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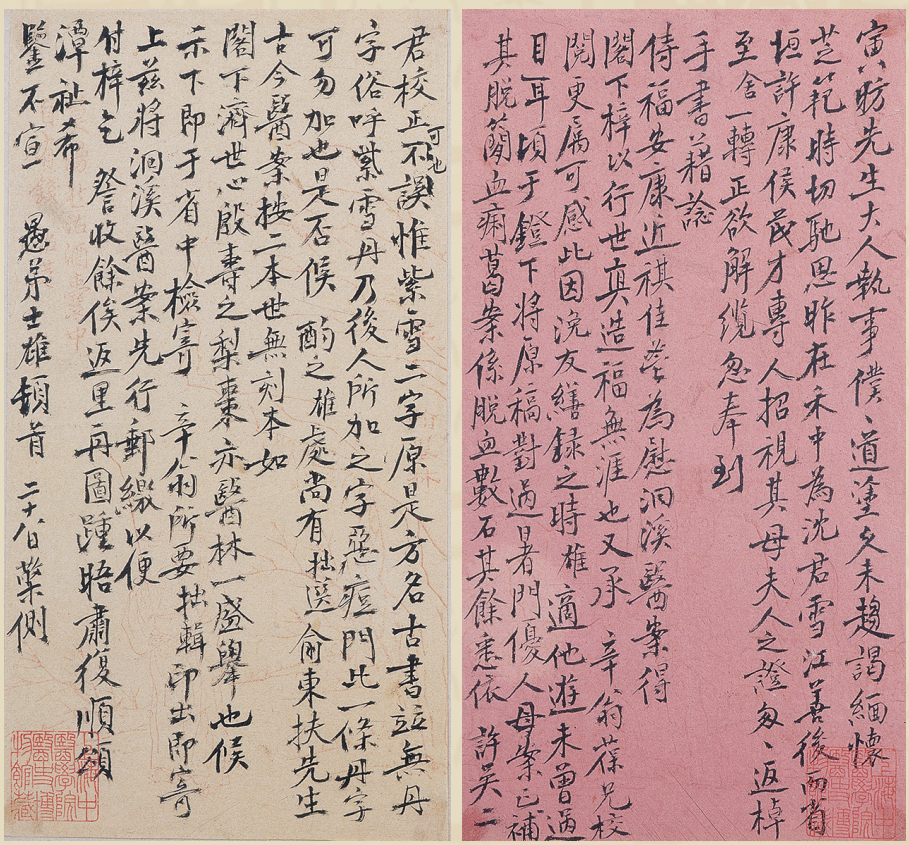

Letters of Wang Shixiong(王士雄书札)

Collected in Shanghai Museum of Traditional Chinese Medicine

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The First Editorial Board Meeting of *Chinese Medicine and Culture* & the International Seminar on the Journal's Development

Editor-in-chief: Jianguang Xu (徐建光)

On 29th October, 2020, the first editorial board meeting of the journal *Chinese Medicine and Culture* & the international seminar on the Journal's development were held at Shanghai University of Traditional Chinese Medicine (上海中医药大学). The authorities and experts concerned attended the meeting, including Guoqiang Wang (王国强), president of China Association of Chinese Medicine; Jiong Xu (徐炯), vice minister of the Publicity Department of the Shanghai Municipal CPC Committee and director of Shanghai Municipal Bureau of Press and Publication; Xingkang Wang (王兴康), president of Shanghai Periodicals Association; Shujiang Mo (莫淑江), deputy secretary general of Shanghai Periodicals Association; Yongzhang Sun (孙永章), deputy secretary general of China Association of Chinese Medicine; Hongyi Hu (胡鸿毅), deputy director of Shanghai Municipal Health Commission and deputy director of Shanghai Municipal Administrator of Traditional Chinese Medicine; Jihong Fu (傅继红), deputy director of Foreign Affairs Office of the Shanghai Municipal People's Government; Linlin Chen (陈琳琳), director of the Media Supervision Department of the Publicity Department of the Shanghai Municipal CPC Committee; Yu She (厍宇), director of the Information Department of China Association of Chinese Medicine; Xikang Cao (曹锡康), secretary of the Communist Party Committee of Shanghai University of Traditional Chinese Medicine; Jianguang Xu (徐建光), President of Shanghai University of Traditional Chinese Medicine and editor-in-chief of the journal *Chinese Medicine and Culture*, and other experts from the circle of traditional Chinese medicine and periodicals.

Guoqiang Wang raised suggestions on the purpose and goal, the main tasks and the development direction of the journal, and stressed that while inheriting and carrying forward traditional Chinese medicine culture, *Chinese Medicine and Culture* should strive to become "the messenger of the global communication of traditional Chinese medicine culture". In addition, Guoqiang Wang hoped that the journal would be able to continuously enhance their international publication quality and academic influence, and make more contributions to accelerating the integration of traditional Chinese medicine into the international medical system and promote the international spread of traditional Chinese medicine.

At the international seminar of on the journal's development, Kaixian Chen (陈凯先), academician of the Chinese Academy of Sciences, Guozheng Liu (刘国正), president of the periodical office of *Journal of Traditional Chinese Medicine*, Yishan Duan (段逸山), tenured professor of Shanghai University of Traditional Chinese Medicine, Jing Li (李晶), director of Wolters Kluwer (China), Haiying Li (李海英), managing director of the editorial department of *Chinese Medicine and Culture*, and Yuehong Zhang (张月红), former editor-in-chief of Journal of Zhejiang University all made speeches focusing on the internationalization of traditional Chinese medicine, the role of sci-tech periodicals in the internationalization of traditional Chinese medicine, and the development of the journal *Chinese Medicine and Culture*, ect. The Meeting also caught the attention and support of experts, scholars and cooperative organizations at home and abroad. They sent short videos and congratulatory letters from different countries and regions to express their expectations for *Chinese Medicine and Culture*.

Jianguang Xu, editor-in-chief of *Chinese Medicine and Culture*, stated in his concluding remarks that the editors of *Chinese Medicine and Culture* will further aim to build a world-class journal, give full play to the characteristics and advantages of TCM, and attract first-class international talents. In this process, we should integrate resources and make full use of the advantages of the digital era to "tell the story of traditional Chinese medicine and enhance the international dissemination of TCM", and then to promote scientific research and scientific innovation for the benefit of human life and health.

Chinese Medicine and Culture

《中医药文化（英文）》 Established in 2018 Quarterly

Chinese Medicine and Culture

《中医药文化 （英文）》

General Information

Chinese Medicine and Culture is an Open-Access quarterly journal published by Wolters Kluwer. The journal covers historical events, life preservation, treatment, herbal medicines, acupuncture and traditional sports health care in field of traditional Chinese medicine. It aims to rapidly report the new progress, new insights, and research achievements on Chinese medicine, and those related to these fields. It provides a high-level platform for academic communication of researchers dedicated in Chinese medicine. Medical physicians, researchers, teachers, and students specializing in this field are the primary audience for the journal. Researchers who work in related science fields are also our target readers. Indexed by Ex Libris-Primo Central (Israel), EBSCO Publishing's Electronic Databases (US), Baidu Scholar (China), CNKI (China), Wanfang Data (China), Google Scholar (US), Hinari (Switzerland), Infotrieve (France), Netherlands ISSN Center (France), ProQuest (US), and TdNet (Isreal).

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The Cognitive Evolution from "Plague" to "Infectious Disease"

Xi Gao
Department of History, Fudan University, Shanghai, China

Abstract

According to the *Grand Chinese Dictionary,* plague is defined to be an acute infectious disease. The Chinese term "infectious disease" is not what it is commonly thought originated from Japanese. The medical nomenclature shift from the traditional "plague" to the modern "infectious disease" is completed by the medical missionaries, Chinese scholars, and the national authority, each utilising different strategies. It is a history of acceptance concerning the concept of "infectious disease" from academia to national level. The conscious use of infectious disease-related thought and terminology by Chinese officials and doctors when studying infectious disease is a scientific modernization towards the understanding of epidemics. In a sense, this evolution of medical knowledge embodies the modernization of infectious disease in China.

Keywords: Epidemics, infectious disease, modernity, sanitary regulations

The study of epidemics was originally the patent of epidemiology, public health, anthropology, and archaeology. The investigation of epidemic diseases in the history of traditional Chinese medicine (TCM) used to focus on the literature, academics, and schools, while the theory of Wen Bing (温病plague), which is directly related to epidemic diseases, mainly been investigated for the thoughts of doctors and its scholarly history. Influenced by Western historians in the 1980s, Japanese and Taiwanese scholars began to pay close attention to historical epidemics in the study of Chinese history [Note 1]. Among them, research of a Japanese scholar, Lijima (饭岛涉), which is based on the concept of infectious disease, has great influence on the domestic historiography circle.[1] The outbreak of SARS in 2003 triggered the concern of Chinese scholars about the history of disease and public health. Research on malignant infectious diseases such as plague, cholera, leprosy, and schistosomiasis has been carried out [Note 2]. The medical social history, disaster history, environmental history, and population history of China have also been rewritten in the name of "plague" [Note 3]. In the past 20 years, the disease history and medical history research results is fruitful and has become a long-lasting subject which cannot be underestimated by the academic circles.[2] Due to the coronavirus outbreak, epidemic history-related articles are spiking again.

There are many expressions of epidemic in the Chinese traditional literature and artefacts, including "Yi (疫 epidemic)", "Li (疠plague)". "Li Ji (疠疾plague)", "Li Qi (疠气pestilent qi)", "Zhang Li (瘴疠miasma disease)", "Wen Bing (温/瘟病warm/plague disease)", "Wen Yi (瘟疫epidemic)", "Han Yi (寒疫cold epidemic)", "Shi Yi (时疫seasonal epidemic)", and "Tian Xing (天行climatic epidemic)". [Note 4] *Zhou Hou Fang* (《肘后方》*Handbook of Prescriptions*) states that "Shang Han, seasonal epidemic and warm epidemic are from the same source which have little difference (伤寒、时疫、瘟疫，三名同一种耳，而源本小异)". Chen Yanzhi (陈延之), a famous doctor in the Eastern Jin Dynasty, contended that there is no difference in the meaning of the various names given to the disease. It is just the difference of common name and scholarly term only. For instance, "Shang Han is a noble term, while TangXi and Wen Yi are folks' terms, with different names but the same disease".[3] Doctors in the Song Dynasty had noticed that the phenomenon of the same disease but different Chinese names might cause confusion. "When the ancient and modern disease names are different, search result is often hindered and suspicious irrespective of whether you are performing a slow or an urgent search. If they could not be distinguished, then how the public could differentiate"?[4]

Address for correspondence: Prof. Xi Gao,
Department of History, Fudan University, Shanghai, China.
E-mail: gaoxi@fudan.edu.cn

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Lin Fu Shi (林富士), a Taiwanese scholar, believes that the understanding of plague in the Middle Ages is still very vague. The so-called Wen Bing and Yi Li in medical books are often the general terms of epidemic diseases.[5]

However, the explanation of Wen Yi in modern Chinese is very simple, i.e. it is a general term for acute epidemic infectious diseases (传染病).[6] The term "Yi Bing" also has the same meaning.[7] The so-called "infectious diseases" is a term used to describe transmissible diseases caused by invasion of microorganism.[8] Coined by the experimental scientists in the late 19th century, the term is invented to describe a new set of diseases based on the germ theory. Literature review found that such understanding of infection also exist in TCM literature. The *Zhu Bing Jie Fa* (《诸病捷法》*Diagnosis and Treatment of Various Diseases*), which was published in the Ming dynasty, uses the word "infectious disease" specifically for leprosy. However, a search in all databases suggested that there is only one above example linking 'Wen Yi' to infectious disease. Thus, it cannot be used to confirm that such concept exists in traditional Chinese medicine. In TCM, the term "infectious disease" is not a conventional term. However, there is no shortage of references such as"transmissible symptoms" in the traditional medical literature. Some scholars have pointed out that the "Wen", "Yi" and "Zhang" in the ancient literature are not necessarily explosive infectious diseases. They could also be nutritional deficiencies associated with great famine or endemic chronic diseases.[10] Some scholars believe that the "Wen Yi" defined by TCM does not based on a single criterion of being infectious only.[11] However, Contemporary historians have erroneously regarded the occurrence of "Wen Yi" in traditional literature directly equivalent to infectious diseases.[12] They would follow the modern biological characteristics of infectious diseases, search for clues of similar events happened throughout the history, and labelled some of the great epidemic outbreaks simply as plague, cholera, and other diseases. This kind of tacit modern scientific research thinking has come under criticism by scholars.[13]

Taking leprosy as an example, Angela Leung probed into the conceptual difference and mode of transmission of infectious disease between traditional Chinese culture and modern understanding.[14] Her research found that the word "infectious disease" started to replace "Wen Yi" as early as 1902.[15] Recently, some scholars have tried to distinguish between the Chinese medicine "Shanghan" and the Western medicine "infectious typhoid", and they put forward the idea of "modern history of febrile diseases".[16] These researches have corrected the previous research ideas of explaining traditional medicine directly with modern scientific terms.

The transformation from "plague" to "infectious disease" is not only a simple change of terminology but this change also involves the transformation of subject knowledge, the construction of national public health system and a series of related events [Note 5]. This paper attempts to discuss two questions: first, how did the traditional "Wen Yi" become equivalent to the modern infectious disease? Secondly, an Italian scholar Federico Masini once stated that the term "infectious diseases" was likely to be created by the Japanese.[17] This article refuted the Japanese origin theory. While combing the transformation process from the term "Wen Yi" to "infectious diseases," factors and motivations that promoted such modernisation and recognition by the whole society would be identified.

The Relevance between Wen Yi and Infectious Disease: "A Person Will be Infected with the Disease"

This standard medical terminology is derived from Latin language [Note 6]. Since the 19th century, English has been the main and commonly used language for cultural exchanges between China and foreign countries, and the Western people have mainly learned Chinese through English–Chinese or Chinese–English dictionaries. Therefore, the term "infectious diseases" discussed in this paper is mainly based on English references. Just as its counterparts in Chinese, "infectious disease" also has many expressions in English such as contagious disease infectious disease, pestilence, plague, and epidemic disease. It should be noted that the term "infectious diseases" in ancient English is also different from contemporary English.The transformation of Chinese terminology from tradition to modern times coincided with the development of European medicine from miasmatic theory to bacteriology.

The missionaries, doctors and merchants were the first to discuss the translation between the Chinese and English while the "Wen Yi" encountered with "infectious disease" in the early 19th century. R. Morrison (1782–1834), a Protestant missionary, worked in China mainly to compile a bilingual dictionary of English and Chinese. He was very interested in TCM knowledge, and bought a large number of TCM books to compile TCM-related vocabulary for his dictionary. In 1815, Morrison's first Chinese–English dictionary was completed, which included words such as "Wen", "Yi", and "Zhangli". He translated "Zhangli" as pestilential vapors, a term inherited from the Middle Ages, meaning "stench". Morrison regarded "Zhangli" as "warm disease". He translated the word "Yi" as "epidemic" and used "the grand canal was dried up (at a particular place) and a great epidemic in Peking" as an example [Note 7]. When the first worldwide cholera outbreak in Mumbai in 1817 triggered a global pandemic, the Western medical community had no idea of the cause of the disease. Morrison's first wife died of the then unnamed cholera in Hong Kong. In 1823, Morrison described epidemical disease as the "disease that spreads amongst the people, which once infected followed by many deaths [Note 8]. The author wrote about the pain of losing his wife in the dictionary. *Zhong Guo Yu Qi Meng* (《中国语启蒙》*The Beginner's First Book in the Chinese Language*) which was published in 1847 and compiled by American missionaries, T. T. Devan, was the first dictionary to include medical terms but no such word as "Wen Yi".[18]

There are differences between Mandarin and dialects in the Chinese language, and the missionaries soon came to notice that Mandarin is used only among residents who have access to more up-to-date information.[19] For the purpose of smooth communication with Chinese patients or peers, Western doctors tend to use dialect [Note 9]. Therefore, the initial translation between Chinese and English was not carried out in the context of introducing Western knowledge. This is evident in the English–Chinese or Chinese–English dictionaries compiled by early missionaries to help foreigners to learn Chinese. Morrison translated "contagion" as "Wen Bing", indicating that "a person will be infected with the disease".[20] W. H. Medhurst (1796–1857), a missionary of the Society of London, in *Ying Hua Zi Dian* (《英华字典》 *English-Chinese Dictionary*), carried on Morrison's saying that Wen Bing was "contagious".[21] In 1864, W. Lobscheid (1822–1893), a German medical missionary, recorded in his Chinese grammar book that the common language used by the Chinese to describe the disease as "both these men were very sick, [and] both have died".[22] Joseph Edkins (1823–1905), a well-known sinologist who long worked as a translator in Shanghai, translated "infectious diseases" into the standard Shanghai dialect as "contagious".[23] In addition, W. T. Morrison, a missionary in Ningbo, translated the verb "infectious" into Ningbo dialect.[24] John Macgowan (1835–1922), a British missionary, translated it into Xiamen dialect as pestiferous.[25] J. Doolittle (1824–1880), an American missionary, translated it into English as "contagious" in his book *Ying Hua Zhu Lin Yun fu* (《英华萃林韵府》*Vocabulary and Hand-Book of the Chinese Language*) [Note 10]. In the 1880s, Tetsujiro Inoue called infection disease as "contagious".[26] Even at the beginning of the 20th century, the *Hu Yu Ying Han Zi Dian* (《沪语英汉字典》*Shanghai English-Chinese Dictionary*) kept the translation of the word "contagions" as "contagious", whereas the word "infections" is defined as "I live a pestilential life" [Note 11].

Such an oral translation that "Yi" is "transmissible" and "contagious" puts an emphasis on the practical function of language and[27] the effect of seeking common ground while preserving differences in Eastern and Western medicine. Ensuring smooth communications between doctors and patients should be the effect pursued by the missionaries while translating the texts. They interpreted "infectious diseases" in the context of TCM and build a bridge for Western people to learn Chinese medical knowledge and understand folk medical customs. This is the beginning stage of converting and aligning the medical term "infectious disease" to "plague." Western medicine practitioners in China thought that TCM does not have a specific theory of infectious disease, but there are some terms related to epidemics or infectious disease. Most Chinese associate "Wen Yi" with plague.[28] When missionaries compiled English–Chinese dictionaries, they referred to *Kangxi Dictionary* in principle. For medical terms, they referred to *Ben Cao Gang Mu* (《本草纲目》*Compendium of Materia Medica*), *San Cai Tu Hui* (《三才图会》*Collected Illustrations of the Three Realms*) and *Zhi Wu Shi Ming Tu Kao* (《植物名实图考》*Illustrated Catalogue of Plants*), etc.[29] Missionaries discovered that "some of these [the TCM disease] names are very similar to those used in early British medicine".[30]

How are they similar? Using representative Chinese–English dictionaries that was published before 1902, the author attempted to compare the common words used to express "Yi" and "infectious diseases".

