancient Chinese traditional culture. The translation of culture-loaded words is a difficult but crucial point in the translation of *Huangdi's Internal Classic* and directly relates to the quality of the translation of *Huangdi's Internal Classic* as a whole. Taking the two English versions of Maoshing Ni and Li Zhaoguo as examples, this work identifies the culture-loaded words appearing in the chapter "Yin Yang Ying Xiang Da Lun" (阴阳应象大论 Comprehensive Discourse on Phenomena Corresponding to the Yin and Yang). This work studies the strategies and translation process of culture-loaded words in *Huangdi's Internal Classic,* with a view to contribute to the English translation of TCM classics.

Keywords: Culture-loaded words; *Huang Di Nei Jing* (《黄帝内经》*Huangdi's Internal Classic*); Translation

1 Introduction

Huang Di Nei Jing (《黄帝内经》*Huangdi's Internal Classic*) is the foundation of traditional Chinese medicine (TCM) and listed as the most significant work of the Four Great Classics of TCM.[1] *Huangdi's Internal Classic* enjoys a unique position in the classics of TCM. It is the "Bible" in the theoretical system of TCM, and plays a decisive role in the inheritance and development of TCM culture.[2] As a TCM classic, there are a large number of culture-loaded words in *Huangdi's Internal Classic* that reflect Chinese traditional culture, which brings difficulties to translation. As Lan Fengli claims,[3] culture-loaded words are the emphasis of the translation of *Huangdi's Internal Classic*. The translation of these words directly affects the quality of the entire translated text. Thus, research on the translation of culture-loaded words in *Huangdi's Internal Classic* is particularly important.

By making a comparative analysis of the sample sentences of culture-loaded words in Maoshing Ni's *The Yellow Emperor's Classic of Medicine*[4] and Li Zhaoguo's *Yellow Emperor's Canon of Medicine: Plain Conversation* (Figs. 1 and 2),[5] this study discusses the role of relevance principle in the translation of culture-loaded words and defines translation strategies and methods that can be used. This study focuses on enriching the research of relevance translation theory, translation of culture-loaded words in TCM classics, and promoting international communication of TCM culture.

2 Selection of the Chinese texts

In this study, Wang Bing (王冰)'s Zhu *Huang Di Nei Jing Su Wen* (《注黄帝内经素问》*Annotation of Huangdi's Internal Classic Basic Questions*) is used as the Chinese text,[6] and Wang Qingqi's *Nei Jing Xuan Du* (《内经选读》*Selected Readings of Huangdi's Internal Classic*),[7] Cheng Shide's *Nei Jing Jiang Yi* (《内经讲义》*Lectures on Huangdi's Internal Classic*),[8] and Guo Aichun's Huang Di *Nei Jing Su Wen Jiao Zhu Yu Yi* (《黄帝内经素问校注语译》*Interpretation of Huangdi's Internal Classic Basic Questions*)[9] are selected as the reference texts.

2.1 Selection of the English versions

This study examines the chapter "Yin Yang Ying Xiang Da Lun" (阴阳应象大论 Comprehensive Discourse on Phenomena Corresponding to the Yin and Yang) from the English version of Maoshing Ni (herein referred to as Mao's version)[4] and Li Zhaoguo (herein referred to as Li's

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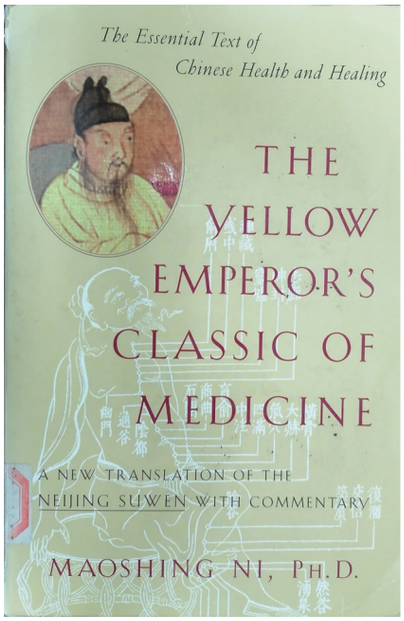

Figure 1 Cover of *The Yellow Emperor's Classic of Medicine* translated by Maoshing Ni

version)[5] as the research subjects. The translation texts are selected based on the following four reasons.

2.1.1 Influential translations

Mao's version is the translator's interpretation of the philosophical system of TCM from a clinician's point of view. This translation is admired by TCM amateurs and in the clinical teaching of TCM in the United States. As one of the Library of Chinese Classics, Li's version is highly recognized and accepted both domestically and internationally.

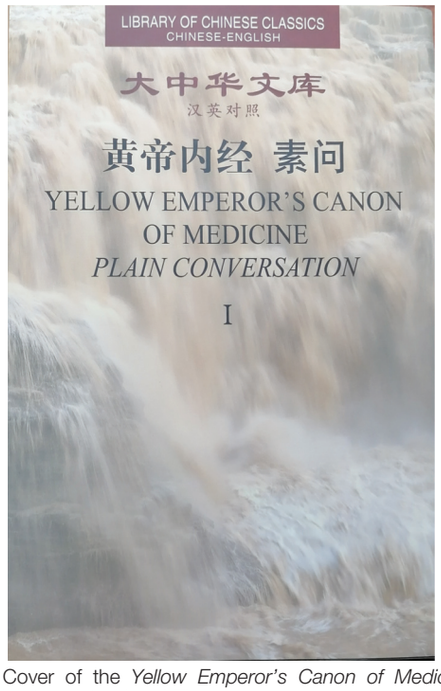

Figure 2 Cover of the *Yellow Emperor's Canon of Medicine: Plain Conversation* translated by Li Zhaoguo

2.1.2 Different translation features

Mao's version is a full-text version compiled in English, which focuses on free translation and conveys the translator's ideas and feelings. Li's version is a full English-Chinese translation, which retains the form and content of the original books to the maximum extent.[10] In order to maintain the connotation of the original text to the greatest extent, Li uses the methods of English translation plus intext annotations and post-text annotations.

2.1.3 Translators' background differences

Born in a family of TCM, Maoshing Ni engages in both clinical practices and teaching of TCM in the United States. He was educated in both Chinese and Western Medicine and translated a lot of books. Li Zhaoguo is a Chinese scholar and professor of foreign languages at Shanghai Normal University. He has been engaged in the translation, teaching, and research of TCM in English since 1992. Both scholars have different upbringing, thought, and knowledge. All of these factors can affect translation, so the translation texts are comparable.

2.1.4 Higher satisfaction

According to Wen Juan and Jiang Jichang's research,[11] Mao and Li's versions have the highest satisfaction in short-term foreign studies (those who have studied abroad for more than 2 weeks but less than 1 year), so they will be used for references in the translation of TCM classics.

2.2 Classification of culture-loaded words

This article mainly refers to Deng Yanchang's[12] method of classifying culture-loaded words according to the corresponding conditions of source and target languages. There are four types of culture-loaded words: first, those having no equivalent words in the target language; second, those sharing the same literal meanings but having different connotative meanings; third, those having multiple but not completely equivalent counterparts in another language; and fourth, those having similar basic meanings but different secondary or additional meanings.

3 Results and discussion

According to the characteristics of culture-loaded words summarized in the previous section, culture-loaded words appearing in the texts and translations of *Comprehensive Discourse on Phenomena Corresponding to Yin and Yang* are marked manually. Due to the large number ofwords involved, the author marked the four types of words in the order of first to fourth serial number, using Excel software to randomly select three samples. The words can be seen in Table 1.

3.1 Without counterparts in the target language

阴阳：黄帝曰：阴阳者，天地之道也，万物之纲纪，
变化之父母，生杀之本始，神明之府也。

Li's version: YinYang.
Mao's version: Yin and Yang.

Table 1 Randomly selected culture-loaded words

NO.	Selected culture-loaded words with Chinese pinyin		
1	阴阳(yin yang)	七损八益(qi sun ba yi)	六合(liu he)
2	五脏(wu zang)	风(feng)	阴痿(yin wei)
3	归化(gui hua)	涌泄(yong xie)	泻(xie)
4	纲纪(gang ji)	苍(cang)	海(hai)

"阴阳" is a pair of categories used in the Chinese philosophy and has evolved from things that actually exist in nature. As an abstract philosophical concept, Yin and yang mainly represent two opposite and complementary attributes. Yin and yang are used to explain the two aspects of one opposite unity, as well as opposites between interrelated things in nature. Both Li's version and Mao's version have adopted transliteration, and both have transliterated "Yin Yang (阴阳)" in Chinese Pinyin (拼音). It can be observed that, with the spread of Chinese culture, foreign readers are becoming increasingly aware of the concept of yin and yang. Therefore, transliteration can allow foreign readers to infer the concept of yin and yang as accurately as possible.

七损八益: 岐伯曰: 能知七损八益，则二者可调，
不知用此，则早衰之节也。

Li's version: Seven (ways of) losses and eight (ways of) profits.

Mao's version: The methods or Tao of maintaining health and the causes of depletion.

"七损八益" has always been interpreted differently. However, the basic argument is to adjust the yin and yang of the human body and to avoid any disruption. Li's version accurately conveys information intention via literal translation with endnotes. However, this concept is too complicated, and Li ignores the cognitive environment of the target readers, which may bring some difficulties to the readers. Mao's version paraphrases the core ideas of this concept, and it allows communicative intention to be transmitted, which is conducive to readers' understanding.

六合: 余闻上古圣人，论理人形，列别藏府，端络经脉，
会通六合，各从其经。

Li's version: The six combinations.

Mao's version: The meridians are further coupled as yin yang pairs, called liu he.

"六合", the 12 meridians (十二经脉) of the human body have their own divergent meridian (经别), which becomes the 12 divergent meridians (十二经别), and its distribution characteristics can be summarized as "exit (离), entrance (入), out (出), and convergence (合)". The yin meridian is combined with the yang meridian on the surface of human body, and then, the six yang meridians (六阳经) are added together to form a "combination". Each pair of meridians forms a "union," so that the 12 meridians (十二经脉) become 6 pairs, known as the "六合". Li's version uses transliteration plus endnotes, and Mao's version translates freely. Both are related to the information and intention of the original text. Due to the complexity of the "six combinations" concept, the translations may be less effective to achieve optimal relevance to the cognitive understanding of target readers. However, Li's version contains multiple explanations in the endnotes to facilitate the understanding of relevant cultural information, which are worth learning.