From Table 1, we can summarize several features of the English–Chinese translation, as follows:

1. Based on current available known dictionaries, there is no translations of "infectious diseases" listed in those English–Chinese dictionaries up to 1902. This absence also exists in the dictionaries that are not included in Table 1 [Note 12]
2. The English-Chinese dictionaries basically collected all the Chinese vocabulary of epidemic diseases, including 瘟疫 (Wen Yi, plague), 瘟症 (Wen Zheng plague), 瘟病 (Wen Bing blast), 瘟疾 (Wen Ji, plague), 瘟疡 (Wen Yang, plague), 疫 (Yi, epidemic), 大疫 (Da Yi, great epidemic), 疫气 (Yi Qi, epidemic qi), 病 (Bing, disease), 疫症 (Yi Zheng, epidemic disease), 时症 (Shi Zheng, seasonal epidemic), 瘴疠 (Zhang Li, miasma), 沾染 (contamination), and so on.
3. "Pestilence" and "Plague" are the two most common words. These two words mainly mean "plague" in contemporary English. However, Chinese–English dictionaries at the end of the 19th century offers a "plague" interpretation, until Yersinia pestis was discovered in 1894. Thereafter, "pestilence" and "plague" had become synonymous with infection of *Yersinia pestis* added to the dictionary.
4. "Infected (Ran Bing)", "contaminated (Zhan Bing)" or "contaminated with disease (Zhan Ran Bing)" and other similar terms are common in the dictionary. The term closely related to "plague" – the *Yersinia* infectious disease first appeared in the *English–Chinese Dictionary Series* compiled by the Chinese.

Before 1900, there were three bilingual dictionaries edited by the Chinese editors. They are Tang Tingshu (唐廷枢)'s *Ying Yu Ji Quan* (《英语集全》*English Anthology*), Kuang Qizhao (邝其照)'s *Zi Dian Ji Cheng* (《字典集成》*Dictionary Integration*), and Xie Honglai (谢鸿莱)'s *Shang Wu Shu Guan Hua Ying Yun Zi Dian Ji Cheng* (《商务书馆华英音韵字典集成》*Business Book Library Chinese-English Phonological Dictionary Integration*). Tang Tingshu entered "plague" and "miasmatic contagion" into his book [Note 13]. Kuang Qizhao is remembered as the first person who compiled Chinese-English dictionary [Note 14]. His dictionary is a textbook for Chinese students to learn English [Note 15]. In 1899, he changed its name to be *Hua Ying Zi Dian Ji Cheng* (《华英字典集成》*Chinese-English Dictionary Integration*). This edition of the dictionary contains a wide range of English and Chinese words [Table

Table 1: “Wenyi” and “infectious disease” in English-Chinese and Chinese-English Dictionary

时间	名称	作者	Contagion	Contagious	Epidemic	Infect	Infection	Infectious	Pestilence	Plague	注
1823	Dictionary	R.Morrison			瘟疫	沾染			瘟疫、疫气之流行瘴疠	疫	英汉
1832	A Dictionary of the Hok-Keen Dialect of the Chinese Language	M.Medhurst			瘴疠				瘟疫		汉英
1844	English and Chinese Vocabulary	S.Williams	时症, plague		时症	惹疾, 染病, 传染			瘟疫,	疫病	英汉
1847	English and Chinese Dictionary	M.Medhurst	Transmission and contagious, transference of evil, distemper, plague, miasma, poison gas	瘟病, 劳瘵, 瘟疫, 瘟症, 可染过人的, 有瘟的, 有毒气的	瘟症, 疫症流行民间	染病, 沾病			疠, 瘟疫, 瘟疡, 疫毒气, 恶气, 烟瘴气,	病疫, 瘟疫, 瘟疾	英汉
1856	Tonic Dictionary of the Chinese Language	S.Williams			瘟				瘟	瘟	汉英
1866	English and Chinese Dictionary	W.Lobscheid	沾染之气, 毒气, 瘟疫, 瘟气, 疫气, 传染	沾染的病, 瘟病, 传染的	流行的	染病。传染, 染毒, 传毒, 染毒, 传毒	染了病, 染过病, 沾染者, 沾染者, 传染者,	传染的	瘟疫, 瘟疡, 疫症	瘟疫, 瘟病, 疫症	英汉
1872	Vocabulary and Hand-book of the Chinese Language	J.Doolittle	传移及染, 瘟病, 瘟疫, 时症	可染过人的	瘟疫, 大疫	惹疾, 染病, 传染, 感染, 病过于人	病疫, 传染	感染的, 过人的病	瘟疫, 瘟瘴气, 瘟疡	疫病, 瘟疫, 全家遭瘟	英汉
1884	An English and Chinese Dictionary	井上哲次朗	沾染之气, 传染, 沾染物	传染的, 瘟病	疫症、瘟疫、流行之症	染病, 沾病, 传染,	沾染者, 染毒,	瘟疫, 过人之病。	瘟疫, 瘟疡, 疫症, 死症。		英汉
1899	Dictionary of English Phrase	Kwong Tsuun Fuk	疫气, 令易沾人染之气	传染的, 令人沾染的	瘟疫, 大疫	染病, 沾病, 传染		瘟疫, 传染之病	瘟疫, 瘟疡, 疫症, 死症。		英汉
1902	Commerical Press English and Chinese Pronouncing Dictionary	Xie Honglai	沾染之气、毒气、瘟疫	传染的, 沾染的瘟病、	流行的、传染的、疫症；瘟疫	染病、沾病、传染	沾染、传染	瘟疫, 传染之病	瘟疫, 疫症	瘟疫, 疫症	英汉

1]. Xie Honglai’s *Business Dictionary* also adopts the term “infectious diseases.”

Before the 20th century, there were three groups of people who undertook the translation and interpretation of medical terms namely and respectively, sinologists, missionary doctors who knew TCM, and Chinese translators. Compared with the conservative adjustment strategy of missionaries actively moving closer to traditional culture, Chinese translators fully show their eagerness for the introduction of new knowledge, which accounts for their willingness to give up the new meaning of the old language which is more radical than that of the first two categories of people. The first appearance of the word “infectious disease” in the dictionary compiled by the Chinese is the clear evidence.

Old Learning and New Knowledge: Discovery of 瘽“(Yi)”

In this dialog with oriental medicine, there is a key problem that is often neglected by our modern researchers, which is the knowledge structure of knowledge communicators of Western medicine. Before the middle of the 19th century, the Western “infectious disease” theory was in the stage of fermentation (miasma) theory; the germ theory of dealing with

infectious diseases had not been established yet. Missionaries and doctors in China at that time had no absolute advantage over Chinese medicine in dealing with diseases, especially infectious diseases [Note 16]. Second, in the 19th century, there were several large-scale outbreaks of infectious diseases in Europe and Asia, and some of them became global pandemics. Cholera began to attack the world in 1817 and accelerated to be the most dangerous plague in the 19th century. The plague broke out at the end of the century. Western translators were living in a complex environment of cognitive changes in disease where new diseases, new methods, new discoveries, and new theories were emerging. Those missionaries who had not received professional medical training could not grasp the knowledge of Chinese traditional epidemic disease nor the progress of Western medicine. As the main communicator of Western infectious diseases, Western medicine doctors in China must deal with the dual transformation of medical knowledge: firstly, it is the problem of the same "epidemic" disease but using different word context, and how to connect the two different theories of East and West, and Chinese patients and doctors to complete the translation from English into Chinese? Second, how did they learn to cope with the cognitive change of Western disease and follow the progress of "infectious disease" theory, and undergo self-renewal of medical knowledge. Therefore, the limitations of Western translators in terms of professional knowledge structure and insight should not be ignored in the undergoing study about the spreading of Western medicine.

B. Hobson (1816–1873), a medical missionary of the London Mission Society, was the first doctor to translate Western medicine into Chinese in modern times. He created a way to bring Western medicine knowledge into the framework of TCM, explaining Western medicine concepts of disease in terms familiar to the Chinese people. The prescription and medicine of body disease syndrome all use the names of the Chinese medicine book, in order to understand it by Chinese; if there is no or no name in the Chinese medicine book, they have to use the name of a Western country, and still use Chinese or translate its meaning, or translate its sound, and read it in detail.[31] He translates "Fever" into "fei e" and explains that TCM divides heat syndrome into toxic syndrome and nontoxic syndrome. The patients can infect people. Spring means warmth and summer means plague. It is a time of discord. If one get infected, the people in that region may be infected.[32] In 1858, Hobson published *Yi Xue Ying Hua Zi Shi* (《医学英华字释》 *A medical vocabulary in English and Chinese*).[33] This is the first bilingual dictionary of medical science, and his translation accurately expresses the original meaning of the Western language:

- Contagion disease: 传染病证
- Epidemic disease: 传染时行之病
- Pestilential disease: 瘟疫病.[34]

In *Xi Yi Lue Lun* (《西医略论》*Briefly Theory on Western Medicine*), Hobson even flagged "hot disease" for transmissible diseases, febrile jaundice, malaria, dysentery, and cholera. The modern meaning of infectious disease terms and disease names has been clearly translated and explained in Hobson's famous medical book. His translation of Western medicine was once the only textbook in missionary hospitals and medical schools, and the glossary he listed was also an important reference for medical missionaries in translating medical books. Oddly enough, other Chinese–language medicines of that era did not have the term "infectious disease", but the Chinese–language reports of missionary hospitals did exhibit records of "cholera" and "fever". In 1875, when John Fryer (1839–1928) introduced "cold and heat syndrome" and "heat syndrome" in *Ru Men Yi Xue* (《儒门医学》*Confucian Medicine*), she mentioned the characteristics of disease "transmission", saying that "cholera in Asia is the most serious plague".[35] At this time, the Chinese newspapers of missionaries generally used the word "plague" to describe epidemics in Europe and China. Consider *Wan Guo Gong Bao* (《万国公报》 *The Globe Magazine*) as an example, every issue of the country has reported the epidemic situation, the commonly used title: "Egypt: Fun Fact about the Plague (1873), Great Russia: Plague in Europe" (1879), and so on.

Since the 1870's, the term and knowledge system of "infectious diseases", as a classification of diseases, began to appear in China, not in Chinese, but in Western languages. In 1871, a new classification system, a zymotic disease, and four sub-categories including "malaria", "endemic", "diet diseases", and "parasitic diseases" appeared in *Hai Guan Yi Bao* (《海关医报》 *The Custom's Medical Report*) published by Shanghai.[36] Zymosis is an acute infectious disease. *The Custom's Medical Report* is an English publication published by the General Inspector of the Imperial Customs [Note 17]. R. Hart, (1835-1911) suggested that doctors should be scattered across the country to provide local epidemic disease counseling, special diseases – leprosy, seasonal epidemics, etiology, treatment, and mortality to the general administration on a regular basis to provide the general administration with information on local epidemic diseases, special diseases – leprosy, seasonal epidemics, etiology, treatment, and mortality.[37] Since then, infectious diseases and epidemic-oriented disease observation and treatment began to infiltrate the Chinese medical community. In 1881, Translation Department of Kiangnan Arsena translated and published *Nei Ke Li Fa* (《内科理法》*Internal Medicine Law*) [Note 18]. The infectious characteristics of the disease became the focus of discussion; this book comprehensively elaborates air, heat, and environment on the impact of infectious diseases and introduces antiseptic drugs.[38] Western medical translators, however, have not been able to break away from the language habit of the disease. Instead, they have created various names of the disease according to the characteristics of infectious diseases, embedding new knowledge into traditional terms such as "pestilence", "epidemic cessation", and "fulminant epidemic".[39] In the same year, the *Xi Yi Nei Ke Quan Shu* (《西医内科全书》 *Encyclopedia of Western Medicine*), compiled by the Canton Hospital translator Kong Qinggao and J. Kerr

(1824–1901), was published. The idea of "inflammation" and "fever" was adopted to discuss infectious diseases, and the European "method to stop the spread of plague" was explained [Note 19]. The word "plague" is always the first choice for missionaries to explain infectious diseases. Plague and infection are discussed together, and the infectious characteristics of epidemic diseases are clarified.

At this time, the part of speech of "plague" has changed; it was gradually separated from "toxic" and "nontoxic", "folk epidemic ghost", and other diverse characteristics of TCM plague, shrinking to a disease–infectious disease synonym.

At the end of the 19th century, medical missionaries were fully aware of the importance of unifying and standardizing medical terms for the dissemination of new knowledge in Western medicine. In 1890, S. A. Hunter, a Presbyterian missionary, spoke at the Shanghai Congress of the Medical Missionary Association of China (MMAC) on the topic of "plague:": "The Wen Yi is only a generic term for a pandemic, and it is the only one that can be used to refer to an infectious febrile disease (a containment fever). If we accept the plague as a synonym for typhus and revise its meaning, we will have taken a big step forward in explaining the nature of the disease to the Chinese students".[30]

In this paper, "Wen Yi" is defined as an infectious disease – "typhus Shang Han". Hunter suggests the direction of the translation of "Wen Yi" from a comprehensive phrase that generally refers to all kinds of epidemic diseases to a special noun for a single disease. He holds that in order to make the Chinese name of the disease correspond to the scientific knowledge of Europe, "when Western doctors create new names, they must find the synonyms of the disease in Chinese, and define the meaning of the words with the help of the description and scope of the disease".[30] In 1890, the medical missionary P. B. Cousland (1860–1930) was commissioned by MMAC to compile the English-Chinese Medical Dictionary. The disease vocabularies collected in the dictionary based on two resource, one is from the "disease terms" edited by J. Kerr in 1870's, and the other is from the brand-new word created by the Japanese.[40]

In 1896, the Bo Yi Hui published the translation of the translation of the word "infection disease": **瘽** disease.[41]

The word from the *Kang Xi Zi Dian* (《康熙字典》*Kang Xi Dictionary*) means: "sick phase infection". Cousland specifically explained reason of excluding the word "infection".

The word is bacteriology. The word "染" has the double meaning of "dye" and "infection". In Chinese, using the word "染" will cause confusion, this is why the best choice is **瘽**.[42]

The body of knowledge about medical diseases in the West was gradually systematized in the 1870s. After the 1880s, with the establishment of bacteriology, it became clear that an infectious disease was a theory produced by a bacterium. This idea was introduced into China at the same time, as Wang Guowei (王国维) said that the language is the representative of thought, so the input of new ideas would mean the input of the new language also.[43] Cousland needed to choose a new word to express a new concept. He found from the Kangxi character library a remote word that can not only express the new theory directly and clearly but also differ from the meaning of the word "dye", which is usually familiar to people-**瘽**. In a sense, the rare word is another form of "new", suitable for explaining the latest medical achievements and emerging medical ideas. At the same time, Cousland holds that "瘟" and "疫" refer to two diseases. Typhus is "瘟", while "疫" means plague. And zymotic disease is regarded as hot syndrome, seasonal fever or infections.[41] In 1908, *Gao Shi Yi Xue Ci Hui* (《高氏医学辞汇》*Ga's Medical Dictionary*) was approved of and published by the Terminology Committee of the Chinese Medical Association, **瘽** and became the standard translation of "infectious disease". Typhus fever is translated as distemper[44] and malaria fever as "瘴症".[45] After that, all translations and textbooks published by Fanbo Medical Association and Christian Medicine are based on dictionary terms [Note 20].

At the beginning of the 20th century, the members of the MMAC painstakingly crawled out the nouns they thought suitable from the *Kang Xi Dictionary*, and tried to shove the cutting-edge knowledge of Western science into the ancient Chinese ideological system. Because of the difficulty in recognizing the word or the compound character created by the word, the antiques crawled out of the pile of ancient characters completely deviated from the image of the new medicine in the Western dynasties. The inability to transfer new knowledge and concepts is not recognized by Chinese scholars, especially the growing Chinese medical students. Wang Guowei criticized that the new names of the West were always expressed in inappropriate archaisms. The ending of **瘽** words would be abandoned.[46]

In 1908, the Commercial Press published Yan Huiqing (颜惠庆)'s *Ying Hua Da Ci Dian* (《英华大辞典》 *English-Chinese Dictionary*), the medical term of which was taken from the words approved of by the Medical Association, but Yan Huiqing abandoned the word **瘽**, though he used the word "Infectious diseases." Yan Huiqing said " Words are the coat of thought, so if we want to think seriously and express our thoughts accurately, we should have an exact understanding of words." The Medical Terms Committee's translation of the retro word eventually came to a dead end. However, Yan Huiqing was the first person to use the word "Infectious diseases?"

Official Definition and Sanitary Regulations

With the new Chinese characters created by missionaries, it is impossible to complete the construction of the system of scientific and technical terms. In the 1920s, most of the obscure or newly created characters in *Gao Shi Yi Xue Ci Dian* (《高

氏医学辞典》*Cousland's Medical Dictionary*) and Chinese Medical Nomenclature Committee were mostly abandoned. For a long time, Chinese and foreign scholars have been defaulting to medical terms, especially the new terms which represent advanced medical thoughts and technologies, which have been eventually replaced by the literal translation of Japanese compounds.[47] According to this logic, even if there is no direct basis, "infectious disease" is considered by scholars to be a Japanese primitive loanword. "Infectious disease" translate into Chinese as trisyllabic——传染病——is most likely created by Japanese scholar [Note 21].

Is this really the case?

Masini thinks that there may be the word "epidemic" in the 1886 edition of *He Ying Ying He Yu Lin Ji Cheng* (《和英英和语林集成》*Integrating of English and Chinese*). *Integrating of English and Chinese* is the earliest Japanese–English dictionary compiled by James Curtis Hepburn (1813–1911), a Presbyterian minister who went to Japan to practice medicine. It was published in 1867. The second edition of 1872 included the vocabulary of Western science, literature, and system, and the third edition of 1886 adopted the loanword Pinyin, which became the standard of Japanese–English dictionary. However, there is no separate entry for "infectious disease" in any of the three editions. The Japanese word for pestilence is "pestilence", which is the same as the missionary's translation.

The modern sense of the word "infectious diseases" first appeared in a Shanghai publication, it is the local government in the form of decrees that issued it. In 1872, the Shanghai Municipal Bureau of Public Concession reported that "German steamers coming to Shanghai were infected by infectious diseases" [Note 22]. In July 1873, cholera broke out in India, Siam (now Thailand), Malaya, Indonesia, Shanghai Port, and other countries; those that have a close maritime traffic with them were seriously in danger. For their own health and economic interests, Westerners who settled in Shanghai demanded the establishment of port quarantine in an attempt to keep infectious diseases off Shanghai. On July 21, F. E. Wright, the Bureau of Customs and Excise of Shanghai Customs and the medical Office of the custom Jameson (1865–1895), proposed four quarantine regulations based on the British Quarantine Act.[48] On August 26, Consuls and Customs in Shanghai held a meeting to discuss the establishment of a strict supervision of infectious diseases that might be carried by foreign vessels entering the harbor.[49] Eight articles of the association were drawn up and submitted to Foreign Office in Beijing, and the application for implementing the rules in Shanghai first obtained the permission of the Qing Government Administration in Beijing. In the same month of the that year, Xiamen port also exercised harbor quarantine. In September 1874, the Qing dynasty government had approved of *Sanitary Regulations for the Port of Shanghai* which was promulgated by Shanghai Daotai in Chinese, English, and French.[50] *The Globe Magazine* had said that smallpox was a contagious disease, and countries like Taixi take the most cautious prevention on such diseases. Where the business harbor infected with infectious disease, when foreign ships once reach at the port it will become a disaster. We must strictly check the entrance of foreign ships who are not allowed to bring infectious diseases into the establishment of the harbor [Note 23].

As the term for the particular disease, "infectious disease" appeared officially in official documents and was published in the media in 1874. In 1876, the Shanghai Municipal Bureau of Industry enacted the Law on Infectious Diseases [Note 24].

The Japanese counterpart of "infectious disease" appeared on June 7, 1871. During that year, the Siberian coastal areas was facing the spread of serious infectious diseases and later on it spread to Japan. An official who was on a business trip to Shanghai sent a copy of the article on "infectious diseases" to Japan. It was sent back to Japan on June 27 to enact the "Poultry Infectious Diseases Prevention Law" in Shanghai.[51] This is the first three-syllable "infectious disease" that appeared in Japanese, while the article is from Shanghai. There was a special chapter with "infectious disease "in the Nei Ke Zhai Yao (《内科摘要》Internal Medicine Digest) translated by Kuwata Kohei (桑田卫平) [Note 25]. In 1875, Japan established the Health Bureau, and in the same year, they established the Reporting System for Infectious Dseases.[52] The epidemic of rash was circulating in Xiamen in 1877. The port and Yokohama Port, Japan, had been engaged in maritime trade, while the Japanese authorities feared epidemic disease transfer from the port, so they announced the *Leave Rules for Asylum Services*.[53] They set up a medical bureau in Yokohama to inspect incoming ships.[54] In 1879, Japan promulgated *Prevention of Infection of Tiger Lay Disease Rules* in Harbor.[55] *The Prevention of Infectious Diseases Rules* was promulgated in 1880.[56]

Obviously, "infectious diseases" and port quarantine laws started in China and Japan almost at the same time, but Japan's laws and regulations refer to or are related to the regulations of the General Administration of Customs and the Shanghai Municipal Bureau of Industry.

At the early 20th century, a mixture of plague and infectious disease was still visible in medical textbooks and the media. The realization official cutoff of infectious diseases and plague in the terminology is when the "infectious disease" is clear about their identity. This status is officially vested in the government, where the classification of which diseases belong to the family of infectious diseases, and the right to characterize diseases, was based on the local government or the state. Since the Ministry of Industry announced the Infectious Diseases Law in 1876, the Shanghai International Settlement has had "the death toll statistics of infectious diseases." In 1901, the Shanghai Municipal Bureau of Industry expanded its own infectious diseases hospitals [Note 26]. In 1908, the Shanghai Municipal Bureau of Industry formulated the "Regulation of Infectious Diseases." Those certain infectious diseases are: "pox, cholera, typhoid fever, throat rot, phthisis,

plague, spleen fever, equine nose drop, and phagocytosis of mad dog".[57] The name was still halfway between old and new, but the classification of infectious diseases had become clear.

The Qing government's understanding of infectious diseases always had its own way. After the Westernization Movement, the Qing government sent officials abroad. These officials felt the same way about the preventive measures and rules of the Western countries. In November 1876, Guo Songtao (郭嵩焘) took the Ta Wan Kuan to Europe. On the way, the chef on board had pox. Zhang Deyi (张德彝) wrote "pox is the disease that foreign ships would like to avoid, pox being the worst. If there are patients on board, the ships would hang up yellow flags, forbidding people to come or go ashore, while the hospitals extend the duration of the sick persons. They must stay for twenty days until there is no more sign of infection. Only then people on the ships could come to the shore".[58] Huang Zunxian (黄遵宪)'s *Ri Ben Guo Zhi* (《日本国志》*National Records of Japan*) in 1895 introduced the country's infectious disease prevention rules, emphasizing that infectious disease patients or ships with infectious disease patients would be punished and even imprisoned if they should violate *The Prevention of Infectious Diseases Rules* formulated by the government.[59] Such experiences added to the Qing's knowledge of "infectious diseases".

The outbreak of infectious diseases would directly affect the national movement and people's livelihood, prompting the officials of the late Qing Dynasty to pay more attention to the public health policy of Western countries – "Yang Min Zhi Zheng". In 1876, along with Guo Songtao, Liu Xihong, who were sent to England, recorded the data of the death of Chinese people according to their household survey of disease. He presented the data to the king on the New Year's Eve. If there are many people who die, then they will be investigated. Therefore, the doctor was ordered to inspect his land, or to dredge his trenches to pass through the weather, or to dredge his ditches to pass through the ground, or to remove his roads from the disease. When Zhang Deli went abroad again in 1888, he said thus: "Germany tried to prevent the plague before it spread. Recently, the state set up a special office for its affairs, name the Imperial Disaster Department(御灾司)". In charge of the affairs of the patrol to detect the disaster, Buban epidemic prevention and other related things came under leadership of of Ministry of Education and management, and another office of Ministry of Education will discuss everything about the disease. Each province has a medical association to consult at any time that is helpful for the matter of local health, and each prefecture and each county will send a doctor to see the exemption. The treatment of the epidemic caused by poverty may be paid by the State. Anyone who is susceptible of infection must be reported to the patrol. The patrol shall clean the land according to the law, such as the sewers. Where there is a sick child in a household, the members are not allowed to go to school where they may spread the infection through the clothes."[60] The two translated works which influenced the Chinese ideological circles deeply in the late Qing Dynasty, namely Hua Zhian's *Zi Xi Cu Dong* (《自西徂东》*From West to East*) and *Tai Xi Xin Shi Lan Yao* (《泰西新史揽要》*The New History of Tessy*), both have the chapters of "Prevention of Disease", which introduce the epidemic prevention departments and epidemic prevention laws of Germany and the UK.[61]

With the invasion of Europe and the active observation of the Qing officials outside the country, the responsibility of social treatment, disease resistance, and prevention after the epidemic should be borne by the government in order to ensure the safety and interests of the society. Information such as this was channeled through various channels, affecting people of insight and officials of the late Qing Dynasty. Since 1907, students studying in Japan had established various medical and health journals, such as *Health World* and *Journal of Chinese Medicine*, which spread the ideas of health management system and prevention in Japan and European countries. The Qing officials attached significant importance to the relationship between epidemic prevention and the new policy. The 33rd year of Guangxu (1907) witnessed Zhang Zhidong reporting the "new model prison detailed by the statute," in accordance with Japan and Western countries, mentioning the "infectious disease isolation ward".[62] In *The New Decree in the Guangxu Period of the Qing Dynasty* there is a provision in Chapter VI Rules for Prisoners and Poor People and the Others in which there is an infectious disease cell in the prison, which is decided by the medical officer after examination.[63] In 1906, the Capital Normal School set up an infectious disease ward and stipulated that "In case there are diseases, medical officer will check the ward or the infectious disease room for the adjustment and treatment".[64] The national epidemic prevention and punishment system also put the moral shackles onto the "infectious diseases" patients. In 1911, the Qing government promulgated the *Qing Criminal Law*, which called those who violated the ban on the prevention of "infectious diseases" the "crime of obstructing health", and they would be sentenced to fixed-term imprisonment or criminal detention or payment of a fine.[67]

On December 30, 1912, when the Republic of China was founded, Premier Xiong Xiling (熊希龄) and Army Chief Zhou Zizhai jointly promulgated the *Army Infectious Disease Prevention Rules*, which named ten infectious diseases and required the commander of the unit to declare promptly the occurrence of an infectious disease within the unit or the presence of an infectious disease in its vicinity [Note 27]. In April 1915, Yuan Shikai (袁世凯) set up an infectious disease hospital to prevent epidemic. He requested state subsidy to be included in the 4-year budget, and formulated 21 articles of association of the infectious disease hospital.[66] In 1916, the Secretary of State Lu Zhengxiang (陆征祥) of the Northern Warlord Government promulgated the "Regulations on the Prevention of Infectious Diseases". The officials determined that infectious diseases include: (i) cholera, (ii) red dysentery, (iii) typhus, (iv) natural pox, (v) measles, (vi) scarlet fever, (vii) diphtheria, and (viii) plague,[67] a total of eight types.

Conclusion: The Modernity of Epidemic Diseases

At the beginning of the 20th century, the harm of infectious diseases to civilized society gradually formed a certain cultural cognition in the public psychology and became a basic common sense. In 1903, in Shanghai's urban novel *Nie Hai Hua* (《孽海花》*A Torn Lily*), there are even protagonists who are infected with "infectious diseases". Around 1907, Ding Fubao (丁福保) called "infectious diseases" as new things, "new things are gradually observed, and the opinions of infection disease are gradually beyond the new matter".[68] Activists even had a sense of crisis about the relationship between the health of infectious diseases and ethnic survival. "If you want a strong nation, people must be strong. If people want to be strong, you must first study about health. If you want to study about health, you must first pay attention to the sanitation of infectious diseases". In the then China, medical science field was obscure and blind where sanitation of health was not on the focus. For thousands of years, human beings have been becoming weaker and unreasonable and these are the reasons. No wonder, Westerners say that our country is the sick man of the East".[69] In 1910, Ding Fubao wrote *Lecture Notes on Acute Infectious Diseases*, introducing the origin, representatives, and new knowledge of the subject. Under his influence, the new knowledge was quickly accepted by the field of TCM and incorporated into the knowledge system of TCM. In 1913, under the guidance of bacteriology theory, TCM historian Chen Bangxian (陈邦贤) came to see that "There are three kinds of infectious diseases in the old customs, namely, miasma, infection, and devil." Now, it is attributed to bacteria, and he also listed forty bacterial infectious diseases".[70] In 1914, he incorporated the concept of modern science into the outline of the *Zhong Guo Yi Xue Shi* (《中国医学史》*History of Chinese Medicine*), creating a modern paradigm for the study of the history of Chinese disease with a Western medical system. This not only constructs the style of combining medicine and disease in the history of Chinese medicine but also modifies the academic discourse of diseases in TCM. The epidemic diseases in history are all discussed according to the classification of modern infectious diseases so that they can be in dialog with modern science [Note 28]. In 1943, Yu Yunxiu (余云岫) put on the academic hat of epidemic acute infectious disease in *Gu Dai Ji Bing Ming Hou Shu Yi* (《古代疾病名候疏义》*Ancient Disease Syndrome*), explaining that "microorganism is the pathogen of epidemic acute infectious disease".[71]

From then on, the transformation from the traditional "plague" to the modern "infectious disease" has been completed in terms of both terminology and theory.

American scholar C. Rosenberg pointed out in the study of modern disease history to the effect that: in some ways disease does not exist until we have agreed that it does, by perceiving, naming, and responding to it. He explained: "it is fair to say that in our culture a disease does not exist as a social phenomenon until we agree that is does, until it is named".[72] The emergence of "infectious diseases" terminology in China is a case in point. The traditional "plague" is similar with the modern "infectious disease". The process was carried out by missionaries, Chinese scholars, and officials in China, each adopting a different strategy. When "plague" and "infectious diseases" meet, the whole world's understanding of the disease is in the "miasma" era. Therefore, in the initial stage of knowledge exchange and terminological docking between the East and the West, the cultural adjustment strategy was adopted at the cultural level. The missionary finally embarked on the road of the word retro, leading to a failure of innovation. The term "infectious disease" officially appeared in China around the 1970s and was investigated in terms of time sequence. At this time, the Western medical profession accepted the bacterial theory of disease transmission at the theoretical level, changed from negative treatment to positive preventive medicine at the practical level, and the state was more deeply involved in medical and health affairs.[73] Whether in China or in Japan, influenced by Western countries, the definition, naming, classification, and regulation of "infectious diseases" have a clear governmental background. Moreover, the national health management system and the local urban public health construction supplement each other, become an important part of the national modernization development framework, and put the degree of civilization of social indicators into test. The transformation of terms from "plague" to "infectious disease" occurred in modern China, the essence of which is a history of acceptance of the concept of "infectious disease" from the intellectual world to the national level. This is a process of scientific cognition of epidemic diseases. Chinese officials and Chinese doctors both consciously discussed epidemic diseases in the scientific context. They agreed with and accepted the idea as well as the vocabulary of "infectious diseases" to analyze epidemic diseases in history. In a sense, this evolution of knowledge is the embodiment of the modernity of epidemic diseases.

Notes

Note 1: During the period of studying Chinese history in China in the 1980s, Mr. Iijima turned to pay attention to the study of the history of infection in China because of the influence of McErney's "plague and man." Mr. Iijima involved in "discussion on the Chinese History of Infectious Diseases" and "Historical Research." 2015(2), p. 4-8.

Note 2: Representative Books and Papers: Ran Qizhi: "Lepra: A Medical Social History of a Disease" (Commercial Press, 2013), "Facing Disease: Medical Concepts and Organizations in Traditional Chinese Society," Renmin University Press, 2011; Cao Shuji and Li Yushang, "Plague: The State of the Environment and Social Change in War and Peace in China" (Shandong Painting and Calligraphy Publishing House, 2006); Shan Li, Classical Cholera Epidemic Research in Qing Dynasty (Doctoral Dissertation, 2011); Li Yushang, "the change of tidal area and schistosomiasis in Qingpu Lake area," "Theory and Exploration of Environmental History Research in China," 2013(2), p. 326-340.

Note 3: Since his doctoral thesis, Mr. Weng Xinzhong has focused on this field and made pioneering research on it.

Note 4: According to the literature review, there are three special features of "epidemic diseases:" Yunxiu: Fan Xingzhuan; "Ji Bing" Liu Zhao combed the historical "epidemic" situation from the unearthed literature oracle bone inscriptions, silk, and explanatory articles, and filled in the "epidemic situation in ancient characters." The Paper, April 10, 2020.

Note 5: "Plague" has a variety of explanations; this article is limited to the scope of medicine.

Note 6: China's first standard medical vocabulary in 1927, "Anthology of Anatomical Nouns," was used in Latin, German, English, and Japanese to regulate medical terms.

Note 7: Rev. R. Morrison, Dictionary of the Chinese Language ("Dictionary"): the great cannel was dried up and a great epidemic in Peking," Macao: Printed at the Honorable East India Company's Press, 1823(2), p. 66. There are many versions of Morrison's dictionary. See Yuan Qing: "The rise and Development of Chinese-English and English-Chinese Bilingual Dictionary compilation and publication in the late Qing Dynasty," "The study of Modern History," 2013 (1): Shen Guowei, "A Modern English-Chinese Dictionary of Modern Times," Beijing: Kansai University Press, 2011.

Note 8: Ibid., p.86.

Note 9: On the missionaries' study and study of dialects, see: Lee Siu Lun, History and current trends of teaching Cantonese as a foreign Language, Ph.D thesis, University of Leicester, 2004.

Note 10: Lu Gongming: Yinghua Collection of Lin Yunfu, Foochow: Rozario, Marcal and Company, 1872, pg 95. The medical terms in Luk Kung Ming's dictionary come from Hexin's English-Chinese Medical Dictionary, but he did not adopt the translated version.

Note 11: Shanghai Christian Dialect Association, Chinese-English Dictionary of the Late Qing Dynasty, Shanghai: Translation Press, 2018. This is a reprint of the 1913 edition of the English-Chinese Dictionary of Shanghai Dialects, p. 203, 449.

Note 12: This table is based on a representative dictionary of each era in the 19th century, listed in Shen Guowei's A Chinese-English Dictionary in Modern Times, before 1900, there were 50 dictionaries. Except for some dialect dictionaries, none of the large comprehensive dictionaries had the word "infectious disease."

Note 13: Tang Tingshu is the forerunner of the modernization of China's industry and commerce. Research on Tang Tingshu and his Tang Family, see Tang Kaijian: "Research on the Guan Cai of the Tang Tingshu Family in Macao" Research on Tang Tingshu, Vol. 1, p. 1-27.

Note 14: Mr Kwong was educated in Western Studies in Hong Kong and opened several pharmacists as pharmacists before going to Australia should engage in the medicinal materials business. For a study of Kwong Qizhao, see: Takata Shixiong, Sun Jianjun, translated by Sun Jianjun, English in the late Qing Dynasty: Kwong Qizhao and his works, Oriental Studies, No. 117 (2009), p. 1-19. Shen Guowei: Kuang Qizhao's Dictionary Integration, Modern Yinghua English Dictionary solution, p. 117-135.

Note 15: "Zi Dian Ji Cheng" is available in 1868, 1875, and 1887 editions.

Note 16: Traditional Chinese medicine has the methods and means to deal with epidemic diseases systematically. The school of febrile diseases rose in Ming Dynasty and mainly treated acute infectious and noninfectious febrile diseases. The representative figures and works were Wu Yousex's "theory of warming epidemic," Ye Gui's "theory of warming heat," Wang Shixiong's "Huorang theory," Liu Kui's "Songfeng theory of epidemic," etc.

Note 17: For a detailed introduction of Customs Medicine, see Gao Xi: Preface, Customs Medicine News, Beijing: China National Library Press, 2017.

Note 18: The Law of Internal Medicine, The English Tiger Writing, translated by Shu Gaodi, Written by Zhao Yuanyi origin from "Hooper's physician's vade mecum or "A manual of the principles and practice of physic," London: Henry Renshaw; Whittaker and Co., 1809, by R. Hoopper (1773–1835), a British physician who had several medical departments. *Internal Medicine Act* is a textbook of internal medicine in British medical colleges. It was first published in 1809 and extended in 1833, and has been reprinted many times since. The book also has an American edition, which has been reprinted several times.

Note 19: Kong Qing Gao translate, "Western Medicine Internal Medicine 16 Volume," "Western Medicine Fever General Catalogue," Guangxu 8 years Boji Medical Bureau engraved version.

Note 20: The Medical Terminology Committee of the Bo Yi Hui Medical Association stipulates that all medical terms translated by the members of the Bo Yi Hui Medical Association shall be examined and approved by the Committee on Medical Terms and may be published and distributed. Gao Xi: Preface, edited by China Bo Medical Association: Bo Yi Hui Bao, Beijing, China National Library Press, 2013.

Note 21: Masini based his argument on the 1886 edition of Hepburn's Integration of English, English, and Chinese, but there is no word for "infectious disease," "The Formation of Modern Chinese Vocabulary-A Study of Chinese Loanwords in the 19th Century," p. 195.

Note 22: Infectious Diseases of Ships from Germany to Shanghai, U1-2-612, August 1872, Shanghai Archives.

Note 23: "Investigation of the Charter of Haikou of Infectious Disease Coming from Foreign Countries," The World Journal, No. 312, 1874, p. 21-23. The translation of Shen Bao is Charter of Shanghai Port of Entry for Foreign Vessels from Countries

with Infectious Diseases, November 7, 1874, 2nd edition. At present, domestic research and customs history writing are based on the "Declaration" name.

Note 24: The Establishment of the Infectious Disease Law by the General Office of the Shanghai Municipal Department of Public Concessions, U1-2-757, December 1876, Shanghai Archives.

Note 25: The Seven Diseases of Cai Mo is divided into two categories: Eruptive Infectious Diseases and Noneruptive Infectious Diseases. Katsuya Shimamura, "The Internal Medicine Digest," Meiji Renshen Year, Qian Qianzhai Zangzi.

Note 26: On the document of the General Office of Shanghai Public concession Industry Bureau on the expansion of Infectious Diseases Hospital, Shanghai Archives, June 1901, U1-2/236, 1901, Shanghai Archives, June 1901, Shanghai Archives.