3.2 With different connotative meaning counterparts in the target language

五脏: 人有五脏化五气，以生喜怒悲忧恐。

Li's version: The Five Zang-Organs.

Mao's version: The five Zang organs.

"五脏" is a collective term including the heart (心), liver (肝), spleen (脾), lung (肺), and kidney (肾). Unlike the physical organs in the Western Medicine, "五脏" is a combination of physical viscera and functional organs. Both versions adapt a literal translation to ensure the transmission of information intention while ignoring the communicative intention of the original text. Perhaps, this is because translators believe that readers have a certain understanding of the Five Zang-Organs (五脏) concept in China. If the translators take ordinary readers into account, the author suggested to add annotations to ease understanding.

风: 天有四时五行，以生长收藏，以生寒暑燥湿风。

Li's version: Wind.

Mao's version: The pathogenic wind.

"风," refers to wind evil (风邪). All external pathogens with the characteristics of opening and discharging are wind evil (风邪). "风" is the most important of the six pathogenic factors (六淫). Both versions use literal translation, but Mao's version describes wind as a factor that causes disease, while Li's version does not convey the communicative intention of the original text.

阴痿: 年六十，阴萎，气大衰，九窍不利，
下虚上实，涕泣俱出矣。

Li's version: Impotence.

Mao's version: The kidneys drained.

"阴痿" refers to atrophy of the sexual organs. "阴痿" refers to the weakness of the penis when the man is still in his prime. "阴痿" also refers to vaginal atrophy, dryness, and an unpleasant sexual life when the woman is still young. The two versions do not translate well. Li's version does not convey the whole message because impotence only refers to men and does not reflect the atrophy of the female vagina. Mao's version ignores the reader's cognitive environment which causes information miscommunication.

3.3 With multiple incomplete meaning in the target language

归化: 味归形，形归气，气归精，精归化。

Li's version: Transforms (into Yuan qi [Primordial-Qi]).

Mao's version: The functional part of the qi is derived from the Jing/essence.

"归化" means nourishment and generation; "transformation" means gasification and metaplasia. This means that essence can transform into Qi (气). Both Li's amplified version and Mao's free translation version have considered the contextual effect, and both have successfully realized the optimal relevance and intention transmission.

涌泄: 气味辛甘发散为阳，酸苦涌泄为阴。

Li's version: Vomiting and purgation.

Mao's version: Purging and eliminating.

"涌" means vomiting; "泄 " means purgation. "涌泄" refers to the role of medicines and food in reducing aggression, eliminating water, eliminating stasis, and purgation. The translations presented here mostly display translation skills and language use. Both versions infer the intent of the original text, but Li's version is more accurate in delivering the intent to the reader, while Mao's version does not consider the translation of vomiting.

泻: 其实者，散而泻之。

Li's version: Purging (therapy).

Mao's version: Carminative herbs.

"泻" can be understood as a treatment for the elimination of pathogenic factors in the body. Li's version and Mao's version both express the meaning of excreting pathogenic factors from the body, whereas Mao's version has a specific object. Li's version expounds this idea of treating diseases. The author believes that Li's translation is more appropriate.

3.4 With similar meaning in the target language

纲纪: 黄帝曰: 阴阳者，天地之道也，万物之纲纪，
变化之父母，生杀之本始，神明之府也。治病必求于本。

Li's version: The fundamental principle.

Mao's version: The foundation.

"纲纪" is summarized as the meaning of the fundamental principle. The translation of the two editions is consistent. Because the source language has corresponding words in the target language, "纲纪" could be translated literally.

苍: 神在天为风，在地为木，在体为筋，在藏为肝，在色为苍，
在音为角，在声为呼，在变动为握，在窍为目，在味为酸，
在志为怒。

Li's version: Blue.

Mao's version: Green.

"苍" refers to cyan. The translator's understanding of the source information and the target reader's context can be observed in the translations. Although cyan is between blue and green, green reflects spring which making green the better translation.

海: 六经为川，肠胃为海，九窍为水注之气。

Li's version: The stomach act as the seas.

Mao's version: The stomach and large intestine, which contain the fluids and food, are like the ocean.

"海" is the analogy of the human body's gastrointestinal function. The two versions are literal translations, which can convey intention and achieve the best relevance. However, Li's version requires readers to make some efforts to comprehend it, which is more consistent with the Relevance Theory.

4 Conclusions

The writing and words of *Huangdi's Internal Classic* cover the rich and profound Chinese traditional culture. These culture-loaded words are the key points and difficulties in the translation, which are directly related to the successful dissemination and acceptance of the English translation of *Huangdi's Internal Classic*. By combing Relevance Theory, the writer summarized the translation strategy of culture-loaded words in *Huangdi's Internal Classic*.

4.1 Achieving the optimal relevance of multiple ostensive-inferential communication

The relevance translation theory points out that the translation activity consists of twice ostensive-inferential communication,[13] which are increasing the translation of ancient books in a geometric progression. The translator's goal is to pursue optimal relevance between the source text and the target text as well as the cognitive environment of the target readers.[14] Considering the translation process of "the pathogenic wind (风)" in Mao's version, the translator firstly finished the translation from ancient books to modern Chinese, and then finished the translation from modern Chinese to foreign languages. In this process, the cognitive transformation of wind from the natural phenomenon to pathogenic evil is realized, which is conducive to the realization of readers' optimal relevance.

4.2 Attaching importance to the transmission of cultural information

Under the Relevance Theory, the communicative intention of translation precedes the information intention, so we can infer that the communicative intention of culture-loaded words is to convey cultural information. The translator must make the translated text not only relevant to the culture of the nation to which the original text belongs, but also relevant to the culture of the nation where the target readers live, so as to ensure that target readers can correctly understand and comprehend the cultural information conveyed by the translation. For example, there are a lot of explanations in the endnotes of "the six combinations 六合" in Li's version, which fully conveys cultural information carried by the words and make it easy for readers to understand.

4.3 Combination of direct translation and indirect translation

There are two translation strategies in the Relevance Theory: Direct translation and indirect translation. Direct translation retains the communicative clues such as the

style and expression of the original text, including literal translation and transliteration. Indirect translation retains a similar relevance between the original text and the reader, including free translation and amplification translation.

4.3.1 Direct translation

In order to convey the cultural features of *Huangdi's Internal Classic* to the target readers, the translator can adopt direct translation strategy when translating culture-loaded words, which retains the communication clues such as the style and expression of the original text.

4.3.1.1 Literal translation. For culture-loaded words of non-proprietary nouns in *Huangdi's Internal Classic*, such as Chinese socio-cultural words and concepts in some TCM terminologies, literal translation can be used. Target readers can infer the relevant context according to the communicative context clues. For example, "阴阳" is not only thought to be related to TCM, but also to ancient Chinese philosophy, which has been understood by foreign readers, so "阴阳" could be transliterated as "Yin Yang (阴阳)."

4.3.1.2 Transliteration. For most culture-loaded words, especially the first type of culture-loaded words, which do not have English counterparts, transliteration is a good idea. This can help target readers understand the connotation of this type of culture-loaded words with the help of simple annotations. Cultural relevance and communication of target readers can be realized by guiding the target readers to make more inference efforts to achieve enhanced contextual understanding. For example, Li translates "角" into "Jiao," with the endnote "Jiao is one of the five scales (tones in music) (五音) in ancient times in China." Transliteration does not only transmit the relevant information completely, but also achieves the best correlation with the target readers' cognition through the use of endnotes.

4.3.2 Indirect translation

For some culture-loaded words which may result in unnecessary inference efforts or fail to obtain the optimal relevance by using direct translation strategy, indirect translation strategy can be adopted.

4.3.2.1 Free translation. For culture-loaded words that are still in use today but had special meanings in ancient times, we can adopt the method of free translation to make readers infer their relevance. For example, Mao translates "七损八益" into "the methods or Tao of maintaining health and the causes of depletion," which directly illustrates its core ideas, while saving unnecessary processing efforts of the target readers, and effectively conveys information.

4.3.2.2 Amplification. Due to the conciseness of classical Chinese, some prefixes and phrases are often omitted, and only the subject is retained. In order to make foreign readers who are not familiar with the style of classical Chinese gain the same contextual understanding, the translator needs to supplement the translation. For example, "酸苦" in the above section refers to the bitterness of the medicines. But it is not sufficient to translate "酸苦" into "sour and bitter flavors," in both versions. Adding the word medicines to the translation can achieve the optimal relevance more effectively.

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Ethical approval

This study does not contain any studies with human or animal subjects performed by any of the authors.

Author contributions

Zhi-Wei Zhou conceived of the study and designed the study. All authors participated in writing the manuscript.

Conflicts of interest

Hai-Ying Li is an Executive Editor-in-Chief of *Chinese Medicine and Culture*. The article was subject to the journal's standard procedures, with peer review handled independently of Hai-Ying Li and her research groups.

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Review

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OPEN

Development and Future Trends of Traditional Kampo Medicine in Japan

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Abstract

Traditional Kampo medicine is based on traditional Chinese medicine, which spread to Japan via the Korean Peninsula in the 5th century. The practice of Kampo developed gradually under the influence of local Japanese culture and prospered until the Meiji Restoration. Kampo appeared in schools successively, such as the School of Later Developments, the School of Classic Methods, the School of Textual Research, and the Integrated School. However, the practice of Kampo gradually declined after the Meiji Restoration. Today, through the continuous efforts of knowledgeable Japanese Kampo practitioners, the practice of Kampo has entered a new era as an indispensable aspect of contemporary Japanese medicine.

Keywords: Medical history; History; Japan; Kampo; Traditional Chinese medicine

Traditional Chinese medicine (TCM) was introduced to Japan via the Korean Peninsula in the 5th century and gradually developed into the Japanese practice of traditional Kampo medicine with Japanese indigenous cultural influences, such as local eating habits. This development was due to TCM's remarkable curative effect and Japanese officials' emphasis on sinology. During the Meiji Restoration, however, Japan began to be influenced by Western medicine and the Japanese government decided to abolish the practice of TCM. Thus, the development of Kampo medicine temporarily stagnated. Nevertheless, based on the ongoing efforts of knowledgeable Japanese people, Kampo preparations and crude drugs were included in Japan's National Health Insurance system. As a result, the practice of Kampo has entered a new era in Japan.[1] By reviewing the development and current situation of traditional Kampo medicine practices in Japan, we explore the reasons for its rise and fall, analyze the factors affecting its growth in Japan today, and provide reference materials for its further development in Japan.