Note 27: The 10 infectious diseases are cholera, red dysentery, intestinal smothering, natural acne, rash asphyxiation, yellow fever, scarlet fever, diphtheria, Benedict, and those specifically designated by the head of the Army. Official Gazette, No. 597 of December 31, 1913, Vol. 21, p. 506-517. Ding Rui's paper "Beijing Police's Control of Infectious Diseases during the Period of Beiyang Government" (Public Security Research, 2019 (2), No. 3, p. 108. In this paper, eight infectious diseases listed in "A Survey of Beijing Police Service" (1917) are compiled by the Jingshi Police Department: Cholera, dysentery, typhoid fever, varicella, scarlet fever, diphtheria, and bubonic plague. The authors say that the names were set in 1912.

Note 28: Chen Bangxian, History of Chinese Medicine, published by the Medical Book Company in 1919, is the first history of Chinese medicine. Wu Liande called it "an unprecedented masterpiece." Wang Yunwu, History of Chinese Medicine, 1936. Commercial Press, 1956. These three editions of "History of Chinese Medicine" construct the narrative mode of Chinese medical history, which has influenced the present.

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Conflicts of interest

There are no conflicts of interest.

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Comparative Study of Traditional Chinese Medicine and Western Medicine in the Treatment of Coronavirus

Li Shen, Ke Wang[1], Jia Zhou[2]

Director of the Publicity Department, [1]Acupuncture Anesthesia Clinical Research Institute, [2]Department of Cardiothoracic Surgery, Yueyang Hospital of Integrated Traditional Chinese and Western Medicine Affiliated to Shanghai University of Traditional Chinese Medicine, Shanghai, China

Abstract

Taking the process of treating coronavirus disease 2019 (COVID-19) with Western medicine and traditional Chinese medicine (TCM) as the research object, this article compares the characteristics of Western medicine and TCM from the perspectives of aetiology, pathogenesis, diagnosis, and treatment. Western medicine and TCM each has its own theoretical system. Each has its own exposition in explaining the etiology and pathogenesis of the disease, and each has its own characteristics and advantages in diagnosis and treatment. Integrating TCM and Western medicine can improve the effect of treatment by forming a coordinated traditional Chinese and Western medicine treatment method.

Keywords: Combination of Chinese and Western medicine, comparative study, coronavirus pneumonia, COVID-19

Introduction

In January 2020, the new coronavirus pneumonia (coronavirus disease 2019 [COVID-19]) epidemic saw its first outbreak in Wuhan, Hubei Province, and it spread subsequently to the other parts of China. Since then, the epidemic has occurred wantonly around world. As of November 13, 2020, the total number of confirmed cases worldwide had exceeded 53 million, with more than 1,300,000 deaths.[1] At the beginning of the Wuhan outbreak, the epidemic situation was uncontrollable and the number of severe cases and deaths increased rapidly, in part, due to the weak awareness of the disease. Even now, "no effective drugs have been found to treat the new coronavirus."[2] However, one month after the outbreak of the epidemic, with the widespread participation of traditional Chinese medicine (TCM) practitioners, the level of understanding the disease has improved, the treatment methods were expanded, and the synergistic treatment of integrated traditional Chinese and Western medicine achieved remarkable results. The number of patients whose symptoms progressed from mild to severe or who became critically ill decreased significantly,[3] alleviating the treatment pressure of designated hospitals and saving a lot of valuable medical resources. The combination of TCM and Western medicine has become a characteristic "Chinese experience."[4] This article compares the respective characteristics of Western medicine and TCM in the treatment of COVID-19.

Understanding of epidemics in traditional Chinese medicine

In TCM, infectious diseases were named "epidemics (疫病)" or "pestilences (瘟疫)", which accompanied the development of human society and took countless lives. According to *Zhong Guo Yi Bing Shi Jian* (《中国疫病史鉴》*History of Epidemic Diseases in China*), there were at least 321 attacks of epidemics in China from the Western Han Dynasty to the Opium War in 1840. Chinese people accumulated rich experience in the prevention and treatment of epidemics, and TCM played an essential role herein.[5] Understanding epidemics in TCM can be traced back to *Huang Di Nei Jing* (《黄帝内经》*Huangdi's Internal Classic*). *Su Wen*"Liu Yuan Zheng Ji Da Lun Pian" (《素问· 六元正纪大论篇》*Basic Questions* "Major Discussion on the Progress of the Six Climatic Changes") said that "Pestilence prevails and people tend to die suddenly (疠大

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Address for correspondence: Dr. Jia Zhou, Yueyang Hospital of Integrated Traditional Chinese and Western Medicine Affiliated to Shanghai University of Traditional Chinese Medicine, Shanghai, China. E-mail: pdzhoujia@163.com

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至, 民善暴死)"; and *Su Wen*"Ci Fa Lun Pian"(《素问·刺法论篇》*Basic Questions* "Discussion on Acupuncture Methods") said that "Five kinds of pestilence all can spread from people to people. No matter whether the patients were children or adults, the symptoms are the same (五疫之至，皆相染易，无向大小，病状相似)." In *Huang Di Nei Jing Su Wen Yi Pian* (《黄帝内经素问遗篇》*Lost Chapters to the Basic Questions in Huangdi's Internal Classic*), the abnormalities in five moments and six qi (五运六气), and the patterns of occurrence and development of epidemics were collectively described and acupuncture and moxibustion were mainly used in the treatment.[6] In the Eastern Han Dynasty, there was a pandemic cold damage, and Zhang Zhongjing (张仲景) wrote in his *Shang Han Za Bing Lun* (《伤寒杂病论》*Treatise on Cold Damage and Miscellaneous Diseases*) that "There had been as many as 200 members in my clan and in less than 10 years, two thirds of them died and cold damage was the main cause of their death." He designed the system of "six channel patterns of identification" and gave treatment accordingly. In the Song and Yuan dynasties, a large number of ready-made medicines were recorded in the medical books compiled under the sponsorship of the government, including *Tai Ping Sheng Hui Fang* (《太平圣惠方》*Taiping Holy Prescriptions for Universal Relief*), *Jiao Zheng He Ji Ju Fang* (《校正和剂局方》*Corrected Formulary of Pharmacy Bureau*) and *Tai Ping Hui Min He Ji Ju Fang* (《太平惠民和剂局方》*Formulary of the Bureau of Taiping People's Welfare Pharmacy*. In the Yuan Dynasty, Li Dongyuan (李东垣) formulated Pu Ji Xiao Du Yin Zi (普济消毒饮子) to treat swollen-head infection and obtained good effect. This prescription is still commonly used to treat swollen-head infection and mumps up until today. In the late Ming and early Qing Dynasties, Wu Youxing (吴有性) wrote the very first monograph on warm disease study in TCM, i.e., *Wen Yi Lun* (《温疫论》*Treatise on Pestilence*) and proposed the idea of "perverse qi causing disease (戾气致病)" as etiology. He suggested that "Pestilences are not caused by wind, cold, summer-heat or dampness, but rather an abnormal qi between heaven and earth (夫温疫之为病, 非风、非寒、非暑、非湿, 乃天地间别有一种异气所感)" and he believed that "The pathogen is latent in the pleurodiaphragmatic interspace (邪伏膜原)." So, it was critical to force the pathogen out of the body and it was also important to strengthen the healthy qi. On this basis, Ye Tianshi (叶天士) invented the system of "defense-qi-nutrient-blood pattern identification", and Xue Shengbai (薛生白) differentiated the syndrome types of dampness-heat disease. Subsequently, Wu Jutong (吴鞠通) proposed triple energizer identification and wrote *Wen Bing Tiao Bian* (《温病条辨》*Systematized Identification of Warm Diseases*), which established the status of the school of warm diseases in TCM. In modern times, good therapeutic effect was obtained when TCM was used to treat epidemic encephalitis B in 1974, severe acute respiratory syndrome (SARS) in 2003, and influenza A in 2009. It can be inferred that TCM has thousands of years of history in preventing and treating epidemic outbreaks, with the help of rich experience accumulated and theoretical systems established. TCM has made great contributions to the prevention and treatment of infectious diseases.

Comparison of the etiology of coronavirus disease 2019

In Western medicine, the understanding of etiology is based on anatomy, pathology, and physiology. Western medicine holds that COVID-19 is caused by human infection of the SARS coronavirus 2 (SARS-CoV-2) carried by certain animals, leading to lung inflammation. According to TCM, COVID-19 is an externally contracted febrile disease with high infectivity and falls into the category of "epidemics". Its outbreak in Wuhan this year was triggered by the humid climate in this city at that time, as well as by the warm winter season. The cold and wet weather conditions caused wet evil qi encroaching on the human lungs, resulting in a "cold damp (plague) epidemic (寒湿（瘟）疫)."[7] Although the two systems differ in their understanding of the cause of the disease, both agree that some kind of external material invades the lungs through the respiratory tract, resulting in lung troubles.

Comparison of pathogenesis of coronavirus disease 2019

Western medicine contends that COVID-19 is caused by the already-known SARS-CoV-2 virus that passes through the respiratory tract into the lung, stimulating the body's immune system to produce an inflammatory reaction. Then, then alveolar endothelial tissue is damaged where the inflammatory serous exudated adheres to the alveolar surface, extensively damaging the alveolar oxygen exchange function and reducing the oxygen content in the blood, thus leading to severe hypoxia in patients.[8] TCM proposes that "dampness toxin (湿毒)" is the core cause of disease, and the qi of dampness evil enters from the mouth and nose, invades the lung, reduces the ability of the lung to propagate. According to TCM theory, the lung governs the waterway. When the waterway becomes blocked, body fluid is unable to disperse and it is formed into internal dampness and phlegm. These cold nature pathogens then coagulate the blood, hinder the meridian, causing not only the lung but also the spleen becomes dysfunction, leaving qi trapped inside and collapse. Moreover, "dampness toxin", together with cold, heat, stasis, and deficiency, is one of the pathogenesis.[9,10] In Western medicine, there is organ damage caused by the virus, leading to organ dysfunction or even organ failure. In light with TCM, there is a kind of aggressive invasion of the viscera, leading to blockage of the circulation of the meridians, and internal block and external collapse in the end.

Comparison of diagnoses of coronavirus disease 2019

Western medicine collects the samples of respiratory secretions to undergo nucleic acid detection to make a definite diagnosis. The severity of the disease is assessed by means of blood tests and imaging examinations of viscera. The disease is classified as being mild, common, severe, and critical.[11] Based on the diagnosis of Western medicine, TCM considers comprehensively the main symptoms and clinical manifestations to determine the severity of the disease. In the course of COVID-19, there are five stages of clinical

treatment for diagnosed cases, i.e. mild disease (cold-dampness stagnated in the lung and dampness-heat stagnated in the lung), moderate disease (dampness-toxin stagnated in the lung and cold-dampness obstructing the lung), severe disease (epidemic toxin blocking the lung and blazing of both qi and nutrient), critical disease (internal blockage and external collapse), and recovery stage (qi deficiency of the lung and spleen and deficiency of qi and yin).[9] Therefore, in the diagnosis, Western medicine relies on the detection of the virus, examination of the human body, and collection of laboratory data with which to make analysis and judgment. TCM makes analysis and judgment according to the external presentations of hostile invasion of the viscera.

Comparison of treatment approaches for coronavirus disease 2019

Western medicine believes that the root of the disease lies in the SARS-CoV-2 virus. Only by reducing or eliminating the virus from the body can we reduce the pulmonary inflammation, alleviate the damage to organ function and achieve the purpose of curing the patients of the disease. However, no specific drugs have been found to be fully effective against the virus, so we can only use some immune enhancers and non-specific antiviral drugs, such as hydroxychloroquine and Redsiever. Because of their lack of pertinence and limited curative effect, it is impossible to prevent some patients with mild symptoms from becoming severely ill, and then becoming critically ill. TCM is based on the theory of dampness toxin invading the lung, that as long as it can remove dampness and blood stasis, dispel pathogenic factors and toxins, dredge the veins, improve the lung and spleen functions, it can then achieve the purpose of curing the patients of the disease. The "three drugs and three prescriptions (三药三方)" recommended in the national "COVID-19 Treatment Plan", represented by the Lian Hua Qing Wen Capsule (莲花清瘟胶囊) and the Qing Fei Pai Du Decoction (清肺排毒汤), are effective TCM treatment schemes based on the etiology and pathogenesis of a cold-dampness epidemic toxin blocking the lung and trapping the spleen. TCM has achieved good clinical results in the Wuhan epidemic outbreak, preventing the symptoms of the vast majority of patients from progressing from mild to severe and from severe to critical.[12] It can be seen that, although Western medicine has a clear diagnosis and modern assessment methods, the overall effect is not ideal because there are no drugs that specifically eradicate the virus. Relying on its own unique theoretical system, TCM treats disease through syndrome differentiation by incorporating inspecting, listening, smelling, inquiring, and pulse-taking to determine treatment principles and methods, as well as prescriptions and drugs. It is because the treatment methods of resolving dampness, removing toxin and clearing the lung that the overall efficacy of TCM treatment is superior to the Western medicine for mild, moderate and severe cases.[13] It is worth pointing out that once the patient's condition becomes critical, that is, once they enter the state of internal blockage and external collapse, TCM is limited in the choice of drugs or treatment methods. Western medicine can rely on modern advanced medical technology, such as the use of ventilators, plasma exchange, hemodialysis, extracorporeal membrane oxygenation , lung transplantation, and etc.[14] Western medicine has obvious advantages to save the lives of such patients.

In addition, Western medicine has an irreplaceable advantage in the following areas: 1) Prevention and control of large-scale infections, 2) Determining the source of infection, 3) Blocking the transmission route, and 4) Protecting vulnerable populations. There are systematic and targeted prevention and control measures in Western medicine in response to public health emergencies, including quarantine, contact tracing and vaccination. TCM, with its theory of "treating disease before its onset", also has obvious advantages, especially in disease prevention. However, further exploration and study are warranted for effective participation of TCM in the prevention and treatment of public-health-emergency cases.

Chinese and Western medicine work together: 1 plus 1 is greater than 1

The medical system is different between Western medicine and Chinese medicine. However, in the fight against this epidemic, the two kinds of medical sciences share one goal. Each of them has its advantages, so they can work together to curtail the disease and play an equally important role in the triumph over the epidemic. Moreover, in the epidemic prevention and treatment, TCM has gradually become the main force.[15] The combination of TCM and Western medicine is a combination of traditional and modern technical methods against the disease, which is a unique Chinese experience. In clinical practice, they can play the role of 1 plus 1 becoming greater than 1 where TCM therapy is combined with Western medicine therapy to have a curative effect that is much greater than that of TCM or Western medicine alone.

TCM and Western medicine, although differing in theory and practice, have the same purpose. The combination of traditional Chinese and Western medicine, through their complementary advantages, maximizes the effect of traditional and modern medicine, improves the curative effect and can accelerate the rehabilitation of patients. It is the construction of a valuable Chinese programme for the shared future of humankind. Nowadays, there is still a serious global pandemic threat outside of China. We should collect clinical data about the TCM and Western medicine treatment of COVID-19 from all countries to establish a database, analyze, and evaluate the therapeutic effect objectively, and to summarize the experience and explore the advantages of integrated treatment. This will provide a treatment regimen with Chinese characteristics for the prevention and control of global pandemic.

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Conflicts of interest

There are no conflicts of interest.

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The Plant *Cynomorium* in Maltese Materia Medica

Charles Savona-Ventura
Centre for Traditional Chinese Medicine, University of Malta, Msida, Malta

Abstract

The search for possible effective local therapeutic agents led to the discovery of a plant that was later known as *Fungus Melitensis*. This parasitic flowering plant was initially believed to grow only on a small islet off Gozo known variably as General's or Fungus Rock. It is now known to be more widely distributed with a range extending from the Canary Islands to China. First mentioned in 1647 by the Maltese historian Gian Francesco Abela, the plant was later described and illustrated in 1674 by the Palermo botanist Paolo Boccone, while a detailed clinical treatise was prepared in 1689 by the Maltese physician Gio Francesco Bonamico. Based on the principles of the "doctrine of signatures," the plant was considered useful by virtue of its color in conditions involving bleeding, while on the basis of the phallic appearance, it was considered efficacious for venereal disease. The medicinal properties of the plant became renowned throughout the European continent, increasing the demand for its collection and export. Measures were introduced to limit the collection to authorized individuals while physical access to the islet was made more difficult by cutting away the sloping parts of the islet. The plant lost its medicinal reputation during the early decades of the 19th century and has now been relegated to the annals of medical history and folklore, though it is still designated a protected species.

Keywords: Maltese materia medica, Suo Yang (锁阳 Cynomorium coccineum), fungus melitensis, hemorrhage, dysentery, medical history

Introduction

The seventeenth-century prescription lists from the medieval period Santo Spirito Hospital at Rabat in Malta confirm that pharmaceutical practice during the Early Modern Period was very much in the mainstream of the Arabo-Hellenic medical tradition that flourished on the continent at the time. The *Materia Medica* lists available in Malta during this period show an overwhelming majority of vegetable source materials, many of which were available locally in the Maltese Islands, though some required importation from overseas, probably from the nearby Sicily. Substances derived from the animal and chemical kingdoms were also utilized but proportionately not equal to the extent of material derived from plants.[1,2] Throughout the ensuing centuries, very little improvement appears to have been made in the development of effective pharmaceuticals despite a continuous search for possible useful agents among the Maltese flora. Pharmaceutical practice at the end of the 18th century (1769) remained similar to that in the earlier centuries, though some of the previously listed items had been identified as useless and possibly harmful, while other medications identified to originate from foreign sources were introduced in the pharmaceutical armamentarium.[3] The continuous search for possible effective therapeutic agents in the Maltese Islands led to the realization in the 17th century that the plant Suo Yang (锁阳 *Cynomorium coccineum*) [Figure 1] was extant in the Maltese Islands – a plant that was reputed to have pharmaceutical properties. This was quickly incorporated into the Maltese pharmacopeia and exported to the European continent.

Biology

Suo Yang (锁阳 *Cynomorium coccineum*) was reputed to have medicinal properties by several medieval Islamic physicians including Ibn Masawayh (777–857 AD), Al-Kindi (800–870 AD), Al-Razi (865–925 AD), and Maimonides (1135–1204 AD), though it is not clear whether these and other authors were attributing medicinal properties to Suo Yang (锁阳 *Cynomorium coccineum*) or rather referring to another parasitic plant belonging to the *Orobanche* genus. In the 17th century, the

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Address for correspondence: Prof. Charles Savona-Ventura, Centre for Traditional Chinese Medicine, University of Malta, Msida, Malta.
E-mail: charles.savona-ventura@um.edu.mt

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botanist Paulo Boccone from Palermo described and illustrated this very plant in his major botanical work, naming the species as *Fungus Typhoides coccineus Melitensis* [Figure 2]. He observed that when this was cut into thin slices and exposed to sunlight, its color changed from white to red. In addition, when squashed, its juices were noted to be colored blood red. The flesh of the plant was said to be rather bitter and astringent to the tongue and mouth. It was considered to cause constipation.[4] In 1759, Carl Linnaeus designated the plant in the binomial system as Suo Yang (锁阳 *Cynomorium coccineum*). In his work, Linnaeus also included an earlier treatise on *Fungus melitensis* by Johannes Pfeiffer [Figure 3]. Here, the plant was said to be an excellent remedy for drying up ulcers, strengthening gums, and stopping uterine bleeding.[5]

The *Cynomoriaceae* family comprises only one species with two subspecies Suo Yang (锁阳 *Cynomorium coccineum*). subsp. *coccineum* and *C. coccineum* subsp. *songaricum* (Rupr.). The plant is an herbaceous, perennial, parasitic, nonphotosynthetic dark red-colored plant growing generally to a height of 10–40 cm. The plant grows in rocky or sandy soils in sub-desert areas, but in the Mediterranean region, it is often found in saline habitats in proximity to the coast. The plant consists of a rhizome that produces succulent cylindrical stems during the flowering stage. When cut open, the rhizome and plant yield a mucilaginous bitter tasting juice that turns to a brilliant red color. The rhizomes penetrate the roots of the host plant, establishing cellular and vascular connections. The plant itself does not perform photosynthesis but instead completely relies on nutrients from host plants belonging to various angiosperm families including *Asterales*, *Caryophyllales*, *Sapindales,* and *Zygophyllales*. It has been suggested that pollination takes place through the intervention of flies feeding on the pollen, while the seeds are dispersed after a rise in humidity breaks the pericarp.[6]

Originally deemed to have a rather restrictive distribution, the genus *Cynomorium* is now known to grow in a wide range extending right from the Canary Islands, through the Mediterranean and Irano-Turanian region, to the Mongolian deserts in West China. The subspecies *Coccineum* occurs in the western part of this distribution range from Spain to Afghanistan, while the subspecies *Songaricum* is found in the eastern part of the range from the Altay region to the Xinjiang region of China.[7] In the Maltese Islands, the plant, known to the locals as *gherq is-sinjur* or *gherq il-general,* is considered to be rare with a very restricted distribution. It was initially believed to grow only on a small islet off Gozo, known variably as the General's or Fungus Rock [Figure 4], but it has now been proved to grow in a number of costal localities.[8]

Traditional Use in Malta

This plant was first mentioned in 1647 by the Maltese historian Gian Francisco Abela who wrote that, "on the small islet off the island of Gozo known as General's Rock, there grew a plant which when dried and ground into powder and prepared as a drink was used to mange dysentery."[9] In 1689, the plant was subsequently described by the Maltese physician Gio Francesco Bonamico who reported that this "plant cannot be

Figure 1: Suo Yang (锁阳 *Cynomorium coccineum*). flowering plant stem

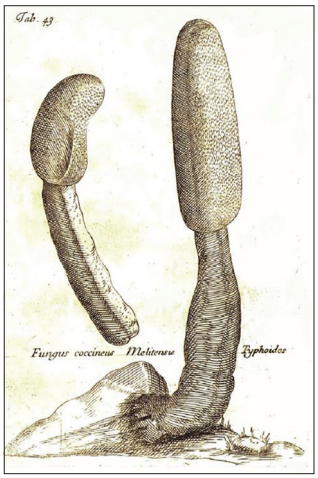

Figure 2: Fungus *Typhoides coccineus Melitensis* as depicted by Boccone P. (1674)

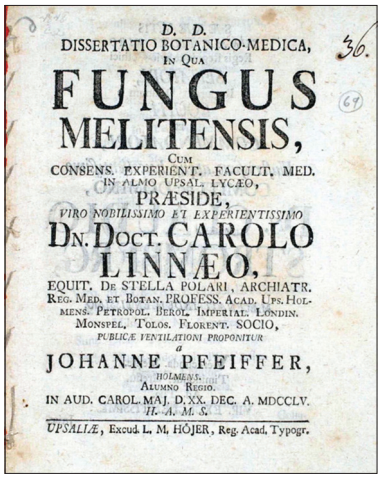
D. D.
DISSERTATIO BOTANICO-MEDICA,
IN QUA
FUNGUS
MELITENSIS,
CUM
CONSENS. EXPERIENT. FACULT. MED.
IN ALMO UPSAL. LYCÆO,
PRÆSIDE,
VIRO NOBILISSIMO ET EXPERIENTISSIMO
DN. DOCT. CAROLO
LINNÆO,
EQUIT. DE STELLA POLARI, ARCHIATR.
REG. MED. ET BOTAN. PROFESS. ACAD. UPS. HOL-
MENS. PETROPOL. BEROL. IMPERIAL. LONDIN.
MONSPEL. TOLOS. FLORENT. SOCIO,
PUBLICÆ VENTILATIONI PROPONITUR
a
JOHANNE PFEIFFER,
HOLMENS.
ALUMNO REGIO.
IN AUD. CAROL. MAJ. D. XX. DEC. A. MDCCLV.
H. A. M. S.
UPSALIÆ, Excud. L. M. HÖJER, Reg. Acad. Typogr.

Figure 3: Thesis title page by Johannes Pfeiffer (1755)

Figure 4: 18th-century watercolor painting (unknown artist) showing Fungus Rock and the cable car system for access

found in any other European or Asian country at least according to the research conducted up to the present day because none of the then great botanists that have sailed around the countries of these two continents and have written volumes on every plant they had seen growing there, ever said that they had found a plant like this. Pietro Castello too, a great scholar of medicine and also a great botanist from the University of Messina, when receiving this plant probably from a Maltese physician, confessed that he had never seen one like it or known that it grew only on our rock." He believed that its use as a medicine in Malta dated to the time of the Phoenicians. He further attributed its medicinal properties stating that "It is said that by this fungus sick people are cured of their illnesses faster than by any other medicine." The plant was prepared by an oven baked in a well-sealed earthenware vessel. It was then powdered and administered with honey or as a wine infusion. It was allegedly useful for apoplexy and dysentery. The plant extract was noted to stain the skin and could also be used to dye cloth.[10]

Basing the rationale of the therapeutic properties of this plant on the principles of the "doctrine of signatures" whereby the characteristics and appearance of the plant were linked to a particular medical condition, the plant was considered useful by virtue of its color in conditions involving blood and bleeding. In his review of the literature relating to the plant, the histographer Giovanni Pietro Agius de Soldanis in 1746 commented that "previous authors maintained that the plant extract was useful in the management of dysentery, bloody evacuations, and every hemorrhage in the chest". It was also deemed to be useful in treating the gums, hematemesis, and for drying wounds. The plant was administered as a half-gram or more fine dry powder mixed in wine, broth, or any other liquid. Alternatively, an ounce of the plant could be mixed with citrus jam or preserve or any other astringent substance. The dose could be repeated until recovery from the disorder. It was considered very efficacious, and any failure was considered to be a certain indication that the plant used was not the genuine item. It was considered much more efficacious in the management of dysentery than the American anti-dysenteric, named the *epiquecana*. The plant was also used to control traumatic and surgical bleeding, and was also considered useful for the management of venereal disease.[11] Bonamico reported that, according to an elderly medical physician working in Gozo, the plant was used to subdue gonorrhea and "feminine flows," and that women had superstitiously adopted the habit of hanging the plant between the breasts to improve fertility and guarantee future happiness.[10] The association to venereal and gynecological disease was probably contributed to it by the phallic appearance of the plant.

Named *fungus melitensis*, the plant gained increasing popularity in Europe and started been exported overseas. It was considered so efficacious that several grand masters of the Hospitaller Order of Saint John, then ruling the Maltese Islands, sent gift samples to various kings, nobles, relatives, and other personages in Europe. The increasing demand for this restricted plant led to the concern on its possible extinction. Collection was therefore controlled through legislation that restricted the plant collection to individuals appointed by the reigning grand master. Transgressors of this legislation were condemned to serve as rowers in the Order's galleys for a number of years.[12] The legislation alone was insufficient in serving as a deterrent to illicit collection of the plant. In 1744, the reigning grand master gave instructions to remove the sloping sides of the islet that led to the sea. This created a cliff, making access to the rock difficult. In addition, watchmen were employed to guard the rock.[13] A cable-pulley system was set up to facilitate access to authorized individuals. This cable-pulley system was described by Jean Houel in 1785:

> "To the summit of one part of the cliffs are attached two very strong cables, which, at their extremity reach the outcrop where they are also secured; from these cables hangs a large box …., similar to the tubs in which orange trees are planted. The cables pass through pulleys attached to the four upper corners of the box, which can hold one or two men; by pulling on a third, less taut, cable, the men cause the pulleys to roll on the other cables and move the box forward; thus they can easily pass from the shore to the islet or vice versa."[14]

The civil disorder of the French interlude after the expulsion of the Order of Saint John from the islands in 1798 led to a slackening of guarding the rock. With the resumption of the civil order in 1800, the Civil Commissioner appointed to be responsible for the Maltese Islands witnessed the need to issue a specific proclamation to remind the residents that the collection of the *fungus melitensis* was still prohibited and that collection was only allowed by government-authorized individuals.[15]

During the early decades of the 19th century, this plant retained its medicinal reputation, but during 1821–1824, the plant was reported to have "lost its high repute, and is at present very little called for."[16] The cable-pulley system remained

in place but apparently sometime in 1842–1842, "the cables of this novel aerial conveyance gave way and precipitated the passenger into the gulf below."[17] The cable-pulley system has never been replaced since. This plant has now both been relegated to the annals of Maltese medical history and folklore. Due to its rarity and restricted distribution on the islands, in 1992–1993 the plant was legally designated to be a protected species and the General's Rock was declared to be a Nature Reserve.

In China, this plant is known as *suoyang* meaning "locking the yang" and is supposedly used to tonify the yang, nourish the blood, alleviate old age related blood deficiency type of constipation, strengthen the tendons to lessen backache, and treat impotence. The plant extract is mentioned by Zhu Danxi (朱丹溪) in the 14th century (the Yuan dynasty) work *Ben Cao Yan Yi Bu Yi* (《本草衍义补遗》*Supplement to the Amplification on Materia Medica*) as a management for impotence and weakness of the lower limbs which were to be caused by heat or damp-heat damaging the yin. The formulae, known as Huqian Pill (虎潜丸), is made from a composite of plants including Huang Bai (黄柏 *Phellodendron amurense*) and Zhi Mu (知母 *Anemarrhena asphodeloides*) which are used to harden the yin and clear heat source, thus to clean the flow; Cang Zhu (苍术 *Rhizoma Atractylodis*) and Yi Yi Ren (薏苡仁 *Semen Coicis*) to dispel dampness; Rou Cong Rong (肉苁蓉 *Herba Cistanches*), Suo Yang (锁阳 *Cynomorium*), and Chuan Niu Xi (川牛膝 *Radix Cyathulae*) with tiger's bone to strengthen the sinews and bones; Shao Yao (芍药 *Paeonia*) and Mu Gua (木瓜 *Fructus Chaenomelis*) to emolliate the sinews and relax tension; and Shu Di Huang (熟地黄 *Radix Rehmanniae Preparata*) and tortoise shells to enrich yin and boost the marrow. In this way, damp heat is discharged and transformed away, yin essence is subdued and astringed, the sinews are hardened and strengthened, and finally the feet are then able to walk.[18]

Pharmacological Effects

The phytochemistry of *Cynomorium* has confirmed that the plant has more than forty different secondary metabolites including gallic acid which has the capacity to cross-link and denature proteins and serve as an antioxidant. Gallic acid was frequently used in the past few centuries as a component of styptic and anti-diarrheal remedies. It was reportedly useful in managing uterine bleeding disorders, other hemorrhages, fluxes, and for "checking the night sweats in phthisis."[19] Pharmacognostic studies have suggested that the water-soluble extract has blood pressure-reducing properties when tested on dogs. This physiological effect may have contributed further in reducing bleeding.[20] The presence of phenolic hydroxyl groups, tannins, and tannic acids can interact with protein structures to form a precipitate on mucous membranes, which acts as a protective layer. In the intestinal tract, this protective layer serves to attenuate bowel motility, thus reducing peristalsis, contributing to decreased bowel movement, an effect that can be exploited in diarrheal conditions.[21] Extracts have also demonstrated a growth inhibitory effect on melanoma and malignant colon cells.[22] The water-soluble extract of *Cynomorium* appears to further have a direct spermatogenic influence in immature female rats, possibly through hormonal influences. The extract was shown to reduce gonadotropin and testosterone levels. In immature rats, the extract caused a profound folliculogenesis of the ovaries.[23,24]

The widespread traditional use of this plant species throughout the range of its distribution, together with the growing phytochemistry and pharmacognostic evidence, suggests that this species is very likely to have useful pharmacological effects that merit further investigations.

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Conflicts of interest

There are no conflicts of interest.

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The Records of Anatomy in Ancient China

Shuijin Shao, Haidong Guo, Fangfang Mou, Chunxia Guo, Lisheng Zhang

Department of Anatomy, College of Basic Medicine, Shanghai University of Traditional Chinese Medicine, Shanghai, China

Abstract

Through long-term observations and repeated practices of human body structure, anatomical knowledge in ancient China has gradually developed from the sprouting period when ancient Chinese hunted animals for survival, to anatomical exploration, which breaks the shackles of fear and religious rites. For example, Hua Tuo (华佗), a famous doctor in the period of The Three Kingdoms, did exquisite abdominal surgery; Yan Luozi (烟萝子), a Taoist priest in the period of The Five Dynasties, drew a map of human anatomy; Wang Weiyi (王唯一), a medical official in Northern Song dynasty, was responsible for casting acupuncture bronze figures, an anatomical mold for practicing acupuncture; Song Ci (宋慈), a forensic expert in Southern Song Dynasty, wrote *Xi Yuan Ji Lu* (《洗冤集录》*Collected Cases of Injustice Rectified*); Wang Qingren (王清任), a physician in Qing Dynasty wrote *Yi Lin Gai Cuo* (《医林改错》*Correction on Errors in Medical Works*). Ancient Chinese anatomy is far ahead of Western anatomy in understanding and describing human body structures. It has made great contributions to the emergence of *Huang Di Nei Jing* (《黄帝内经》*Huangdi's Internal Classic*) and laid a solid foundation for the establishment of visceral manifestation theory and meridian and collateral theory. Even now, it has served the basic theory of traditional Chinese medicine and clinical practices. Anatomical knowledges, such as relevant operation records, books, Atlas, models in ancient China, especially the names of Zang-organ and Fu-organ, bones and five sense organs, are still used in modern anatomy and modern medicine, making indelible contributions to the development of modern anatomy in China.

Keywords: Anatomy, Song Ci (宋慈), *Xi Yuan Ji Lu* (《洗冤集录》*Collected Cases of Injustice Rectified*), traditional Chinese medicine, *Yi Lin Gai Cuo* (《医林改错》*Correction on Errors in Medical Works*), Wang Qing Ren (王清任), Hua Tuo (华佗)

Introduction

Throughout the long history of China, we Chinese tried hard to search for the clues of anatomy and to summarize its formation and development as a discipline. The anatomy development has witnessed the anatomical germination in ancient times when people hunted animals, the exploration of human anatomy which needs to overcome fears and religious rites, and the medical anatomy for diagnosis and treatment. And this development has been closely linked to and mutually influenced by the living environment, politics, economy, social culture, and medical mainstream.

From Ancient Times to the Western Zhou Dynasty

Anatomical origin of prehistoric culture

The prehistoric culture is archaeologically divided into the Paleolithic Age and the Neolithic age. In the former case, man's main social activity was hunting for food. Hunters rounded up animals and slaughtered them to cut out those parts which could be used for food and the other parts which could be used for sacrifice. Archeologists have found wild ox patterns on the murals in the primitive cave with an outstanding mark at its heart, which suggests that people at that time had already recognized the importance of this organ in hunting, and marked its anatomical location for practice and inheritance. Therefore, they could aim at the heart and kill the preys with one shot. In the Neolithic age, the body of animals was cut open by people with stone knives and axes in daily lives, or the broken limbs, belly sliced open and entrails removed after wars between tribes all helped people at that time to have a preliminary understanding of the internal structure of animals and human bodies. According to *Li Ji* "Ming Tang Wei" (《礼记·明堂

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Address for correspondence: Prof. Lisheng Zhang, Department of Anatomy, College of Basic Medicine, Shanghai University of Traditional Chinese Medicine, Shanghai, China.
E-mail: zlisheng@sina.com

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位》*The Book of Rites* "The Position of Ming Tang"), You Yu Shi (有虞氏a tribe in ancient China) takes the head as sacrifice; emperors in the Xia dynasty take the heart; those in the Shang dynasty take the liver and emperors in the Zhou dynasty take the lung. *Li Ji* "Ji Yi" (《礼记·祭义》 *The Book of Rites* "Significance of Sacrifice") describes the process of killing cows for sacrificing. When the sacrificial ceremony was held, the monarch led a cow with his sons standing opposite to him to assist him and his subordinate officials following him. After entering into the temple, the monarch ties the cow to a stele in the court and one official exposes his left arm and kills the cow. Taking the hair from the ear, which is the best, the official cuts through the cow with Luan knife, takes the fat between blood and intestines out for the sacrifice and then leaves. Therefore, it can be inferred that the anatomy in China begins with the anatomy of animals in the ancient times.

Anatomical terms found in oracle bone inscriptions

During the period of the Shang dynasty, hunting, sacrifice and war were common. Slaughtering animals laid a foundation for ancient Chinese to understand the structure of human body, while the anatomy of slaves and prisoners of war deepened that understanding and people began to describe the shape and the structure of human body in words. This is the time when human perception of anatomy deepened.

Oracle bone inscriptions, the earliest Chinese characters, recorded[1] a series of human anatomical results like head, face, nose, ears, mouth, tongue, teeth, neck, abdomen, breasts, shoulder, arm, elbow, hand, fingers, hip, knee, leg, toes, foot, etc., as well as external tissues like beard, mustache, sideburns, hair, etc., and the internal structures like heart, bones, blood, spine. These bone inscriptions also pictured the physiological functions of eyes, ears, mouth, nose, tongue, hand, and foot. These anatomical terms indicate that anatomical knowledge was available in primitive China. In addition, early anatomy was closely related to medicine. Among all oracle bone inscriptions found in the Yin ruins, 323 pieces of bones have recorded 34 diseases pertaining to such body organs as the head, the eyes, the ears, the nose, the teeth, the abdomen, and the heart.

The ancestor of anatomy----Yu Fu

Yu Fu (俞跗), a physician in ancient times, is said to excel in surgeries. Sima Qian (司马迁) pointed out in his book *Shi Ji* "Bian Que Cang Gong Lie Zhuan" (《史记·扁鹊仓公列传》 *Historical Records* "Biography of Bian Que and Chunyu Yi") that there was once a physician named Yu Fu who could treat diseases without using decoction, herbal wine, acupuncture, stone needle, Dao Yin (导引), massage or hot medicinal compress. He knew where the disease was after undressing the patient's clothes and observing the naked body. To treat the patient, he cut through the skin and then the muscles at the Shu-points. After dredging meridians, ligating tendons and massaging brain marrows, relieving Gao Huang (a part between heart and diaphragm), washing intestines, stomach, and five zang-organs, the essence and qi was restored, and the patient began to feel much better immediately. The process is basically in line with the procedure of modern abdominal surgery, suggesting that anatomy before the Han dynasty had developed into a sophisticated level.

Seven orifices found in heart

Zhou (纣), the last sovereign of the Shang dynasty, was notorious for his extreme debauchery and cruelty. His uncle Bi Gan (比干), master of the prince, was loyal and righteous. Bi Gan dissuaded Zhou repeatedly, until eventually Zhou killed Bi Gan and removed his heart to confirm whether Bi Gan had a heart with seven orifices like other sages. The story was recorded in *Shi Ji* "Yin Ben Ji Di San" (《史记·殷本纪第三》 *Historical Records* "The History of the Shang Dynasty").