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1 Historical evolution of Japanese Kampo medicine

1.1 Arrival of traditional Chinese medicine in Japan

Cultural exchanges between China and Japan have flourished since the Jomon period. Japan's first law, the *Taihō-ritsuryō* (*Taihō Code*) (Fig. 1), was promulgated in 701 AD, 200 years after TCM was introduced to Japan. Based on the medical administration and education system of the Tang dynasty in China, the *Taihō Code* established regulations, which required medical students to read TCM classics like *Su Wen* (《素问》*Basic Questions*) and *Huang Di Zhen Jing* (《黄帝针经》*Huangdi's Acupuncture Classic*).[2] Many envoys, international students, and scholarly monks from the Sui and Tang dynasties imported Chinese medical classics into Japan during this period. After hundreds of years of digesting and assimilating Chinese culture, Japan began to independently compile medical books. The book *Ishinpō* (*Prescriptions from the Heart of Medicine*) (Fig. 2), written by the Japanese physician Tanba Yasuyori in 984 AD, provides valuable historical data for the study of Kampo medicine during the Six dynasties, Sui dynasty and Tang dynasty period in China. This book is currently the earliest existing medical book in Japan. Later, Japan entered the Kamakura period (1192 AD–1333 AD), which is equivalent to the late Song dynasty, the early Jin dynasty, and the early Yuan dynasty in China. Translations of the *Shang Han Za Bing Lun* (《伤寒杂病论》*Treatise on Cold Damage and Miscellaneous Diseases*), which was regarded as a medical scripture in Japan and the *He Ji Ju Fang* (《和剂局方》*Formulas of the Bureau of People's Welfare Pharmacy*) were introduced to Japan during this time.[1,2]

1.2 Rise of Kampo medicine

1.2.1 The Muromachi period (1336 AD–1573 AD)

Japan and China had frequent trade exchanges during the Muromachi period, when the four Great Masters of the

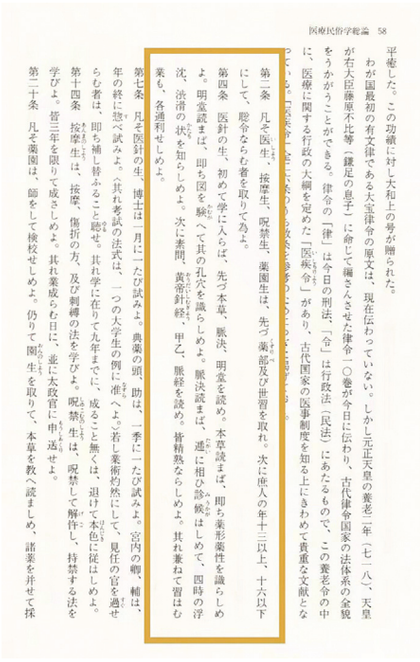


Figure 1 *Taihō-ritsuryō* (*Taihō Code*) (from Kenosuke Negishi. "Medical Folklore")

Jin and Yuan dynasties, Liu Wansu (刘完素), Zhang Congzheng (张从正), Li Dongyuan (李东垣), and Zhu Danxi (朱丹溪), created four distinct schools of knowledge in China. Tashiro Sanxi initiated studies of Li Dongyuan's and Zhu Danxi's distinct schools of knowledge in Japan, forming a TCM school called the School of Later Developments. Tashiro Sanxi's disciple Manase Dosan, also known as "the ancestor of the Japanese medical revival,"[3] vigorously popularized Li Dongyuan's theory of strengthening the spleen and Zhu Danxi's theory of nourishing yin.[3] Tashiro Sanxi's *Qi Di Ji* (《启迪集》*Textbook of Medical Philosophy and Experiences on Medicine*) emphasizes the importance of treatment based on syndrome differentiation, and advocates abdominal diagnosis and treatment. He and his books had a profound impact on later Japanese medicine.[1,3]

1.2.2 The Edo period (1603 AD–1868 AD)

Starting in 1635 AD, the Tokugawa government of Japan closed the country for more than 200 years and allowed only the Port of Nagasaki in west coast of Japan to be connected with China and the Netherlands.[2] During this period of self-lockdown, many scholars and physicians conducted more in-depth research exchanges and academic discussions. Various schools were formed such as the School of Classic Methods, the Herbal School, the School of Textual Research, the Integrated School which advocated integrating the School of Later Developments with the School of Classic Methods, the ChineseNetherlands Integrated School which advocated integrating the Kampo with the Western medicine.

The School of Classic Methods took the *Treatise on Cold Damage and Miscellaneous Diseases* as its core text and attached importance to learning Zhang Zhongjing's (张仲景) advocacy.[2] The representative figures include Nagoya Gen'I, Gotō Gonzan, and Yoshimasu Tōdō. Nagoya Gen'I painstakingly studied ancient classics stored in Kyoto, held in-depth exchanges and discussions with famous TCM doctors, and completed works such as *Ihoumonnyo* (*My Understanding of Medical Prescriptions*) and *Kinnkiyourixyaku Txyuukai* (*Notes on the Synopsis of the Golden Chamber*).[1] Gotō Gonzan was a physician aligned with a revolutionary movement among TCM prescribing physicians before the Song dynasty. He emphasized clinical effectiveness rather than theories. He invented the perspective of "sole qi stagnation (一气滞留)," as he believed that all diseases are caused by qi stagnation.[3] Yoshimasu Tōdō advocated the theory of "sole toxin for all diseases (万病一毒说)," which drew lessons from Chinese physicians' research methods of "classifying syndromes by prescriptions (以方类证)" and Zhang Zhongjing's "treatment according to syndromes (随证治之)". Although The School of Classic Methods's promotion of traditional prescriptions and emphasis on clinical practice had a positive effect, it is controversial because of its rejection of various schools and ignorance of fundamental TCM theories.[3] As a result, the Integrated School advocated integrating the thought of the School of Later Developments focusing on syndrome differentiation and treatments with the thought of the School of Classic

Figure 2 Ishinpō (*Prescriptions from the Heart of Medicine*) (from Tokyo National Museum)

Methods focusing on classic prescriptions. The School of Later Developments mainly studied the TCM prescriptions of the Song, Jin and Yuan dynasties. While the School of Classic Methods mainly researched on the TCM prescriptions of the Han, Sui, and Tang dynasties. Wada Touka's advocacy is representative of the Integrated School.[3] The Herbal School took Li Shizhen's (李时珍) *Ben Cao Gang Mu* (《本草纲目》*Compendium of Materia Medica*) as its core text and completed works on materia medica, such as Kaibara Ekiken's *Yamato Honnzou* (*Yamato's Materia Medica*)[1]. The development of the School of Classic Methods and the Herbal School marks the establishment of Japanese Kampo medicine's characteristics. Kampo medicine focuses on symptoms and uses authentic medicinal materials only. Its medical theories don't emphasize practice. In the late Edo period, the School of Textual Research, which advocated textual research on ancient classic literature, appeared in Japan. The output of the School of Textual Research was marked by works such as Taki Motoyasu's "*Shixyoukannronn-shixyuugi* (*Editing of Intentions from the Treatise on Cold Damage*)" and his son Taki Gennkenn's "*Shixyoukann-ronjixyutugi* (*The Meaning of Treatise on Typhoid Fever*)"[3]. The works of the Japanese School of Textual Research spread to China after the Meiji Restoration and positively influenced the development of TCM in China.[1] In 1774, Sugita Gennpaku's first Japanese translation of the medical book *Kaitai Shinnshixyo* (*The New Book of Human Anatomy*) made Japanese medical scholars pay more attention to Western medicine.[2] Some doctors attempted to practice Kampo and Western medicine together, which led to the emergence of the Chinese-Netherlands Integrated School. In 1804, Hanaoka Seishu extracted a breast cancer tumor during an operation using Tong Xian Powder (通仙散) under general anesthesia.[1]

1.2.3 Decline of Kampo medicine

The Meiji government (1868–1912) adopted the German medical education system.[2] In 1875, the Japanese Ministry of Internal Affairs issued a new circular, which stipulated that six Western medicine subjects were to be added to the licensing examination. The Kampo profession organized a protest and proposed the inclusion of "six subjects of Kampo medicine," but the government ignored.[3] In 1883, the Meiji government announced that 3 years of studies in Western medicine would be the precondition for taking the national examination and obtain a practicing certificate. In the same year, Kampo medicine doctors' right to prescribe traditional medicines was prohibited.[3] During this period, Japanese Kampo or folk medicine practitioners established many societies and presented several petitions that urged the Meiji government to attach importance to the practice of Kampo medicine, but all these requests were shelved or rejected.[2] The "Aichi Hakuaisha" was founded in Nagoya and its president Kunikai Asai stepped forward to contact the Kampo Salvation Alliance in various regions to carry out a petition campaign. In 1895, the Japanese National Assembly rejected the amendment proposed by Kampo medical doctors in a vote of 105 to 78. This was the last straw for saving the practice of Kampo medicine.[3] At that point, Kampo medicine, which was then practiced for more than 1000 years, experienced a general decline in Japan.