From the Spring and Autumn Period and Warring States Period to Qin and Han Dynasties

Huang Di Nei Jing (《黄帝内经》 *Huangdi's Internal Classic*)----the pioneer of anatomy in Traditional Chinese Medicine

Huang Di Nei Jing (《黄帝内经》 *Huangdi's Internal Classic*) is the first classic on the theory of Traditional Chinese Medicine (TCM) as what it exists today. As a cornerstone of TCM anatomy, it describes surface anatomy, osteology, bone-length measurement, splanchnology, otorhinolaryngology, meridian and collateral theory in detailed length, weight, volume and capacity. The terms in the book like viscera, bone, five sense organs, are still used in modern anatomy and medicine. Even the term of Jie Pou (解剖 anatomy) is first recorded in this book. It says that there are two ways to study the human body structure and its parts. Externally, we can measure it; internally, we can observe it after we dissect it.

Anatomy in *Nan Jing* (《难经》 *Classic of Difficult Issues*)

In terms of anatomy, Nan Jing (《难经》 *Classic of Difficult Issues*) is complementary to *Huang Di Nei Jing*, as it has a more comprehensive understanding of the shape, size and weight of five zang-organs. For example, *Nan Jing* "Si Shi Er Nan" (《难经·四十二难》 *Classic of Difficult Issues* "the Forty-second Issue") recorded that heart weighs twelve *liang* (a unit of weight) with seven orifices and three *mao* (毛) and can contain three *he* (a unit of capacity) of essential liquid. Seven orifices include four chambers of the heart, aortic orifice, pulmonary orifice, superior and inferior vana cava. Three *mao* indicate papillary muscle and chordae tendinae between valves. Three *he* of essential liquid refers to the blood capacity of four chambers. *Nan Jing* "San Shi San Nan" (《难经·三十三难》 *Classic of Difficult Issues* "the Thirty-third Issue") also said that lungs can float on water, which is derived from anatomical observation on the weight of lungs. *Classic of Difficult* "the Forty-second Issue" also recorded that there are two kidneys and each weighs one *jin* (a unit of weight) and one *liang*, suggesting that kidneys are paired organs and its weight is recorded.

Contributions made by medical books unearthed at Mawangdui on anatomy

Medical books unearthed at Mawangdui Tomb of Han Dynasty also mentioned the names of viscera.[2] For example, in *Wu Shi Er Bing Fang* (《五十二病方》*Prescriptions for Fifty-two Diseases*), the character of heart appears in the 47th and 48th clauses, while the character of kidneys (actually refers to scrotum and testis) present in the 140th, 143rd and 164th clauses. The character of liver appears in the 34th clause of *Yang Sheng Fang* (《养生方》*Prescriptions for Life Cultivation*) and the 8th clause of *Za Liao Fang* (《杂疗方》*Prescriptions of Miscellaneous Treatments*). Medical books with the richest anatomical records are *Zu Bi Shi Yi Mai Jiu Jing* (《足臂十一脉灸经》*Moxibustion Classic on Eleven Meridians along Arms and Legs*) and *Yin Yang Shi Yi Mai Jiu Jing* (《阴阳十一脉灸经》*Moxibustion Classic on Eleven Meridians of Yin and Yang*). Both books contain numerous anatomical terms and many parts on the body surface are named to demonstrate the course of meridians.

From Wei and Jin Dynasties to Sui Tang and the Five Dynasties

Hua Tuo (华佗), a famous doctor with a good command of anatomy

San Guo Zhi (《三国志》*The History of the Three Kingdoms*) by Chen Shou (陈寿) depicts that if the internal disease cannot be treated by acupuncture or herbal medicine, the part which is sick needs to be removed. At this time, Hua Tuo often prescribes Ma Fei San (麻沸散 Anesthetic Powder) for the patient. After the patient loses the awareness and sensation, the cutting and removing of the sick parts can be performed. If intestines are diseased, remove the sick part and cleanse the rest. After stitching the abdomen, the doctor needs to apply some cream and massage the wound. 4 or 5 days later, the patient will recover. And a month later, the wound will heal. The book describes the superb abdominal surgical skills of Hua Tuo, indicating that there is no way by Hua Tuo to remove intestines without a good command of anatomical knowledge on human abdomens.

Zhang Xiugu (张秀姑), a civilian anatomy performer

Nan Shi "Gu Ji Zhi Zhuan" (《南史·顾觊之传》*History of the Southern Dynasties* "Biography of Gu Ji") recorded that Tang Ci (唐赐), a man living in Xiang county, Pei prefecture, went to Peng's residence which was next to his village to have dinner. However, Tang got sick and vomited dozens of worms after he returned home. He asked his wife Zhang Xiugu to dissect him to find the cause when he was dying. After he passed away, his wife followed his last words. She cut open his abdomen and dissected all his viscera. However, the local official considered Zhang immoral and a criminal as she dissected her husband and his son Tang Fu (唐副) unfilial as he didn't stop his mother. According to the law at that time, a wife injuring her husband would be sentenced to 5-year imprisonment and an unfilial son could be sentenced to death. However, the case wasn't in full accordance with the law. This is the first record of autopsy in China and it takes the lead in human pathoanatomy. It was not until 800 years later in 1302 that Bartolomeo da Varignana, the famous anatomist in Europe did the first autopsy on a man who was poisoned to death in Bologna.

Nei Jing Tu (《内境图》*Illustrations of Inner Body*), the first human anatomy map

Six human anatomical maps drawn by Yan Luozi (烟萝子) were collected in the 18th volume of *Xiu Zhen Shi Shu* "Za Zhu Jie Jing" (《修真十书·杂著捷径》*Ten Chapters of Taoist Internal Alchemy* "Za Zhu Jie Jing"). Among the six maps, *Yan Luo Zi Shou Bu Tu* (烟萝子首部图 *The Anatomical Drawings of Head by Yan Luozi*) and *Yan Luo Zi Chao Zhen Tu* (烟萝子朝真图 *The Map of Meditation by Yan Luozi*) illustrated nine palaces in head and the spirit in brain, suggesting that brain plays an essential role in Taoist life cultivation. The drawings in the left and right side view showed that there were 24 vertebrae, and the tube along the inner side of the spinal cord was the spinal canal. The dark crescent in the center was diaphragm, and the liver and gallbladder were located above the diaphragm. The drawings in the front and back view [Figures 1 and 2] were anatomical illustrations. On the one in the front view, there were two holes in the throat. One was the esophagus and the other one was trachea. There were four lobes of lungs that were located above the heart, and the stomach was below the heart and located centrally below the lungs. The stomach was located below the heart with its cardia on the left and pylorus on the lower left. The liver was on the upper left with gallbladder on its lower side, while spleen was on the upper right. In the abdomen, there were small intestines, large intestines, bladder, and other organs. The drawing in the back view accurately illustrated that kidneys were on the left side and Ming Men (命门) were on the right side.[3] Compared with modern anatomy, the biggest error in the book was that the liver was located on the left side, spleen on the right side, and liver and gallbladder above the diaphragm. Even so, *Illustrations of Inner Body* is still the earliest anatomical drawing in China and even so in the whole world. It is the first attempt to draw

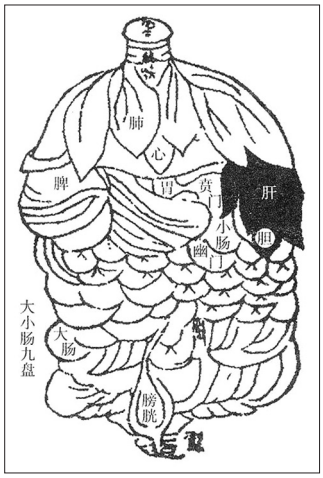

Figure 1: Front view of inner body

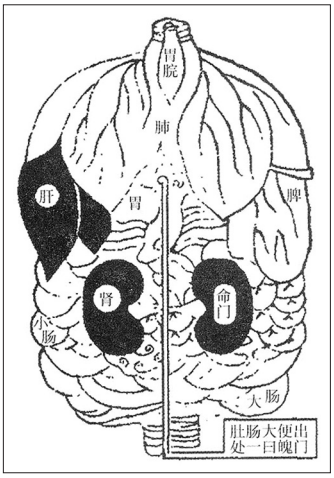

Figure 2: Back view of inner body

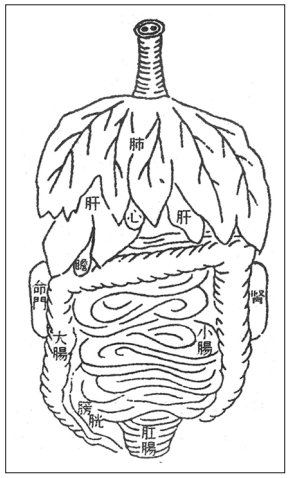

Figure 3: Ou Xifan's *Anatomical Illustrations*

anatomical drawing and the end of the anatomical era of "talking without drawings" five generations before it.

From Song, Liao, Jin and Yuan Dynasties to Ming and Qing Dynasties

Ou Xi Fan Wu Zang Tu (《欧希范五脏图》*Ou Xifan's Anatomical Illustrations*), the first human anatomical atlas

In Northern Song dynasty, Ou Xifan (欧希范) and his 55 subordinates revolted in Yi Zhou, Guang Xi. Being deceived by Du Qi (杜杞), they were executed immediately after surrender. Wu Jian (吴简), the official in Yi Zhou, ordered a doctor to dissect the corpses of 56 surrenderors and remove their kidneys and intestines. Meanwhile, he recorded the body structure and asked a painter to illustrate them according to the dissection.[4] The illustration was named *Ou Xifan's Anatomical Illustrations* [Figure 3]. According to the records, Wu Jian described the location of viscera and the relation between each other accurately. For example, he noticed that the right kidney was slightly inferior to the left one, which is a remarkable finding. He also confirmed that spleen is located under the left side of the heart, which corrects the error of the liver in the left and spleen in the right as was recorded in *Huangdi's Internal Classic*. In addition, he noticed some pathological signs. For example, a man who coughs a lot gets dark lungs and gallbladder; a man who has eye diseases in his younger days gets white spots on the liver. This is a massive anatomical activity in history, and the book is the first human anatomy illustration.

Zhen Jiu Tong Ren (《针灸铜人》*Acupuncture Bronze Figure*), the first human anatomical mould for practicing acupuncture

Wang Weiyi (王唯一), a medical official in the Northern Song dynasty, was ordered to revise acupuncture books and to design and cast two human-sized bronze figures for teaching acupuncture. Wang Weiyi wrote a new book named *Tong Ren Shu Xue Zhen Jiu Tu Jing* (《铜人腧穴针灸图经》*Illustrated Manual of Acupuncture Points of the Bronze Figure*). The bronze figure is an imitation of the real human body of a young male, who is naked and upright. The limbs and internal viscera are detachable. On the body surface, 354 points are inscribed with their names written beside in golden. All these points are sealed with wax and the figure is filled with water. If a point is selected correctly, water will flow out after insertion. If not, a needle cannot be inserted. According to Emperor Renzong's order, one figure is placed in the imperial palace for appreciation; the other is sent to Imperial Medical College as a teaching and examining aid. The design and cast of the bronze figure is a major creation in medical history. As the earliest human anatomy mold and a teaching aid for acupuncture, two bronze figures are of great significance in history.

Cun Zhen Tu (《存真图》*Anatomical Atlas of Truth*) by Yang Jie (杨介)

Yang Jie (杨介), a doctor in the Northern Song dynasty, drew *Anatomical Atlas of Truth* according to the autopsy of prisoners who were executed in Si Zhou. The illustration is extremely exquisite and in great detail. It includes drawings of thoracoabdominal anatomy in the front, the back and the lateral view [Figures 4-6]. Besides, there are detailed drawings of each part and each system.[5] The location and shape of internal organs drawn by Yang are basically consistent with the real conditions. In addition, blood vessels, digestive, urinary, and reproductive systems are also drawn into pictures. All illustrations have explanatory notes attached to them. Therefore, Atlas is of great value in history. Human anatomy is rare in Europe before the 16th century. Ou Xi Fan Wu Zang Tu and Cun Zhen Tu marked the advanced anatomical level of China, which was ahead of the other civilizations in the world before the 11th century.

Xi Yuan Ji Lu (《洗冤集录》*Collected Cases of Injustice Rectified*), the first forensic monograph

Song Ci (宋慈), a forensic scientist in the southern song dynasty, was honored as the founder of forensic medicine and compiled *Collected Cases of Injustice Rectified*.[6] This book is a summary of the long-accumulated knowledge of pathology, anatomy, and pharmacology in ancient times, as well as a

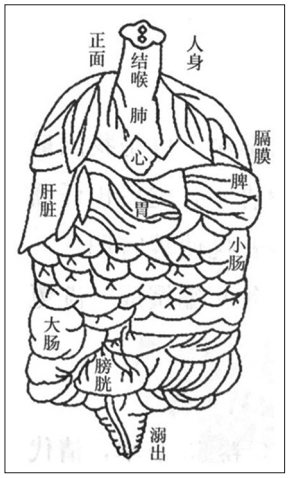

Figure 4: Front view of viscera

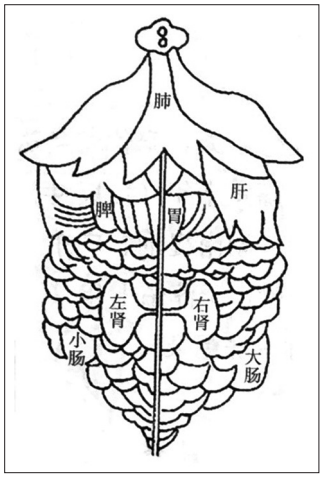

Figure 5: Back view of viscera

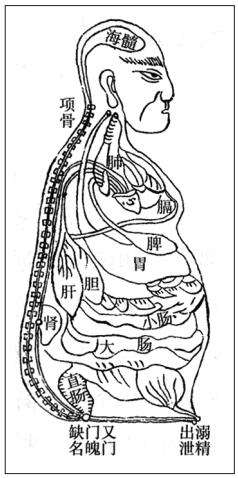

Figure 6: Right side view of viscera

collection of forensic knowledge and experience by the feudal government before the Song dynasty. Therefore, hailed as the world's first systematic treatise on forensic medicine, the book was widespread and was translated into Japanese, Korean, English, German, French, Dutch, and other languages. It covers almost all branches of modern forensic medicine, such as internal medicine, surgery, gynecology, pediatrics, orthopedics, anatomy, pathology, first aid, etc. Therefore, this book is of great value. What it mainly contributes to in anatomy are anatomical terms and maps of the human body and osteological knowledge applied in the bone examination.

Yi Lin Gai Cuo (《医林改错》*Correction of Errors in Medical Classics*), the first anatomy monograph

When it comes to the great figures in China's anatomy history, Wang Qingren (王清任), a physician in Qing dynasty, mustn't be missed. He is believed to be an innovative anatomist in the history of Chinese anatomy. In 1797, an epidemic broke out in what is now Hebei Province. He studied and observed dozens of child corpses at the risk of being contaminated. With the field anatomy, he gained a lot in human body structure. In 1830, Wang Qingren drew a map of Zang-Fu organs and corrected the mistakes made by his predecessors. Combined with his clinical experience, he wrote *Correction of Errors in Medical Classics*.

The book[7] recorded many vital organs that have never been mentioned in previous medical books, such as the aorta (referred to as *wei zong guan* by Wang 卫总管), the superior and inferior vena cava (*rong zong guan* 荣总管), common carotid artery (the left and the right *qi guan* 气管), ureter (*long guan* 珑管), great omentum (*qi fu* 气府), pyloric sphincter (*zhe shi* 遮食), common hepatic duct, common bile duct (*jin guan* 津管); pancreas (*zong ti* 总提), etc. In addition, the difference between arteries and veins is clarified in the theory of combining qi and blood. These descriptions are of little difference from those the modern anatomy.

The book also pointed out that thinking and memory depend on brain. Besides, it showed the relationship between the spinal cord, cranial nerve and the brain in anatomy and functions, especially that between the brain and organs of special senses, cranial nerve I, II and VIII. Wang also divides brain diseases into functional disorders and organic lesions. Due to the limitations of historical conditions, there are inevitably some mistakes in the book, but the splendor still outweighs the flaws.

Through anatomical records in ancient China, we can see that its understanding and description of human body structure is far ahead of the Western anatomy. Anatomical knowledges, such as relevant operation records, books, Atlas, models in ancient China, especially the names of Zang-organ and Fu-organ, bones and five sense organs, are still used in modern anatomy and modern medicine, making indelible contributions to the development of modern anatomy in China. In the long feudal era, Confucianism, feudal ethics, and the feudal system have seriously hindered the development of anatomy. Another reason for its slow development is related to the methodology of a simple system followed by TCM theory. The methodology, discovered by ancient physicians in their

long exploration, is another way conducive to developing TCM. Such methodologies are namely taking analogies and knowing the inside by appearances, which are first elaborated in *Huang Di Nei Jing*. The concept of holism, the theory of Yin and Yang, and the five elements theory greatly enriched and developed the basic theory of TCM, which greatly reduced the dependence of TCM on anatomy. It has to be admitted that ancient physicians are stubbornly conservative and they pursue the concept of analyzing but not doing. Most of their anatomical activities were to verify the theory of predecessors, and the study was terminated as soon as they reached the goal. In addition, ancient Chinese intellectuals attached more importance to *dao* (道 metaphysics) than *qi* (器 physics), so they considered technical activities as the work of ordinary craftsmen, and in doing so they often ignored or even despised practical operations, which made ancient physicians shy away from anatomy. In addition, sectarian bias, complacency, and conservative thoughts among different medical schools also impede the development of anatomy.[8] As time went on, people began to acquire a thorougher and deeper understanding of anatomy, which makes people's understanding on the law of human life activities clearer and more scientific and the TCM theory has thus become more perfect. It is believed that with the further study of anatomy in TCM, we Chinese people will make greater contribution to human health.

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Conflicts of interest

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Qi, Return to Bodily Experience: A New Perspective of Qi and Qigong Experience Research

Xinzhe Huang
Graduate School of International Relations, Ritsumeikan University, Kyoto, Japan

Abstract

For a long period, Qi and Qigong experience were studied within the theoretical framework of natural science, psychology, and TCM. This article reviews the modes and problems of Qi and Qigong researches, discusses the theoretical basis of phenomenological researches in anthropology, exemplifies some important researches and ideas about bodily experience. Furthermore, the possibility and difficulty of utilizing these methodologies and ideas are analyzed out as well. Aims to open up a brand-new horizon of Qi and Qigong research, enriches our understandings of the culture of Qi and Qigong, and makes Qigong better adapt itself to the contemporary and the world.

Keywords: Body, embodiment, phenomenology, Qi, Qigong experience

Introduction

Qi is the essence of Chinese medicine, the soul of traditional health, and the core concept of oriental views of body and universe, which has lasted for thousands of years. Before the natural science and western philosophical epistemology traveled to the Eastern world, the Qi was self-explanatory inside the traditional Chinese thought, however, now it has become a research object of scholars either in East or West, across various fields and disciplines.