1.2.4 Revival of Kampo medicine

However, the practice of Kampo medicine did not perish after receiving no support from the government. The Japanese people's deep-rooted trust in Kampo medicine, coupled with its unique curative effects and fewer side effects in its treatment of modern diseases, sustained Kampo medicine. Even knowledgeable practitioners of contemporary Western medicine began to speak out. In 1911, Wada Keijuro wrote "*Ikai no Textutui* (*The Hammer of the Medical Circle*)," which first advocated a renewed emphasis on the practice of Kampo medicine. After that, Yumoto Qiuzhen was called "the ancestor of Hanfang Zhongxing" by later generations. It is because that his three-volume "*Kokai Igaku* (*Imperial Han Medicine*)" published in 1927 was the earliest interpretation of Kampo medicine in combination with Western medical knowledge, which actively promoted the revival of Kampo medicine in Japan. Through the efforts of Kampo medicine practitioners, the Japan Society for Oriental Medicine (JSOM) was established in 1950 after obtaining the approval from the Ministry of Health and Welfare. In 1991, it was approved by the Japanese Medical Association. There have been regular exchanges of knowledge between Kampo medicine and Western medicine practitioners. The Japanese Kampo medical community has integrated itself with the Western medical community in Japan to promote medical development.[3]

2 Current situation of Kampo medicine in Japan

2.1 Kampo clinical and medical system

2.1.1 Characteristics of Kampo medicine in diagnosis and treatment

The diagnosis and treatment of Kampo medicine are currently dominated by the School of Classic Methods, which emphasizes prescriptions corresponding to syndromes and the School of Later Developments in Medicine, which emphasizes syndrome differentiation and treatment. On the whole, compared with the theoretical system of the School of Later Developments, the prescriptions and syndromes of the School of Classic Methods are relatively easier to understand, so the ancient prescription school still occupies a dominant position in the diagnosis and treatment of Kampo medicine. Data from recent years indicates that about 80% of clinicians use Kampo medications. However, more than 95% of clinicians use ready-made Kampo prescriptions (mainly granules) only. They will not unconditionally prescribe crude drugs for decoction.[4]

2.1.2 Kampo medical system

Japanese medical institutions can be divided into three types: hospitals, clinics, and dental clinics. Currently, the Kampo medical care system in Japan can be roughly divided into the Kampo medicine department in general hospitals, clinics of Kampo medicine including osteopathy clinics, acupuncture and moxibustion centers, massage and shiatsu centers, and Kampo pharmacies. Generally, it

Figure 3 Kashiwa Clinic, Toyo Medical Center affiliated to Chiba University (from official website: http://www.fc.chiba-u.jp/hospital/top.htm)

Figure 4 Comprehensive Research Institute of Chinese Medicine at University of Toyama (from Googlemap)

is rare to have a Kampo medicine department in smaller hospitals. However, Kampo medicine departments can be seen in hospitals attached to medical colleges, such as the Affiliated Hospital of Chiba University and Toyama University (Figs. 3 and 4).

3 Requirements for opening clinics of Kampo medicine

According to Japanese regulations, osteopathy clinics, acupuncture and moxibustion centers, massage and shiatsu centers are all classified as clinics of Kampo medicine. The procedures for setting up these clinics are not complicated and this type of clinic is widely available in Japan. According to 2018 statistics from the Japanese Ministry of Health, Labour and Welfare, there were 30,450 acupuncture and moxibustion centers, 19,389 massage and acupuncture centers, and 50,077 osteopathy clinics.[5] In addition, clinicians can choose to conduct home visit and provide treatment while at patient's home as long as they have the relevant permits. If someone decides to open a surgical center, he or she must submit the details of their identity, qualification certificates, building floor plans, and other materials to the relevant government departments. After passing the government's review, the clinic can provide services. Within 10 days of the clinic's opening, its basic information must be submitted to the local health bureau.[6]

4 Requirements for opening a Kampo pharmacy

Japanese pharmacies generally follow two standard models: dispensing pharmacy authorized by the government to sell prescription drugs or chain pharmacy that displays medicines and daily necessities. However, Kampo pharmacies are unique. In addition to having a full-time pharmacist, it is necessary to submit a new application for the pharmacy's opening license, pharmaceutical manufacturing license, and other relevant materials to the Ministry of Health and Safety for review.[7]

4.1 Policies, regulations, and management

4.1.1 Kampo medicine practitioners

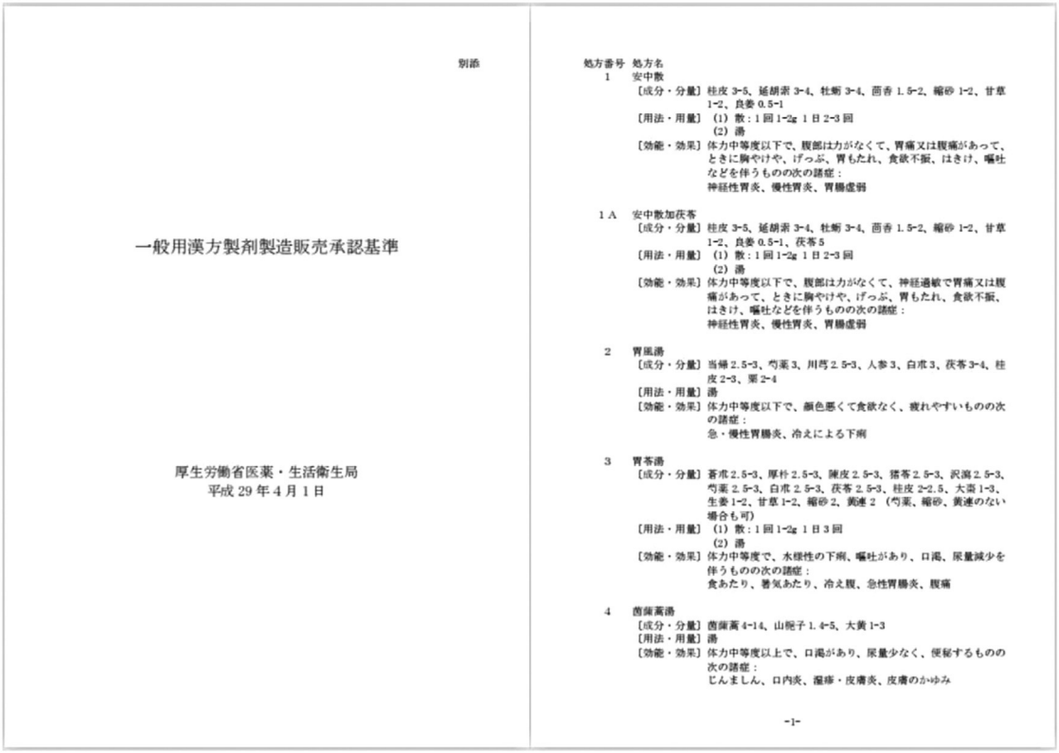
Individuals working in the Kampo-related industry can be divided into Kampo medicine doctors, acupuncturists, moxibustionists, massage and shiatsu specialists, judo rehabilitation practitioners, and pharmacists. In 1989, the Japan Society for Oriental Medicine (JSOM) was established. According to the rules promulgated by this society, to become a Kampo medicine practitioners, one is required to have a Western medicine doctor's license, take relevant courses and pass the relevant examinations. In 2020, there were 2148 Kampo medicine practitioners.[8] At present, acupuncturists, moxibustionists, massage and shiatsu specialists, and judo rehabilitation specialists can engage in medical activities if they have graduated from a college and passed the government examination. However, they have the ri9ght to treat patients but no right to prescribe medicines. According to 2018 statistics from the Ministry of Health, Labour and Welfare which is updated every 2 years, there were 121,757 acupuncturists, 119,796 moxibustionists, 73,017 judo rehabilitation practitioners, and 118,916 massage and shiatsu practitioners.[5] To become a pharmacist, one must pass the college and government examinations. Pharmacists can dispense prepared Kampo medicine according to doctors' prescriptions, and give patients over-the-counter Kampo medicine according to the Japanese pharmacy regulations. However, there is no apparent advantage for a TCM physician qualification certificate in Japan. All Kampo medicine doctors, acupuncturists, moxibustionists, or massage and shiatsu practitioners must still undergo the Japanese school education system and obtain the corresponding license before they are allowed to practice.[9]

4.1.2 Kampo management

Decoctions are rarely used in Japan and pharmaceutical factories mostly make powders, granules, or Japanese Kampo medicines that have been patented. Due to their convenience and effectiveness, these medicines are popular among Japanese people. In 1975, the Ministry of Health, Labour and Welfare organized relevant experts to identify prescriptions from ancient classic literature, such as the *Treatise on Cold Damage and Miscellaneous Diseases* and the *Golden Chamber Synopsis*. The group identified medical indications and other related content from the ancient classic literature and then submitted a recommended list of Kampo medicine prescriptions to the Ministry. The Ministry, through the resolution of the Central Pharmaceutical Commission of Japan, issued the *General Kampo Medicine Prescriptions* (一般用漢方処方の手引き), which was updated to the *General Kampo Medicine Preparations Manufacturing and Sales Recognition Standards* (一般用漢方製剤 承認基準) (Fig. 5) in 2017. The Standards include 294 types of Kampo medicine prescriptions. All pharmaceutical company in Japan can produce the 294 Kampo medicines included in the Standards and water is used as a solvent to create different dosage ratios within the prescribed range. Such preparation is granted exemption from the requirements of pharmacological and clinical research.[10] This rule has become universally accepted and recognized worldwide for the management of traditional medicines. Tsumura, Sankyo, and Kanebo are the three major Kampo medicine pharmaceutical companies in Japan. Each company uses about 10% to 15% of their annual sales revenue for new drug research and development expenses. From the 1920s to the 1980s, the Ministry of Health, Labour, and Welfare established five trial sites for medicinal plant cultivation in Hokkaido, Tsukuba, Izu, Wakayama, and Tanegashima. More than 75% of Japan's crude drug supply comes from foreign countries, mainly China.[4] In response to the safety and quality requirements of sustainable herbs, *The Eighteenth Edition of Basic Policy of Japanese Pharmacopoeia* (第十八改正 日本薬局方作成基本方針) was published by the Ministry of Health, Labour and Welfare. Revised every 5 years, this regulation stipulates the requirements for Kampo medicine prescription properties, loss-on-drying methods, and purity tests. New companies are set up to perform various benchmark tests and specification requirements, including identifying residual pesticides, microorganisms, and heavy metals, among others.[11]

4.1.3 Insurance coverage for Kampo medicine

In 1976, Kampo medicine granules were included in the National Health Insurance system, which enabled relevant industries to grow. From 20 billion yen in 1978, the Kampo medicine industry has grown to exceed 100 billion yen in 1988 and reach 184.8 billion yen in 1992.[4] However, due to an incident with the Xiao Chai Hu Decoction (小柴胡汤), where patients with chronic hepatitis were reported to experience interstitial pneumonia and even died after taking the Xiao Chai Hu Decoction. The Japan Society of Oriental Medicine established an evidence-based medicine committee in 2001 to clarify that the effectiveness of Kampo medicine prescriptions can be objectively evaluated through clinical trials. Clinical trial design and research plans were also discussed.[12] Nowadays, Japan usually divides Kampo medicine preparations into Rx-based prepared Kampo