Qigong, which is born through the body's participation of the cultivation of Qi, is undoubtedly the most direct way to understand the culture of Qi. However, there is still a lot of controversy in the long-term research on the grasp of the essence of Qi. Researches on Qi and Qigong experience often objectively depend on various natural scientific experiments, the individual bodily experiences are always described and reduced as figures and images by laboratory apparatus and statistical analyses. Yet, the particularity and indeterminacy of individual experience are often much less dealt with. This article aims to review the insights of body philosophy and anthropological research on bodily experience and discuss how to apply it to the grasp of Qi and the Qigong experience, thereby opening up a new horizon to Qi and Qigong research.

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Research Models and Problems of Qi and Qigong

In the 1950s, when Liu[1] explicitly put forward the concept of Qigong, the research on the clinical efficacy of Qigong and the theoretical research of Qi and Qigong within the discipline of traditional Chinese medicine had started in China. Now, research on the causal relationship between practicing Qigong and the therapeutic effects of some diseases, especially chronic diseases, has attracted the attention of scientists and clinical researchers not only in China but also in the world. Especially in Japan and the United States, a considerable amount of research has been conducted to make clear the effect of Qigong and the essence of Qi. However, unlike the double-blind experiments and random samples taken by the research of drug efficacy, the mechanism of clinical effect brought by Qigong can be always concluded as a placebo effect, self-suggestion, or the trance state in the context of modern western psychology. This makes the understanding of the meaning and efficacy of Qi and Qigong very limited because no matter whether it is a placebo, a self-suggestion, or a trance, such interpretations put the effect of Qi and Qigong into a "black box" that cannot be expanded.

Address for correspondence: Dr. Xinzhe Huang, Graduate School of International Relations, Ritsumeikan University, Kyoto, Japan.
E-mail: hermeskid@hotmail.com

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In other words, what makes placebos, self-suggestions, and trance that come from Qigong practice produce a therapeutic effect? Such a question still cannot be exhaustively answered. On the other hand, the theories of traditional Chinese medicine and philosophy can explain the mechanism of Qi and Qigong quite well. For instance, Shen and his colleagues[2] emphasized the relevance of bodily movement and Qi, they discussed the "essential Qi" through detailed literature review and text analysis of "Dao Yin" in the context of several important antiquity TCM literature such as *Huang Di Nei Jing* (《黄帝内经》 *Yellow Emperor's Internal Classic*), *Zhu Bing Yuan Hou Lun* (《诸病源候论》*Treatise on the Pathogenesis and Manifestations of All Diseases*) as well as some famous books of ancient Chinese philosophy. Balaneskovic[3] analyzed the logic behind a specific Qigong named Wu Qin Xi (五禽戏 Five Animal Frolics) through the Chinese philosophical theories and rules of Yin Yang and Wu Xing. However, without this specific theoretic framework, Qi and Qigong are still difficult to be understood clearly and decently. This will greatly limit the spread and development of the culture of Qi and Qigong, especially to the people who are not so familiar with the Chinese traditional culture.

After the Cultural Revolution (1966–1976), Gu and Lin[4]'s research on "external Qi" made it possible for Qi to be measured materially and objectively. With the support of Qian Xuesen, this kind of research on the materiality of Qi has blossomed in various research institutes in China and even affected other countries such as Japan and the United States. In these studies, Qi was covered by a lot of modern concepts, such as infrared radiation, electromagnetic waves, biological photons. However, with the development of a large number of studies, the studies on the materiality of Qi has also been questioned by scholars in different fields in the world. In order to find out the truth, the U. S. National Center for Health Research[5] even invested billions of dollars in research on Qi from 1993 to 2007. However, the materiality of Qi still remains in the conclusion of "unknown energy".

On the other hand, the social phenomenon of Qigong fever emerging during the 1980s and 1990s in China caused by the discovery of "external Qi" attracted the attention of many sociologists and anthropologists. Among them, Palmer [6] and Nancy Chen[7]'s research is the most influential. Unfortunately, the focus of their research was not on the actual bodily experience brought about by Qi and Qigong, but rather on the political and economic influence on the Chinese bodies of Qigong in the background of the post-Cultural Revolution era.

From Body in the Culture to the Culture in Body: Phenomenological Methodology for the Description of Bodily Experience

As was above-mentioned, from the research models of Qi and Qigong, whether the studies of clinical effects, the interpretation of Qigong by traditional Chinese medicine theories, the exploration of the materiality of Qi in natural science, or the narrative of sociology and anthropological studies on the background of the bodies that practicing Qigong, these studies are all based on a well-constructed culture (medical or clinical theories, traditional Chinese medicine theories, natural science methodologies, political and economic backgrounds), to explore another kind of culture (Qi, Qigong) produced by body. In fact, there is a more direct method for us to understand the culture of Qi and Qigong, the bodily experience, including such factors as feelings, senses, or emotions, imaginations, which emerged in the practice of Qigong. This method will not make Qi and Qigong only account in a particular context, which makes it difficult to be understood as a common human experience. However, can the subjective experience of Qi or Qigong be explained more scientifically?

Since the 1990s, social and humanitarian sciences have paid unprecedented attention to the body. In the process of studying the body, scholars in the fields of anthropology, psychology, political philosophy, history, and philology have gradually expanded their focus from dualism, such as body-psychology, meaning-behavior, and individual-group, to include a new concept of embodiment that breaks through these dualisms.

Although the embodiment is now widely used in modern sciences including cognitive science and artificial intelligence, its original theory has its roots in philosophy, especially phenomenology led by Husserl, Heidegger, and Merleau-Ponty, and it achieved great development from the poststructuralist theories put forward by Foucault, Bourdieu, and others. From Heidegger's "being-in-the-world" to Merleau-Ponty's "lived body". discussions within the field of phenomenology concerning flesh/body are all designed to overcome and transcend the subject-object and mind-body dualism thinking mode that has long dominated various academic fields, while Foucault and Bourdieu chose the influence of power, social practice, and others on individuals' body as the main research subject.

Thomas Csordas, a religious and medical anthropologist, proposed that embodiment should be regarded as an anthropological research paradigm[8] after he had studied the religious/folk treatment culture for a long time. He used this paradigm to conduct in-depth research and discussions on Catholic treatment rituals (exorcism) in North America, which gained widespread attention in the fields of cultural anthropology, psychology, sociology, and religious studies. Csordas did not interpret the special experience that emerges after religious treatment from the usual religious texts, the structure of rituals, and the theory and concepts of psychology, but inherited and further developed the ideas of the Merleau-Ponty phenomenology of perception, starting from the individual's body, and focusing on the detailed description of the preculture and preobject physical experiences of feelings, kinesthetic sense, emotions, imagination, etc., to grasp how the culture and object are constructed from the body. He pointed out[9-10] that culture is rooted in the body, and proposed the

somatic modes of attention or a specific way of analyzing the physical experiences in the treatment culture, which means that, based on the interaction and inter-subjective experiences between the environment and body, and between one's own body and others' bodies, culture arises from the patterns of attention with the body and attention to the body. A genuine description of the pattern of attention to the body captures moments of body experience and the cultural construction of the body, which shed light on how culture constructs the body and is created in the body.

Similarly, Taiwan anthropologist Yu Shunde[11] discussed culture by using culture bodily experience as a core concept and collected papers in various fields with a focus on bodily experience, edited them, and published observing the object to its details: A research on objects and bodily experience. He argued that the meaning of an object does not come from the existing culture, but is embodied in the action of observing the object to its details, because our body as the subject of the experiences perceives different in-body and out-of-body perception categories, and the meaning of things is built in the environment of personal life through learning, experience, and actions. Thus, it can be seen that both the building of the treatment culture in Csordas's research and the development of the meaning of things put forward by Yu Shunde are inseparable from the realization of bodily experiences. The same is true of understanding the culture of Qi and Qigong. As the theories of Qigong are under the guidance of mind-body monism, the understanding of its essence can not be merely based on natural science, existing theories but also can use the phenomenological approach, to break through the limitations of the cultural context, and to have a more comprehensive exploration of Qigong and the nature of Qi.

Qi in Practice: From Epistemology to Ontology

Qi, as the core of Qigong, is also a body practice with East-Asian and Chinese characteristics. Japanese philosopher Yuasa[12] pointed out that the concept of the body in the East is a practical issue related to life experiences, and is concerned with how the relationship between the mind and the body evolves through cultivation, rather than what the relationship is. Although Yuasa[13,14] also conducted many discussions and observations on the experiences of Qi and Qigong, he discussed the essence of these experiences by using existing frameworks such as Carl Jung's Synchronicity theory and the results of natural scientific experiments, instead of directly drawing on the bodily experiences of Qigong practitioners or analyzing the development process of these experiences.

Qigong is one of many body practices, so how to understand Qigong and Qi must focus on the body itself. The idea that body techniques and body practices build a specific culture and reflect a particular culture has become the consensus among anthropologists and sociologists. Therefore, how can we understand the construction of Qi culture in this Qigong practice through the body? The answer requires us to move out of the epistemological framework like what is Qi epistemology and shift to the ontological framework of how Qi exists in practice. Dutch medical anthropologist Annemarie Mol[15] conducted a long-term and thorough field survey at a subsidiary hospital in a well-known university in the Netherlands. She found that in the case of atherosclerosis, the condition appears to take on multiple forms because of different diagnostic practices (laboratory, clinical manifestations, etc), and often there may be inconsistencies in each form of atherosclerosis due to the different diagnostic methods. Thus, she suggested in her book entitled The Body Multiple: Ontology in Medical Practice that even under the strict disease classification system, diseases in biomedical clinics do not always appear to be the same, but depend on the practices.

If Qigong is viewed as a technique acquired by bodily practices, Ingold's[16] point of view may give us some inspiration. He pointed out that skills acquisition (he called it "enskilment") cannot be simply understood as inheritance, but as a process of inter-subjectivity, and interaction with the environment. In Qigong practices, this environment refers to not only the external environment but also the internal environment of the body. The external environment includes the material and cultural environment, while the inner environment indicates such things as feelings and emotional changes. In other words, observing the process of enskilment can also be analyzed as a detailed description of the interaction processes between these two environments.

Conclusion: The Direction and Obstruction of the Study of Qi and Qigong Experience

The above analyses have introduced some of the discussions and insights of body philosophy and anthropological research on the body in recent years and discussed some new ideas for understanding the experience of Qi and Qigong. Of course, the body here is no longer the body in the sense of biology and anatomy, but the body "being-in-the-world," which, through continuous interaction with the environment, not only constantly constructs cultures but is also constructed by the cultures. If we can do some empirical research in this direction, it will undoubtedly lead us to deepening our understanding of the Qi and Qigong experience, rather than being limited by the existing context and theories.

However, there are also some obstacles, and the difficulties can be predicted in doing research which focuses on bodily experience. First, because of a large number of scientific researches on the materiality of Qi which as a unknown energy has been deeply rooted in people's cognition, and, to bypass this stereotype and return to the bodily experience, this approach itself is not easy to be accepted. Second, since Qigong is an important part of traditional Chinese medicine, practitioners tend to cite statements in ancient Chinese philosophy and traditional Chinese medicine texts to express their true feelings when describing the experience of Qi. Moreover, changes in bodily feelings and emotions are also difficult to be verbalized

or worded, which makes it hard for researchers to describe and analyze these changes in detail. Finally, because of a long-standing linear thinking and logic thinking of causalism, one particular feeling or bodily change will make Qigong and practitioners think they have caught the sense of Qi. This is also a roadblock that prevents us from fully, concretely, nuanced understanding of Qi and Qigong.

To solve these problems, by switching the mode of thinking, researchers themselves should also actively participate in Qigong practices, and take their own perception and experience into account. In fact, this unique research approach has already utilized by some anthropologists and philosophers[17] who studied bodily experiences of the specific culture. Researchers' experiences combined with empirical data of bodily experiences, which account for the real Qigong practice site, will give us a new perspective on describing Qi, observing Qi, understanding Qi and the culture of Qigong.

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Conflicts of interest

There are no conflicts of interest.

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Medical Culture about *Lignum Aquilariae Resinatum* and its Maritime Silk Road

Jing Tian, Zhenguo Wang

Research Institute of Traditional Chinese Medicine Literature and Culture, Shandong University of Traditional Chinese Medicine, Jinan, Shandong, China

Abstract

Initially, Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) was exotic, but it has been playing an important role in the development of traditional Chinese culture and medicine. This article explores the reason for differences in the quality of ancient and modern Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) by analyzing the essential factors including the prosperity and decline of Maritime Silk Road, the relocation of the producing area, and the process of aroma forming. Based on the development and application of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) in Chinese literature and art, traditional Chinese medicine, and folk life over the past 2000-odd years, this article puts contends that Chen Xiang (沉香 *Lignum Aquilariae Resinatum*), which is endowed with the connotation of Chinese culture and health, should assume its new role as the traditional Chinese medical and cultural carrier on the New Silk Road.

Keywords: Chen Xiang (沉香 *Lignum Aquilariae Resinatum*), Maritime Silk Road, medical culture, Su Dongpo (苏东坡), *Qian Jin Fang* (《千金方》*Thousand Golden Prescription*)

Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) is also known respectively as Chen Shui Xiang (沉水香), Shui Chen (水沉), and Mi Xiang（蜜香）in Chinese. At first, Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) was introduced into China as a spice presented by the countries in the South China Sea regions and was an important item of Maritime Silk Road trade. In the 2000 years of the development of Chinese traditional incense culture and traditional Chinese medicine (TCM) culture, Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) has gradually developed into a special cultural carrier, appearing in almost all aspects of traditional Chinese culture and economy including religious belief, folk life, literature and art, TCM, and trade.

Lignum Aquilariae Resinatum, Scholars, and Traditional Chinese Medicine Physicians

As the ancient Chinese poem says, "The Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) is smoking in a censer carved with lions;" and one of the four entertainments that the ancient Chinese scholars loved to do was burning incense, along with drinking tea, painting, and flower arranging. Among the four famous incenses in ancient China namely Chen Xiang (沉香 *Lignum Aquilariae Resinatum*), sandalwood, ambergris, and musk, one of the best known is Chen Xiang (沉香 *Lignum Aquilariae Resinatum*). Those refined scholars gathered to chant poetry and paint pictures, play chess, or sip tea, just like what was portrayed in the poem, "In a moon night, the sound of playing chess echoes in the deep yard; The Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) is burning in the Boshan censer." A smoke of incense in the corner of the tea table is rising in spirals. Su Dongpo (苏东坡) and Huang Tingjian, two famed poets in the Song dynasty, often enjoyed this unique incense together and wrote poems about Chen Xiang (沉香 *Lignum Aquilariae Resinatum*). Wang Zhongxiu (王仲修), a litterateur in the earlier Song dynasty (960–1127), wrote a poem on palace life, which read to the effect that "There are six screens placing in the hall of the Palace, and the Emperor wants to write a poem on it; But he calls the scholar to do it, and the

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Address for correspondence: Prof. Zhenguo Wang, Research Institute of Traditional Chinese Medicine Literature and Culture, Shandong University of Traditional Chinese Medicine, Jinan, Shandong, China.
E-mail: 149077288@qq.com

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scholar who writes a fabulous poem receives several branches of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*).” From all the above-mentioned descriptions, we can get brief a glimpse of the relationship between *Chen Xiang* (沉香 *Lignum Aquilariae Resinatum*) and scholars. Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) ignited the literary pursuits for poetry of the scholars, and in turn, the spread of their verses added a bit of chic to the agalwood – a mysterious treasure from the South China Sea. *Chen Xiang* (沉香 *Lignum Aquilariae Resinatum*) originating from foreign lands is increasingly rooted in the soil of Chinese civilization, and it has become an indispensable carrier in traditional Chinese culture [Figure 1].

The development of TCM has always been advancing side by side with the development of social culture. TCM embraces the world in an open and inclusive manner. Whenever something new appears, TCM can always find its positive impact on human health in time and incorporate it into medical care, just like *Chen Xiang* (沉香 *Lignum Aquilariae Resinatum*). In the vicissitude of TCM, *Chen Xiang* (沉香 *Lignum Aquilariae Resinatum*) has always partook in the Silk Road as a noble, which not only connected the cultural and trade exchanges between the Chinese nation and the countries in the South China Sea, but also gave the new connotation of Chinese Materia Medica. When Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) was first introduced into the ancient China from the South China Sea as a tribute and trade commodity, it was first mentioned in Jiao Zhou *Yi Wu Zhi* (《交州异物志》 *Exotic Matters Records of Jiaozhou*) by Yang Fu (杨孚) in the Eastern Han Dynasty: “Mi Xiang (Lignum Aquilariae Resinatum) can be called Chen Xiang which is made by cutting its root first, and rotting its bark, and putting the hard and black center and joint section in the water.”[1] In the Han Dynasty, the nobles had the custom of perfuming clothes and bedding. With the introduction of Buddhism into China, Taoism gradually flourished as its variation. The function of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) to connect the heaven and earth and communicate with gods was especially appreciated, making it an important incense for religious activities [Figure 2].

In such a social background, *Chen Xiang (*沉香 *Lignum Aquilariae Resinatum)* naturally attracted TCM practitioners. As *Ming Yi Bi Lu* (《名医别录》 *Supplementary Records of Famous Physicians*) records: “Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) and Xun Lu Xiang (熏陆香 *Pistacia lentiscus*), Ji She Xiang (鸡舌香 *caryophyllus*), Huoxiang (藿香 *Agastache rugosus*), Zhan Tang Xiang (詹糖香 *Lindera thunbergii Makino*), and Feng Xiang (枫香 *Liquidambar formosana Hance*) are all slightly warm in nature. They can remove toxin and treat the swollen parts of the body due to the pathogenic wind-water, and get rid of the pathogenic Qi.”[2] Tao Hongjing (陶弘景), a TCM physician of the Liang dynasty with a Taoist background, mentioned in the *Ben Cao Jing Ji Zhu* (《本草经集注》 *Collected Notes to Canon of Materia Medica*) under the item of Gan Cao (甘草 *Radix liquiritiae*) that “this type of herb is the staple of all kinds of Materia Medica, and those less commonly used in classical prescriptions are such herbs as Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) (此草最为众药之主, 经方少不用者, 犹如香中有沉香也).”[3] It can be seen that it has the function of “harmonizing all kinds of incense,” and it was widely used by the people at that time.

Identify the Different Quality of *Lignum Aquilariae Resinatum*

However, from the noble class who used incense to “stick Chenxiang onto the pillars of the pavilion and draw the golden wisps on the lintels” to the incense used in religious ceremonies that “the new peak was seen for a while, but burn the incense to provide fragrance;” from the prescription for aromatherapy treatment in the *Qian Jin Fang* (《千金方》 *Thousand Golden Prescriptions*) to the medical prescriptions written by the doctors to spread for thousands of years; from the collection of one or two pieces of Shuichen valued thousands of golds,

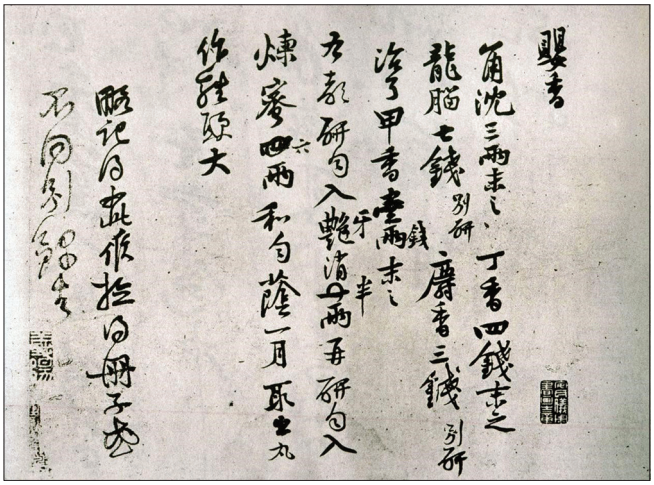

Figure 1: The calligraphy of the formula for making Yingxiang written by Huang Tingjian (黄庭坚) of Northern Song dynasty (collected by Taipei Palace Museum of China)

Figure 2: The Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) from South China Sea

Figure 3: The Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) from India, Brunei, and Guangdong Province and Guanxi Province of China (from left to right)

to the fragrance of Shu Shui (熟水), Xiang Cha (香茶) and Xiang Zhuan (香篆) in the Song dynasty, to the pieces of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) sold by the pharmacy today, all of them actually describe different "Chen Xiang (沉香 *Lignum Aquilariae Resinatum*)". It can even be said that each piece of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) is distinct and unique [Figure 3].