別添

一般用漢方製剤製造販売承認基準

厚生労働省医薬・生活衛生局
平成 29 年 4 月 1 日

処方番号 処方名

1 安中散
〔成分・分量〕桂皮 3-5、延胡索 3-4、牡蛎 3-4、茴香 1.5-2、縮砂 1-2、甘草 1-2、良姜 0.5-1
〔用法・用量〕(1) 散：1 回 1-2g 1 日 2-3 回
(2) 湯
〔効能・効果〕体力中等度以下で、腹部は力がなくて、胃痛又は腹痛があって、ときに胸やけや、げっぷ、胃もたれ、食欲不振、はきけ、嘔吐などを伴うものの次の諸症：
神経性胃炎、慢性胃炎、胃腸虚弱

1A 安中散加茯苓
〔成分・分量〕桂皮 3-5、延胡索 3-4、牡蛎 3-4、茴香 1.5-2、縮砂 1-2、甘草 1-2、良姜 0.5-1、茯苓 5
〔用法・用量〕(1) 散：1 回 1-2g 1 日 2-3 回
(2) 湯
〔効能・効果〕体力中等度以下で、腹部は力がなくて、神経過敏で胃痛又は腹痛があって、ときに胸やけや、げっぷ、胃もたれ、食欲不振、はきけ、嘔吐などを伴うものの次の諸症：
神経性胃炎、慢性胃炎、胃腸虚弱

2 胃風湯
〔成分・分量〕当帰 2.5-3、芍薬 3、川芎 2.5-3、人参 3、白朮 3、茯苓 3-4、桂皮 2-3、薬 2-4
〔用法・用量〕湯
〔効能・効果〕体力中等度以下で、顔色悪くて食欲なく、疲れやすいものの次の諸症：
急・慢性胃腸炎、冷えによる下痢

3 胃苓湯
〔成分・分量〕蒼朮 2.5-3、厚朴 2.5-3、陳皮 2.5-3、猪苓 2.5-3、沢瀉 2.5-3、芍薬 2.5-3、白朮 2.5-3、茯苓 2.5-3、桂皮 2-2.5、大棗 1-3、生姜 1-2、甘草 1-2、縮砂 2、黄連 2 (芍薬、縮砂、黄連のない場合も可)
〔用法・用量〕(1) 散：1 回 1-2g 1 日 3 回
(2) 湯
〔効能・効果〕体力中等度で、水様性の下痢、嘔吐があり、口渇、尿量減少を伴うものの次の諸症：
食あたり、暑気あたり、冷え腹、急性胃腸炎、腹痛

4 茵蔯蒿湯
〔成分・分量〕茵蔯蒿 4-14、山梔子 1.4-5、大黄 1-3
〔用法・用量〕湯
〔効能・効果〕体力中等度以上で、口渇があり、尿量少なく、便秘するものの次の諸症：
じんましん、口内炎、腫瘍・皮膚炎、皮膚のかゆみ

-1-

Figure 5 Establishment of the approval standards for OTC Kampo medicine products (from official website: https://www.mhlw.go.jp/file/06-Seisakujouhou-11120000-Iyakushokuhinkyoku/0000160072.pdf)

medicine and OTC Kampo medicine. The National Health Insurance system supports the former, while the latter must be purchased at pharmacies at patients' own expense. As of 2019, 236 kinds of Kampo medicine granules were subsidized by the National Health Insurance system.[13] For related treatments performed at clinics of Kampo medicine, only six diseases including lower back pain and rheumatoid arthritis were supported by the National Health Insurance system.[14]

4.2 Kampo medical education

In 1972, the Japanese Ministry of Education agreed that the faculty of medicine at medical universities, pharmaceutical universities, and dental universities in Japan could offer courses related to traditional medicine.[15] In 2001, the Ministry of Education, Culture, Sports, Science and Technology issued the *Medical Education Model and Core Curriculum Guidelines,* which outlined compulsory contents for Kampo medicine studies.[12] The guidelines were revised in 2002 and the main change lies in the extension of the period of studies at pharmacy departments of national comprehensive universities or pharmaceutical universities from 4 years to 6 years. This change saw an increase in Kampo-related courses. In 2004, the extension to a 6-year curriculum was officially approved. As of 2019, Kampo medicine courses accounted for about 55% of the total learning contents in the fourth-year undergraduate courses in pharmacy departments or pharmaceutical schools at 73 comprehensive universities across the country.[16] Institutions that currently provide traditional medicine education courses are pharmaceutical universities, dental universities, and medical universities. However, this increase in Kampo medical education has become a trend, including the gradual establishment of Kampo medicine departments in medical schools and hospitals affiliated with medical schools.[16]

In addition, many academic groups, regional doctors' associations, and Kampo medicine manufacturers carry out Kampo medical education activities. The main medical academic groups are the Japan Society of Oriental Medicine with Tadamichi Mitsuma as its current president, the Japanese Kampo Medicine Association with Iijima Hiroshi as its current president, and Tokyo Clinical Chinese Medicine Research Association with Shuji Odaka as its current chairman.[4]

4.3 Development of scientific research and academic institutions

In 1963, the Faculty of Pharmacy at the University of Toyama was among the first national universities to establish a Kampo medicine research facility after obtaining the government's approval. In 1968, the Ministry of Health, Labour and Welfare provided financial support for research into crude TCM. In the subsequent year, the 61st House of Representatives discussed the inclusion of Kampo medicine research funds in the national budget. In 1972, the Comprehensive Research Institute of the Oriental Medical Association affiliated with the Kitasato Research Institute was established. It consists of a primary research department, a clinical research department, a herb production department, a research department, Kampo medicine clinics, and acupuncture and moxibustion clinics. Since then, a series of professional Kampo medicine research institutions have been created. The establishment of the Institute of Oriental Medicine at the Kitasato Research Institute, a well-known modern medical research institution, reflects the support for and recognition of Kampo medicine. In 1979, the National Agency for Science and Technology formulated a comprehensive research plan for the practice of Kampo medicine by investing 1 billion yen in research on syndromes, meridians and collaterals, blood stasis, and sustainability of the available resources for crude TCM. This funding laid the foundation for the rapid development of Kampo medicine.[3] In recent years, pharmacological studies of Chinese herbal medicine in Japan can be mainly categorized into the following types: 1) effective ingredients of Kampo medicine; 2) mechanism of action of the effect of Kampo medicine; 3) production of Kampo medicine; and 4) molecular biology research on Kampo medicine. To meet the requirements of drug internationalization, Japan has successfully formulated such stipulations as Good Manufacturing Practice, Good Laboratory Practice, Good Clinical Practice, Good Post-Marketing Surveillance Practice, and a series of related technical guidelines in the 1980 s to increase the specificity and transparency of the approval procedures and technical requirements.[4]

5 Outlook

The Kampo medical care system in Japan currently can be roughly divided into Kampo medicine clinic in general hospitals, clinics of Kampo medicine, Kampo pharmacies, and general pharmacies. Granule is the primary preparation and some granules are covered by the National Health Insurance system. Additionally, pharmacists working in Kampo pharmacies can prescribe some decoctions.

As a core aspect of TCM, philosophical thinking is characterized by the overall concept and syndrome differentiation. However, there are currently several problems with the practice of Kampo medical education in Japan: 1) the lack of systematization leads to confusion in basic concepts; 2) the lack of traditional medical education system results in a shortage of teachers; and 3) an excessive emphasis on the Westernization of Kampo medicine.[4] In the future, we hope to standardize the Japanese translations of TCM terms to promote medical exchanges between China and Japan, and to increase the student exchanges to cultivate students' philosophical thinking and help them understand syndrome differentiation. In clinical practice, Kampo medicine uses "prescription-syndrome" and "medicine-symptom" as the diagnosis and treatment basis. These standard methods were summarized by Yoshimasu Todo from the *Treatise on Cold Damage and Miscellaneous Diseases* and the *Golden Chamber Synopsis*. We hope to increase exchanges and co-operations between schools and hospitals between China and Japan to provide a mutual reference for the modernization of traditional medicines in both countries.

Japan currently provides comprehensive treatments for major diseases, such as cancer. For these illnesses, Kampo medicine or acupuncture is appropriate as an adjuvant therapy and patients are advised to follow a medicated diet or eat functional food.[4] The healthy foods with anticancer effects are popular in Japan, such as crustaceans, Ling Zhi (灵芝 *Ganoderma lucidum*), propolis, Ci Wu Jia (刺五加 *Radix et Caulis Acanthopanacis Senticosi*), brewers' yeast. And these foods are also used in TCM, which believes that many foods have medicinal effects and has valuable experiences in food therapy. TCM is a great treasure house with rich resources in medicinal plant. Remarkable achievements have been made in clinical research of TCM. We hope to advance knowledge exchange and scientific research cooperation between schools and hospitals in China and Japan. The development of traditional Chinese and Japanese medicine will benefit people worldwide.

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Ethical approval

This study does not contain any studies with human or animal subjects performed by the author.

Author contributions

Risa Shibata was responsible for the article writing. Gui-Xiang Chu provided the relevant data and revised the manuscript. Xun Lin and Jin-Rong Fu were responsible for supervision and revision. All authors have read and approved the final manuscript.

Conflicts of interest

None.

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News and Views

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Voyage of Ben Cao, Part I: Discovery of Kam Wah Chung, the Overlooked Chinese Medicine Museum in the United States

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Keywords: Chinese Medicine Museum; Kam Wah Chung; Medical history; John Day

1 Introduction

Imagery of the Western United States typically evokes vast wheat fields, cowboys, and rolling mountain valleys. Few would associate the American West with Chinese medicine. This article describes a remote town called John Day, which is located in a mountainous terrain in Oregon, and presents the remarkable story of the Kam Wah Chung Museum (Fig. 1).

2 Embarking on the journey

On August 7, 2017, a research team comprising six scholars specialized in Chinese medical pharmacy from China and the United States traveled from Portland, Oregon across the Cascade Mountains. As they approached the southeastern tip of Oregon, the lush environment of the Columbia River Gorge gradually gave way to deserted and barren hills. One of the authors, Eric Brand, an American scholar who had previously explored this route, joked with the group that they were headed to "a place so remote that in Chinese, it would be described as a place where birds will not even defecate". After a 7-hour drive that stretched into the evening, the research team finally arrived at the site of the Kam Wah Chung Museum in John Day.

Given its location in a sparsely populated region where winter conditions are severe, the Kam Wah Chung Museum is only open to the public from May to October each year. Contemporary John Day is a small town with a population below 2000 and no remaining Chinese residents. Consequently, the history of this town, which was once home to the third largest "Chinatown" in the United States after San Francisco and Portland during the Gold Rush Era, is not widely known.

The main exhibition at the Kam Wah Chung Museum is organized according to four themes: "Leaving Home," "The Gold Mountain," "Loneliness," and "Broken Dreams". The displayed photographs, objects and videos presented in the museum vividly trace the journey of Chinese immigrants as they strived to make a living via mining, building railways and roads, establishing family businesses and practicing medicine in eastern Oregon. Chinese immigrants have long made significant contributions to America's development process, and they remain an enduring influence in American history and culture. For over a century, the dreams of some Chinese immigrants led them far from home to a foreign land, only to be broken, while others found prosperity. They not only succeeded in life and in business but they also became well-integrated into the American society.

3 Drifting

In the 1840s, San Francisco became a hotspot following the discovery of gold in the Western United States. Gold was discovered in eastern Oregon in 1862, attracting large numbers of Chinese workers. Within 10 years, the value of the gold discovered in the region of Oregon where John Day is located would have been equivalent to over one billion US dollars at the current value.

Initially, the Chinese community gathered in Canyon City, Oregon. Apart from the difficult living conditions that they endured, their personal safety was never guaranteed, and discrimination against them was rampant. After an unexplained fire destroyed the local "Chinatown," the Chinese community was forced to relocate to the nearby town of John Day, where they established a new Chinese community.

Chinese medicine is bound to be practiced wherever a Chinese community exists. Within the Chinese mining community, there was a doctor of Chinese medicine named Wu Yunian (伍于念), known to the locals as Ing Hay or simply "Doc Hay". His partner was a Chinese businessman named Liang Guangrong (梁光荣), who was known within the community as Lung On (梁安). Doctor Wu was from Taishan, Mr. Lung On was from Xinhui,

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Figure 1 Kam Wah Chung Museum

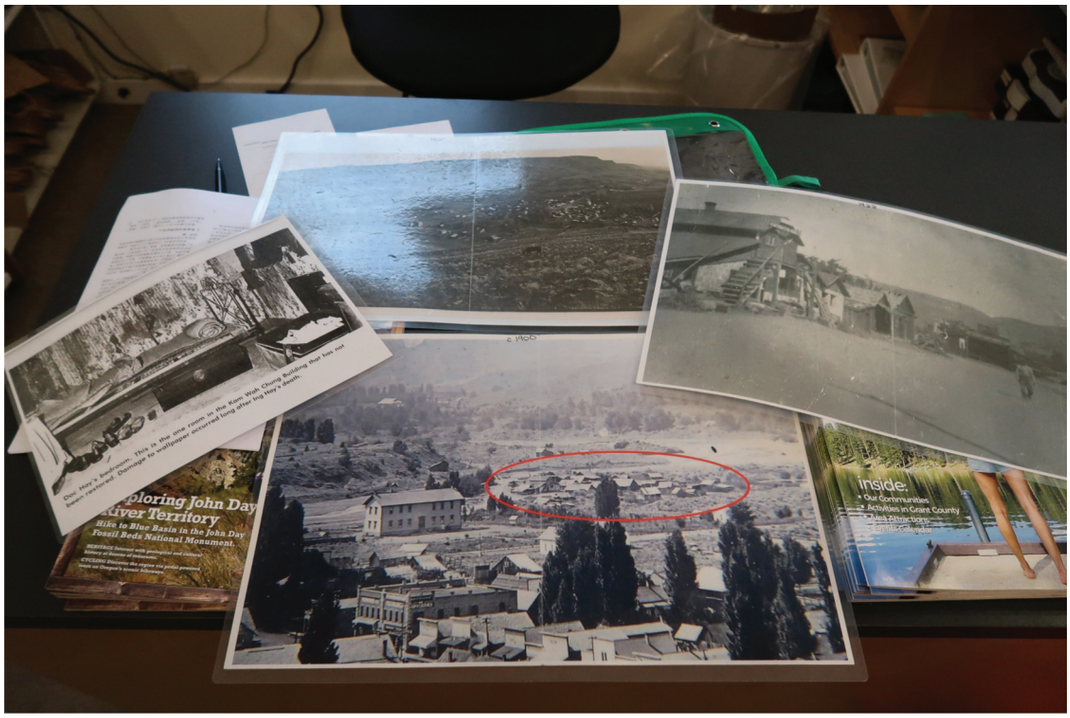

Figure 2 Old photographs of Kam Wah Chung & Co. Museum

both of their regions are villages in Guangdong Province in China. Together, they founded Kam Wah Chung & Co. (Fig. 2), which served as a general store for the Chinese community.

Over several decades, they continued to work closely and live together.

Doctor Wu was a kind individual with excellent medical skills. His reputation eventually expanded beyond the Chinese circles, and he also treated patients in the surrounding community. People sometimes traveled hundreds of miles to receive his medical treatment. In a video from the 1980s that is preserved in the Kam Wah

Chung Museum, Lola, an American grandmother, recalled her childhood experiences of being treated by Doctor Wu. Although Lola is no longer alive, the first author had the opportunity to interview her niece, and she recalled that her aunt often spoke of "Doc Hay" (Doctor Wu) and his treatments. After the gold was exhausted through mining, the local community went through an economic depression, and most of the Chinese residents moved away. However, Doctor Wu decided to stay, and he continued to serve the local community.

Lung On was a shrewd and pioneering businessman. According to the information available at the Kam Wah Chung Museum's Discovery Center, Lung On was educated and he spoke English. He successfully established Kam Wah Chung as a general cultural center for the local Chinese community. At the end of the Gold Rush, his business ventures expanded, and he opened the first automobile store in the region. Lung On continued to remain active in business and epitomizes a successful early Chinese entrepreneur outside of China. Lung On passed away in 1940 at the age of 78.

After his partner passed away, Doctor Wu was filled with grief and had to manage Kah Wah Chung on his own. Although he had married in China prior to his departure for America, he spent the rest of his life away from his own family, neither marrying again nor returning to his homeland. A photograph of Doctor Wu in his later years shows him standing at the doorway of Kam Wah Chung, looking longingly up at a blue sky, as if dreaming of his ancestral homeland 10,000 m away.

In 1948, Dr. Wu suffered a fall and had to leave Kam Wah Chung to live in a retirement home in Portland. He passed away 4years later. In his will, he donated the Kam Wah Chung building and all of its contents to the local government for use as a museum; however, its significance was accidentally overlooked. Over 10 years passed before the local government opened the building in 1967, and work on the museum finally began.

The dusty building that housed Kam Wah Chung officially opened to the public as a museum in 1980. In 2005, the local government designated it as a National

Historic Landmark and formally established the Kam Wah Chung State Heritage Site.

4 Rediscovery

Upon arriving at the front door of Kam Wah Chung, we observed that the first floor of the small two-story building has a single thick metal door with very small windows. The museum curator pointed to bullet holes in the iron door; evidence of the anti-Chinese discrimination that was common in the past. The unusual structure of the home is a reminder that it also served as a site of protection from a hostile outside world.

Upon opening the front door, we were all astounded. The interior of the home was like a time capsule; a vivid reflection of preserved history with everything in its original place, including old furniture, household goods, medicinal herbs, and a variety of miscellaneous goods. Undisturbed, as though it was forgotten by the world, the scene seemed unbelievable. Sealed within a dry isolated environment and protected from the outer world, the items remained perfectly preserved. We could not believe that we were in a museum; rather, it felt as though we had returned to a normal home to experience life as it was lived by the original inhabitants.

The first floor of the building is roughly divided into three parts: a Chinese medicine clinic, a general goods store, and a living area. The second floor, which was built much later, served as a storage area. The original documents and many stored items have since been transferred to the archives at the museum's Discovery Center. We observed a small area on the right side of the front room that served as a pharmacy (Fig. 3), with shelves filled with medicinal herbs, bottles of prepared medicines, as well as tools for preparing the medicines, such as cutting instruments and mortars (Fig. 4). The shelves in

Figure 3 Prof. Zhao and Eric Brand examining the pharmacy

Figure 4 General goods area

the section dedicated to general goods hold common household objects, herbal medicines, and colorful posters.

Many cigar boxes were used to store herbal medicines, with their names written by hand on the front of the boxes. Judging from the names written on the boxes, it appears that Kam Wah Chung put on display over 400 individual medicinal herbs along with a variety of patented medicines, such as aromatic liniments and Po Chai pills. Virtually all commonly used Chinese medicinal herbs were present in the collection along with a considerable number of valuable Chinese herbs, such as Ren Shen (人参 *Panax ginseng*), San Qi (三七 *Panax notoginseng*), and Chen Xiang (沉香 *Aquilaria sinensis*). Because Doctor Wu and Lung On were originally from Guangdong Province, many herbs that are customarily used in Guangdong were present, such as Mu Mian Hua (木棉花 *Bombax malabaricum*) and Qian Nian Jian (千年健 *Homalomena occulta*).

In addition, several Western drugs and devices were present, including aspirin, digitalis, and cinchona (Fig. 5). Given the presence of copper coins from Vietnam, identified by the first author, it is likely that individuals from other Asian nations also passed through the shop.

After passing through a narrow passage, we come to a cramped living area (Fig. 6). On the left and right sides are the small bedrooms that belonged to Doctor Wu and Lung On (Fig. 7). Additionally, four sets of bunkbeds are lined up along the side of the dining room, which provided shelter to passing-by travelers (Fig. 8). A manual pump in the kitchen provided water. Although the facilities are basic, there are many objects used in daily life, including instruments such as Er Hu, board games, and divinatory

Figure 5 Vietnamese copper coins on the counter at the Kam Wah Chung Museum

Figure 6 Fully equipped living area

Figure 7 Doctor Wu's bedroom

items. These items likely helped to relieve the homesickness experienced by members of the Chinese community, revealing that Kam Wah Chung not only provided medicine but it also provided a venue for local Chinese residents to gather, rest, and restore their spirits.

Upon our arrival at the archives housed at the museum's Discovery Center, the staff opened the cabinets, revealing that the collection had been perfectly organized and stored. All of the loose documents had been digitized and scanned to facilitate future research. Because the local curators are generally not proficient in Chinese, our research team intended to help them to decipher the details of purchase orders, prescriptions, letters, and medical texts (Fig. 9).

Many of the prescriptions written by Doctor Wu were complex and lacked clear prescribing principles, making them difficult to understand. In the past, formulations within both Western and Chinese medicine were often shrouded in secrecy either to prevent the formula from being changed or used elsewhere, or to encourage patients to return to the original dispensing Chinese medicine pharmacist. Consequently, some prescriptions were complex, and alternate names of herbs were sometimes used so that only the dispensing doctor would know exactly how to fill the formula. Over time, some of these formulas thus came to be regarded as "secret formulas."

Another mystery that surrounds Doctor Wu lies in his collection of uncashed checks, which were mostly accumulated between 1913 and 1930. Many of the individual checks are not for large amounts, but together they total over 23,000 USD, which was a substantial sum of money at the time. The question of why Doctor Wu never cashed in these checks remains unresolved, but many local people recall that Doctor Wu would offer treatment for free to those who could not afford it. Thus, it is likely that Doctor Wu did not accept payment from patients who he thought could not afford it and did not, therefore, cash in their checks.

Figure 8 Upper and lower bunkbeds provided to travelers

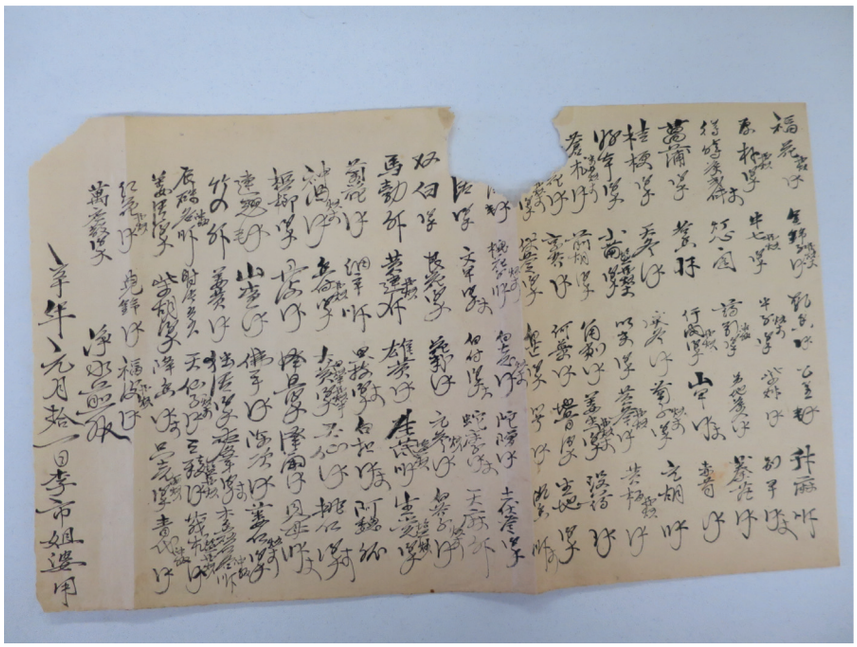

Figure 9 Doctor Wu's medical prescriptions

Without performing a systematic assessment, it was difficult for us to count up all of the objects related to medicine, but many old objects clearly illustrate the coexistence of Chinese and Western medicine and culture from the 19th century to the early 20th century. Our initial impression of this Chinese herbal museum conveyed to us its uniqueness and preservation of a degree of authenticity that is rarely found.

5 Inheritance

A large apricot tree stands about 20 m from Kam Wah Chung. The harsh winter and passage of time has left its outer bark coarse and rough, like the wrinkled skin of an elderly person, yet its leaves remain lush and full. Apricot trees are not uncommon in the region, so it is unclear ifthis particular tree was planted by Doctor Wu. Nonetheless, Doctor Wu reflects the virtue of Chinese medicine, and the apricot forest can be seen as a metaphor for Chinese medicine and culture. Thus, the apricot tree outside Doctor Wu's clinic seems a fitting symbol of his enduring contribution (Fig. 10).

On the hillside behind Kam Wah Chung & Co. lies the cemetery that marks the final resting place of Doctor Wu, Lung On, Doctor Wu's nephew, Bob Wah, and his niece Rose Wah (Fig. 11). The following words are engraved on Doctor Wu's tombstone: "The Tomb of Wu Gong Yu Nian, Ing Hay, 1862–1952, Xiaping Village, Taishan, Guangdong." A medicinal plant species from the Wei Ling Xian (*Clematis* genus) is abloom on the fence next to the tomb. The Chinese name of this plant connotes power, spirit, and immortality, bringing to mind the tenacious

Figure 10 Apricot trees outside the Kam Wah Chung Museum

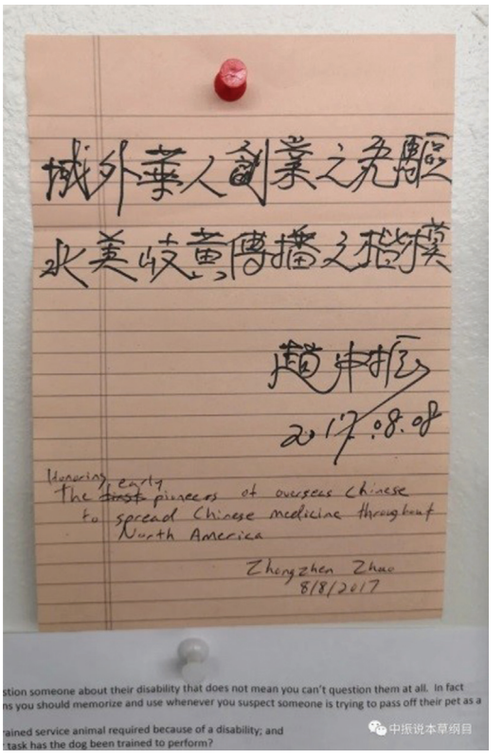

Figure 12 The message left by Prof. Zhao in the guestbook

Figure 11 Graves of Doctor Wu and his family and the grave of Mr. Lung On

spirit of Doctor Wu and Lung On as well as the collective spirit of the adventurous overseas Chinese.

There is still much to explore within the Kam Wah Chung Museum. When bidding farewell, the first author wrote two sentences in the guestbook "To the pioneers of overseas Chinese entrepreneurship, and to the role models who spread Chinese medicine to North America." (Fig. 12).

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NEWS AND VIEWS

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Juglans: Tannin Ink and Magic Formula for Hair Dyeing

Min Shao✉

Keywords: Black walnut; Tannin dyeing; Walnut; Walnut hull

1 The introduction of black walnut (*Juglans nigra*) from North America to Europe

Black walnut is a *Juglans* tree native to the North America plains. It features a tall and dense canopy up to 20 or 30 m high. The timber is dense and hard, making it suitable for woodworks. The natural dark color and beautiful grain are usually preserved in woodworks to reveal its unique chocolate hue.

Black walnut was introduced to Europe at the beginning of the 17th century.[1] Since then, it has become a very precious wood in traditional furniture-making. It commands a prominent position in antique furniture, and is often used as a building material in churches and castles, as well as an interior decorative material in luxury automobiles (Fig. 1). Black walnut is also the traditional wood used for gun stocks. During the Age of Industrialization, it was used as temporary utility poles when laying railways.[2]

An iron nail or ironware on the trunk of a black walnut or walnut will darken the color of the wood.[3] Therefore, iron products are often found in black walnut logs. This is an interesting phenomenon that will be discussed later in section 5 regarding mordant. Black walnut is a fine tree species with high economic value. Its fruit is edible, and its trunk can be used for making wooden wares. Western artisans have found an additional use of black walnut, i.e. its green hulls can be processed into brown ink. As the oxidation time increases, the ink color gradually darkens. This makes black walnut become a raw material in the early production of ink.[4]

2 The Silk Road journey of the common walnut (*Juglans regia*)

Common walnut is another important *Juglans* tree that is also known as the *Qiang* peach in Chinese. The origin of walnut is still debatable. Most books cited Zhang Hua's record in *Bo Wu Zhi* (《博物志》*Encyclopedic Narration*) published in the Jin dynasty. It is stated that the walnut was originated from ancient Persia (current Iran) and that Zhang Qian brought its seeds back to China after a trip to the West during the Han dynasty.[5] Other scholars believe that walnut originated from many countries, including China. The Tibetan or Xinjiang region may be an important origin of walnut.

Regardless of its origin, it is clear that walnut traveled from the West to the East along the Silk Road. *XiJing Za Ji* (《西京杂记》*A Miscellany of the Western Capital*) from the Han dynasty recorded that when building the Shanglin Imperial Park, court officials contributed various exotic fruits, including walnut, from the western regions.[6] Because of its peach-like appearance and *Hu* origin (the Northern barbarian tribes in ancient China), the fruit was

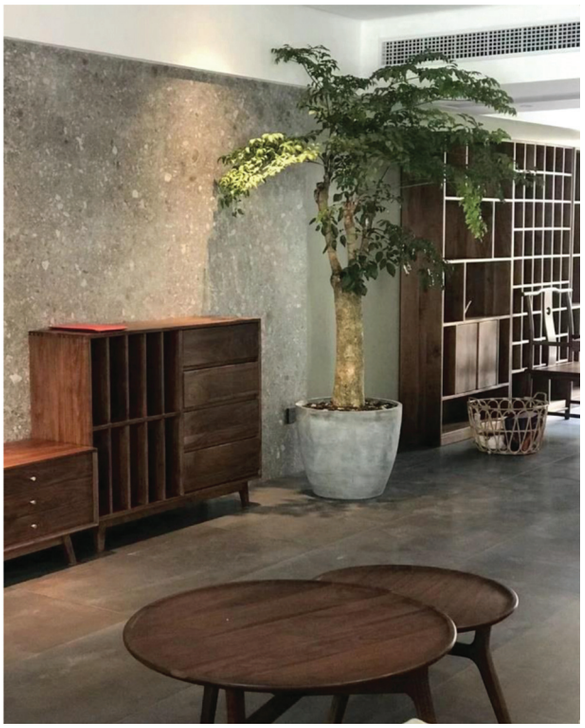

Figure 1 Furnitures made of black walnut wood

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named Hu Tao (胡桃). During the Later Zhao period of the Sixteen Kingdoms, the Chinese character "*Hu* (胡)" was forbidden to be used by Shi Le (石勒); therefore, Hu Tao was renamed as He Tao (核桃). Walnut was first widely planted in the Shaan County and Luoyang Region, and gradually spread to the central plains and eastern regions. By the time of Emperor Taizong of the Tang dynasty, the cultivation of walnut had spread to Vietnam.[7]

During its introduction from the West to East, the medicinal functions of walnut were gradually discovered, and its medicinal use peaked during the Ming dynasty (Fig. 2). In his great medical work *Ben Cao Gang Mu* (《本草纲目》*Compendium of Materia Medica*), Li Shizhen (李时珍) described the walnut kernel as a qi-tonifying and blood-nourishing medicine, with therapeutic effects of "gaining weight, moistening the skin, darkening hair, promoting appetite, inducing urination, and treating hemorrhoids". He also noted that the green hull of walnut could be used as a recipe to "dye mustache and silk to black".[8] Even the walnut bark could be decocted and used as a brown hair dye to wash hair.

Since then, walnut has become a household item in China, and it is endowed with auspicious meaning. Walnut is tough outside but soft inside, qualities which are likened to those of a sage; therefore, it is loved and appraised by the literati. Collecting walnut became popularized especially during the Ming and Qing dynasties and it soon became a traditional Chinese hobby.[9]

Figure 2 Fresh walnut, peeled green hulls and sundried walnut peels

3 Ink of the west and the immortal formula of China

Every autumn, the fruits of walnut trees gradually mature and drop. The fruits look like green peaches, with spots on their surfaces. After collecting the fruits, the flesh is removed and the kernels are dried under the sun. The kernels can be used for oil extracting and for eating after cracking the shell. After been peeled, the green hull of walnut turn from green to brown owing to exposure to the air. If gloves were not worn during the removal of the hull, the juice stained on one's skin and nails will be oxidized to black and become difficult to remove.

Thus, the ancient people discovered another secret about the walnut: its hull could be used for dyeing. In fact, the leaves, roots, barks of walnut trees can also be used for dyeing, but the green hulls is especially superior. Thus, the abandoned green hulls are been given a second purpose. Western artisans use the green hulls of black walnut to make black ink, whereas Eastern artisans used green hulls of walnut to formulate hair dye.

Walnut planting was introduced from the western regions of China. Thus, the green hulls of walnut have been commonly used as a dye for wool fabric in northwestern China for years. This traditional dye is still in use in today's Xinjiang, Gansu, and Qinghai regions. After walnut was introduced into the central plains of China, its use in dyeing was widely adapted and developed into a very typical traditional Chinese herbal dyeing method (Fig. 3). Li Shizhen described the green hulls of walnut in the *Compendium of Materia Medica*, "(it can) dye mustaches and silk to black. [Records states that] Press oil from the green hull of walnut, mix with *zhān táng xiāng* (adecoction of *Lindera erythrocarpa* Makino's branches and leaves) and then apply on hair. Its color is as dark as lacquer."[8] In addition to dyeing, the green hulls of walnut also have an analgesic effect. They are known as *qīng yī lóng* and are used in the traditional Chinese medicine.[10]

4 Rich hues ranging from light brown to brownish black

When walnut green hulls are used as a traditional hair dye, it is applied in paste form; whereas when they are used to make ink or dye, they are boiled to extract the juice.

Figure 3 During decocting, the color of walnut green hulls oxidizes from dark brown to black

Whether as an ink or dye, walnut green hulls are a very important natural dye which exhibits several advantages.

First, the yield of walnut hulls is high and the preservation is easy. The green hulls of various *Juglans* plants, such as black walnut, common walnut, and Manchurian walnut (*Juglans mandshurica* Maxim) can all be used for dyeing. Of the 11 million tons of walnut produced in 2015, the annual walnut green hull production, excluding black walnut and other *Juglans* species, is as large as 2 million tons.[11] The pre-treatment of walnut green hulls is very simple. After peeling the walnut fruit, the fresh green hulls are either boiled while fresh or sundried for preservation. This represents a recycling mode that not only improves agricultural efficiency but also reduces resource wastage.

Secondly, walnut green hulls can not only dye silk and woolen products, they can also be used to dye cotton and linen products. Natural dyes can only be used to color natural animal or plant fibers, and most natural dyes have much higher affinity to animal fibers, such as silk and wool, than to plant fibers, such as cotton and linen.[12] This greatly limits the available dye choices for plant fibers. The effective dyeing ingredient in walnut green hulls is tannin, which can combine with plant fibers very effectively; therefore, walnut green hulls are suitable for a wide range of applications.

Figure 4 Non-mordant woolen fabric dyed with walnut green hulls (the third and fourth fabrics from top to bottom were pre-dyed with a little Sappan wood and mordanted dye using alum)

Thirdly, the walnut green hull dyeing process is simple yet can create plentiful layers of color. Walnut green hulls can achieve rich hues and colors from light brown to brownish black without resorting to the use of a mordant (Fig. 4). The dyeing process is very simple and suitable for daily household use.

According to the traditional plant-dyeing technic and rich dyeing practice, to prepare the dyeing solution, the process used is very similar to that used in decocting traditional Chinese medicines. The fresh or dried green hulls are first soaked in water, boiled at a high heat, and then lower the heat when the water is boiled. After 30 minutes, the heat is turned off. The dark brown juice is removed and serves as the first decocted dye solution. The green hull residue can then be decocted again in the same manner to obtain the second decocted dye solution. The fabric to be dyed is first soaked in clean water and then wrung out. An appropriate amount of dye solution is heated to 50 °C, and the fabric is completely immersed in the solution for approximately 20 minutes, during which it is constantly stirred to avoid uneven dye deposits. Finally, the fabric is removed from the dye solution and wrung dry. Then, it is rinsed in clean water and hung to dry in the shade, avoiding direct sunlight. The dye immersion and cleaning processes can be repeated several times if a darker color is desired.

The first decocted dye solution of walnut green hulls is thick and dark; consequently, it can be used for dyeing items dark brown or for making ink. The second decocted dye solution is relatively lighter and is suitable for dyeing items light brown. During dyeing, the dye concentrations can be modulated to obtain rich layers of different brown colors. Fresh walnut green hulls have a greater dyeing effect than older hulls and can obtain dark brown or brownish black colors.

Fourthly, walnut green hull dyeing produces good color fastness, and is washable and durable. Under the double oxidation of air and sunlight, tannin dyes gradually become darker. Daily washing of fabrics with natural alkaline solutions also accelerate the darkening process. Therefore, fabric dyeing with walnut green hulls has a good color fastness, making it especially suitable for cotton and linen fabrics.

5 Tannins and mordants

Tannin dyes have an interesting feature. When combined with iron ions, the produced color is darker and black precipitates are produced. In *Juglans* plants, tannins are not only found in the green hulls of the fruit, but to a certain extent are available in all parts of the plants. Therefore, the traditional way of darkening the black walnut color with iron nails and ironware has scientific basis.

When walnut green hulls are used to make ink, only a small amount of iron ions (such as rust and melanterite) can be added to the medium, resulting in non-fading purple-black or brown-black color. To avoid the formation of black sediment, the iron ions should be added as needed and the dose should be controlled (Fig. 5).

According to the traditional plant-dyeing technic and rich dyeing practice, black fabric dyed with walnut green hulls usually undergoes a post-mordant treatment. After finishing the dye solution immersion and cleaning processes, the fabric is further immersed in a mordant solution before it is cleaned and dried. The specific method is as follows: Place a small amount of melanterite and dissolve it to form the mordant solution. Immerse the dyed and cleaned fabric in the mordant solution for approximately 15 to 20 minutes, constantly stirring it to avoid uneven dye deposits. After the mordant immersion, remove the fabric, wring it dry and wash it. It is then dried in the shade (Fig. 6).

Figure 5 Pictures painted on handmade watercolor paper using ink made from walnut green hulls

Figure 6 Presence of different grayish blacks shades after walnut green hulls are dyed in an iron mordant

6 Conclusion

Juglans plant, take black walnut and walnut as typical cases, has rich tannin substances in its green hull. In addition to the application in traditional medicine, it also make an excellent plant pigment, resulting in various ancient recipes about ink and dyeing, which are still in use today.

Translator: Guo-Qi Shi

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Ethical approval

This study does not contain any studies with human or animal subjects performed by any of the authors.

Author contributions

Min Shao wrote and reviewed the article.

Conflicts of interest

None.

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The International Organization for Standardization Published its First Terminology International Standard of TCM Diagnosis ISO 23961-1: 2021

The International Organization for Standardization (ISO) published its first terminology International Standard of Traditional Chinese Medicine Diagnosis ISO 23961-1: 2021 Traditional Chinese medicine - Vocabulary for diagnostics - part1: Tongue on 5th November, 2021.

The 8th plenary meeting of ISO/TC249 in Hong Kong, China (2017)

Traditional Chinese medicine (TCM) has become increasingly popular in the countries and regions all over the world. International communication of TCM and medical activities, scientific research, management rules and regulations are in urgent need of international standards. Tongue diagnosis being one of the most distinctive TCM diagnosis methods, there is an increased demand for its international education, academic exchanges and international trade of tongue-equipment-related products as well as international medicine.

Project report in the 9th WG5 meeting in Hong Kong, China (2017)

In 2016, China submitted a new proposal: Traditional Chinese medicine - Vocabulary for diagnostics - part1: Tongue. This proposal was approved unanimously by the committee and 7 countries committed to participate. ISO 23961-1: 2021 Traditional Chinese medicine - Vocabulary for diagnostics - part1: Tongue standardizes the basic terminology and classification of tongue diagnostic methods. According to the relevant needs of the international trade of TCM tongue-equipment-related products, typical tongue images are added as an auxiliary definition of terms in the standard text based on the achievements of the team's objective research of TCM tongue diagnosis about more than 20 years, which provide new ideas and paths for the formulation of TCM terms. In consideration of customary usage of terms and varied needs in different countries and regions, the standard text includes English, Pinyin, Traditional Chinese, simplified Chinese, Japanese characters, Korean characters, which greatly expands the applicability of the standard.

The 10th plenary meeting of ISO/TC249 in Bangkok, Thailand (2019)

This international standard will play an outstanding leading role to speed up the modernization and internationalization of TCM, as well as effectively promoting dissemination of TCM knowledge, international scholarly exchanges and application of scientific and technological achievements. It has far-reaching strategic significance for enhancing of the international influence, competitiveness, international voice.

This standard was formulated by the team of Professor Wang Yiqin, School of Basic Medicine of Shanghai University of TCM and Shanghai Key Laboratory of Health Identification and Assessment. The team carried out the research of the TCM four diagnosis testing system and syndrome differentiation model for more than 20 years. The team has done a lot of pioneering work in the objectification and standardization of TCM diagnosis.

(Shanghai Key Laboratory of Health Identification and Assessment)

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