The same Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) with different names is mainly influenced by many dynamic factors, such as the origin, basic tree species, and the length of aroma-forming time. Its quality and import volume fluctuate with the rise and decline of the Maritime Silk Road, resulting in the different descriptions of it in historical documents. According to textual research, Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) in ancient documents is mainly composed of Daphne odora (made in China) and Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) (imported), while the *Chinese Pharmacopoeia* (2015) stipulates that *Chen Xiang* (沉香 *Lignum Aquilariae Resinatum*) is the resin containing wood of Aquilariasinensis (Lour.) Gilg, which is a plant of Daphne odora.

The origin of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) was first recorded in the *Nanfang Caomu Zhuang* (《南方草木状》 *Introduction to Vegetations in Southern Area*) by Ji Han in the Western Jin dynasty: "there are Mixiang trees in Jiaozhi," which is now situated in the north of Vietnam. The *Ben Cao Tu Jing* (《本草图经》 *Illustrated Classics of Materia Medica*) in the Song dynasty records "only Hainan countries and Jiaozhou, Guangzhou and Yazhou plant it now." It can be seen that the supply of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) in the Song dynasty has developed into two kinds of imported and domestic planting, and the basic tree species have also changed. In the Ming dynasty, Li Shizhen (李时珍)'s *Ben Cao Gang Mu* (《本草纲目》 *Compendium of Materia Medica*) depicted: "Ye Tingyu said, those originating from the Boni (勃泥), Zhancheng (占城), and Zhenla (真腊) are called Fanchen (番沉), which is also called Bochen (舶沉), or Yao Chen (药沉 medicated *Lignum Aquilariae Resinatum*) and is used frequently by physicians. Among them, the Zhenla is the top one. Cai Tao said, Zhancheng is not as good as Zhenla, and Zhenla is not as good as Lidong (黎峒) from Hainan. Meanwhile, Dongdong

Figure 4: The Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) recorded in the *Ben Cao Gang Mu* (《本草纲目》 *Compendium of Materia Medica*) (the Jinling version)

(东峒) from Limu Moutain (黎母山), Wan'an, is the best in all the lands, also named as 'Hainan Chen'(海南沉), which values ten thousand *qian* (钱). Those from Gaozhou, Huazhou in the north of the sea are all the Zhanxiang. Fan Chengda, the man of letters, said, Wan'an is in the east of the island, bathing itself in the sun rise, thus it's more fragrant than others and the local people find it difficult to get it. Bo Chenxiang is strong in smell, and the smoke will be scorched. Lignum Aquilariae Resinatum from Jiaozhi to the north of the sea are all gathered in Qinzhou, known as Qin Xiang (钦香), whose smell is extremely intense. The people in the southern area don't attach great importance to it, but they use it as medicine"[4] [Figure 4].

Due to the influence of the policy of banning the sea trade from the end of the Ming dynasty to the beginning of the Qing dynasty, the trade of the Silk Road through the South China Sea was almost stagnant, and the supply of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) was transformed into the artificial cultivation of Lingnan areas and Qiongzhou, Yazhou. According to the *Dong Guan Xian Zhi* (《东莞县志》 *County Annals of Dongguan*) in the Republic of China, "Grow it for four or five years, before you cut and dry it. You will find that the straight one is the Aquilaria sinensis… and in the third or fourth year, the first incense was chiseled. The first chiseling is called opening the door of incense, with several lines shaped like teeth of horses. After chiseling, cover it with yellow sand soil to let it grow again. The rich could open the door of incense after more than ten years; the poor could open the door of incense after seven or eight years. They can be chiseled every year after opening them."[5] At this time, planting incense has become an important local tax project. According to the research, most of the imported Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) is agarwood, and most of the base tree species planted in China are *Aquilaria sinensis*. The difference between tree species and region will inevitably lead to the difference in the quality of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*).

Figure 5: Imported Chen Xiang *(*沉香 *Lignum Aquilariae Resinatum)* (main component: resin)

Figure 6: Decocting pieces of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*)

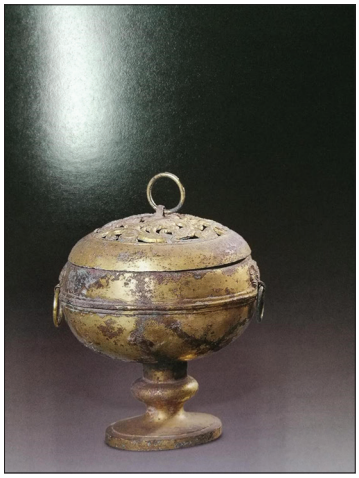

Figure 7: Gilt bronze censer of the Han dynasty (collected by Shanghai Museum of Traditional Chinese Medicine)

It requires certain external conditions in the process of aroma forming. After being stimulated by trauma or infection of rhodopsin, the tree will secrete resin to help heal and produce tissues with strong aroma, that is, *Edgeworthia chrysantha*. According to *Illustrated Classics of Materia Medica* in the Song dynasty, "if you want to take it, you should first cut off its old wood roots. After several years, its skin is dry and rotten, and its wood core and branches which are not rotten are edgeworthia chrysantha."[6] It can be seen that *Chen Xiang* (沉香 *Lignum Aquilariae Resinatum*) used in ancient times was the part of the wood that rotted after a long time, and the residual resin and wood were closely integrated. Because of the high resin content and high density, *Lignum Aquilariae Resinatum* can sink into water. There is a big difference between the stipulation of "wood containing resin" in Chinese Pharmacopoeia (2015) and the ancient literature [Figures 5 and 6].

The difference in the quality of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) is mainly due to the proportion of resin and wood and the length of time of aroma formation. In principle, the one with more resin content and longer time of aroma formation is the most valuable. Because of this, every piece of *Lignum Aquilariae Resinatum* is different. In the *Ben Cao Shi Yi* (《本草拾遗》*On Supplement to the Compendium of Materia Medica*), by Chen Zangqi (陈藏器) of the Tang dynasty, the record goes like this: "Its branches are not rotten and the most compact one is Chen Xiang (沉香 *Lignum Aquilariae Resinatum*); the floating one is fried incense, the chicken-bone-shaped one is Ji Gu Xiang (鸡骨香), and the horse-hoof-shaped one is Ma Ti Xiang (马蹄香). The Ma Ti and Ji Gu are fried incense, and can be smoked to deodorize, without other uses."[7] It is clear that those which cannot sink into water can only be used for "fumigation and deodorization." The *Compendium of Materia Medica*, written by Li Shizhen (李时珍) in the Ming dynasty, divides Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) into three grades according to the proportion of water and the incense: "Chen (沉), Zhan (栈), and Huangshu (黄熟)." Among them, there are four kinds due to ways of aroma forming: "Shujie (熟结), which is the condensation and self-decay and the cream comes out; "Shengjie (生结), which is the cream coagulate by the cutting of the sword and ax; Tuoluo (脱落), which is the condensation due to the decay in water; Chonglou (虫漏), which is the condensation due to the crack of the beetles. The best one is Shengjie, and the substandard one is Shujie and Tuoluo…Zhanxiang, which is half floating and half sinking, namely the incense half connected with wood could be fried incense…but it is not good as Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) for medicine." And it describes in detail that the Huangshu Xiang "is the light incense, whose common name is Su Xiang (速香). There are two categories: One is Shengsu (生速), which can be obtained by cutting; the other one is Shusu (熟速), which is decayed. These two can't be used as a medicine, but it can burn."[4] In *Tian Xiang Zhuan* (《天香传》*Tianxiang Biography*), it is said that "the precious incense like Zhanxiang is priced at the same price as gold," while "sellers in Yuhang City has ten thousand *jin* (斤) of Huangshu Xiang, so it's rare to have one hundred *jin* of real Zhanxiang; one hundred *jin* of real Zhanxiang can only produce ten *jin* of the superior Chen Xiang (沉香 *Lignum Aquilariae Resinatum*), so it's really costly."[6] It can be seen that the fine Chen Xiang (沉香 *Lignum Aquilariae Resinatum)* is very rare.

Live with Chen Xiang (沉香 *Lignum Aquilariae Resinatum*)

The lower quality of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) *includes*, such as fried incense and cooked incense including Mati and Jigu (floating in water), and they are mostly used by market vendors to make fragrant powder, and smoke clothes to deodorize. The medium quality of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) can be used for burning, i.e., Zhan Xiang (栈香) (half floating and half sinking in the water, and half connected with the wood). As for the high quality of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*), there will be no burning smell until it is burnt out, and the slightly worse one will emit burning gas when it is burnt out. The "Baochai will burn when turned over" and "Yuding will be more fragrant when turned over" practice among the Song poetry and they reflect the quality of incense burning in the upper class. Medium Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) can also be used to make fragrant tea. For example, Xu Yin in the Tang dynasty wrote *Shang Shu Hui La Mian Cha* (《尚书惠蜡面茶》*Shangshu Giving Lamian Tea*), which mentioned "gold trough the ground powder of Chenxiang, and the ice bowl contains a wisp of incense smoke." Or it can be used to make perfume. For instance, Gao Guanguo (高观国) in the Song Dynasty wrote a poem named *Shuang Tian Xiao Jiao* (《霜天晓角》*Morning Horn and Frosty Sky*), which reads, "The smoke from the stove is still smoky. Evaporate and precipitate the flower dew. There is no need for Baochai to turn over the incense. Under the window, there is light green." As for the physicians' prescription, Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) "can nourish all Qi, from heaven to spring. It can be used as the guidance in the prescription, and the most appropriate"[8] is the Shuichen. According to the Chinese Pharmacopoeia (2015), the functions and indications of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) are "to promote Qi to relieve pain, warm the middle-*Jiao* to stop vomiting, and receive Qi to relieve asthma." It is indicated for chest and abdominal distention and pain, vomiting and hiccup due to stomach-cold, Qi reverse, and asthma due to kidney deficiency. It is the specific thinking and application of TCM use of its heavy weight and its clear smell, which can correspond to the heaven and clear the human spirit [Figure 7].

Take the Mission and Set Sail Again

"The birds' songs in the flowers disturb my dream, the painted windows open in the morning, and Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) is burning and warming the cold days," as the poem reads, Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) has crossed the boundary of time and space, and has been given new cultural and health connotation throughout the long history of Chinese civilization. These pieces of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) with different quality, floating, or sinking in the water blooms infinite vitality in the hands of intelligent Chinese people.

From the ancient times to the present, when the wheels of the years are rattle into another prosperous era, the Silk Road is thriving once again. In September and October 2013, Chinese President Xi Jinping put forward the cooperation initiatives of building a "New Silk Road Economic Belt" and a "21st Century Maritime Silk Road," respectively. In March 2015, the National Development and Reform Commission, the Ministry of Foreign Affairs, and the Ministry of Commerce jointly issued the Vision and Actions for Jointly Building the Silk Road Economic Belt and the 21st Century Maritime Silk Road. However, this time, China serving as the starting point, the products of Chen Xiang (沉香 *Lignum Aquilariae Resinatum*), with the label of Chinese civilization, bearing the Chinese people's blessing for a good and healthy life, set sail again and headed for the friendly neighbors along the way. Chen Xiang (沉香 *Lignum Aquilariae Resinatum*) has become a new ambassador for the joint construction of the Belt and Road Initiative to enhance people-to-people and cultural exchanges and mutual learning among the peoples of countries along the Belt and Road route and to share a harmonious, peaceful, and prosperous life.

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Conflicts of interest

There are no conflicts of interest.

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Scientific Study Reveals that Electroacupuncture Technique Can Treat PCOS Symptoms

Daniela Donoso Paredes
Life Flow, Ubud, Bali, Indonesia

Abstract

The efficiency of traditional Chinese medicine theory and acupoints shows once more its accurate regulatory capacity by improving women biological cycles with the use of electroacupuncture (EA). Results presented in a research study that preformed ovulation induction in women with anovulation due to polycystic ovary syndrome (PCOS), successfully provided data supporting acupuncture as a natural treatment for infertile women, with no significant side effects. The purpose of this study is to demonstrate how EA treatment can induce ovulation related to the hormonal and neuronal system in women affected by PCOS. This study introduces proof of effectivity and improvement based on the research of the University of Gothenburg, Sweden, that presents a study on how EA can be an alternative to ovulation-inducing drugs, to be considered as a possible holistic regulator of PCOS and symptoms. The study covered 24 women with PCOS and oligo-/amenorrhea who received EA in a low frequency of 2 Hz with a total of 14 treatments applied for 3 months. Samples were taken three times during the study to see fluctuations in hormonal, ovulatory, and symptomatic behavior of PCOS. Results demonstrated effective regular ovulatory inductions in more than a third of women.

Keywords: Amenorrhea, irregular menstruation, oligomenorrhea, ovulation, polycystic ovarian syndrome, uterus

Introduction

Irregular menstruation, anovulation, and infertility are mostly manifested as characteristic symptoms in polycystic ovary syndrome, and are also recognized as the most common gynecological and metabolic endocrine disorders present in women worldwide. This presents major symptoms such as hyperandrogenism, obesity, and insulin resistance (IR). It is a possible precursor to cardiovascular disease and endometrial cancer. The biological process of this syndrome is determined by a high presence of androgens and luteinizing hormone (LH) and a decrease in sex hormone binding globulin (SHBG).[1]

The etiology of the syndrome is complex and multifactorial. Whether it is caused by a condition in the ovaries or the central nervous system is still open to debate. It is suggested that the excessive presence of estrogens produces high concentrations of LH, damaging the maturation process of the follicles and causing possible oligo/anovulation. The circumstances that can cause these phenomena are diverse, highly affected in the nutritional level by intervention and intake of chemicals, high sugar, genetically modified foods (GMO), and processed food.[2]

The psychological factors that are observed in women come from gender inequality in the general world socio–cultural–historical organization, generating high demands while increasing degrees of stress, arising uncertainty between the biological capacity of procreation and family care, along with the need to develop a professional life career in a masculine labor environment. This situation increases emotional stress states, as well as low self-esteem. Certainly, it is perceived in different degrees, varying from diverse personal aspects from woman to woman, exposing the woman's body to endocrine and neuroendocrine imbalances,

Address for correspondence: Dr. Daniela Donoso Paredes, Life Flow, Ubud, Bali, Indonesia.
E-mail: danieladp3010@gmail.com

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finally resulting in hormonal disorder, menstrual disorder, and even sterility.[3]

For this reason, this scientific study is intended to provide support on the use of traditional Chinese medicine (TCM) to help women who are exposed to emotional stress with biological consequences. Evidence of electroacupuncture (EA) to balance hormones regulates the menstrual cycle and the potential improvement of fertility.[2]

The intention of the scientific study carried out by Dr. Elisabet Stener-Victorin at the University of Gothenburg was designed to evaluate the efficiency of EA in women suffering polycystic ovary syndrome (PCOS) and not ovulating regularly or at all.[1]

In order not to lose sight of the dysfunctions during the treatment process, an extensive record of endocrine and neuro-endocrine data related to acupuncture treatment and ovulation was taken into account, revealing results through the measurements of menstrual patterns and basal body temperature (BBT). The purpose of this study was to get general research into the impact of EA on PCOS.[4]

In the study by Dr. Stener, the author made efforts to find the support of alternative treatments with EA that substitute the adverse effects of the pharmacological intervention and its consumption. Attempts are also being made to scientifically support a possible preventive solution with EA to assist women with PCOS and reduce the long-term risk of endometrial cancer, hypertension, and type II diabetes.[3]

Polycystic Ovary Syndrome in Traditional Chinese Medicine

TCM recognizes polycystic ovary syndrome. Unlike Western medicine, this condition has been treated for hundreds of years using a combination of herbs and acupuncture. Its treatment varies according to the identification of syndrome differentiation from the patients' signs and symptoms. There exists a vast diversity of possible syndromes taking into account a combination of pathologies from organs, meridians, qi, blood, and organic fluids.

Etiopathology of PCOS in traditional Chinese medicine

In TCM, any dysfunction from the ovaries and the uterus involves organs such as the kidney, spleen, and liver, along with the disturbance of the harmony of the meridians of Chong Mai (Thoroughfare Vessel) and Ren Mai (Conception Vessel); TCM describes PCOS as a "Tian Gui" (menstruation) disorder which is identified as a genetic dysfunction with irregularity of the cycle and infertility due to anovulation, in which usually the main origin is in the kidneys.[5]

It commonly evolves from kidney yang deficiency (poor metabolism). Spleen deficiency is also associated with symptoms of IR and obesity. Its pathological functions affect the metabolism of nutrients in food by its inability to transform, transport, and evaporate fluids in the lower Jiao.

If there is liver stagnation, it can manifest as blood stagnation or excessive heat in the meridians. Blood stagnation in the channels causes the hair follicles to overproduce unwanted thick hair, generating symptoms of hirsutism which is present in 70% of PCOS cases. Excessive heat in the channels also promotes acne.[5]

The energy system of the kidneys is the basis of all yang in the body. Therefore, kidney yang deficiency affects the energy of the spleen yang. Qi as a yang substance allows the deficiency of qi in the spleen to result in internal dampness. Chronic dampness combined with heat due to stagnation of liver qi forms phlegm in the lower Jiao of women and affects the reproductive system, since the liver controls menstrual blood.[6]

PCOS syndrome differentiation in traditional Chinese medicine

The syndrome differentiation comprises qi and yang deficiencies, phlegm-dampness accumulation in the lower Jiao, and blood stagnation.

Studies showed that kidney deficiency with blood stasis syndrome is the most frequent pattern observed in the PCOS patients, followed by spleen deficiency with phlegm-dampness syndrome, spleen-kidney yang deficiency syndrome, and finally kidney yin deficiency syndrome occurred.[7] Another study states that the syndromes tend to manifest in combination, in which kidney deficiency and liver stagnation are the syndromes that occur most frequently.[8]

Kidney deficiency, disharmony between Chong Mai and Ren Mai

This syndrome is most likely to emerge when there is kidney qi deficiency, prolonged disease, excessive sexual activity, or prolonged ingestion of oral contraceptives. For any of these reasons, kidney function may be impaired by depleting kidney yin and/or yang, leading to failure of the body fluids; consequently, there will be pathogenic heat in the uterus and the malnutrition of Chong Mai and Ren Mai.

Therefore, the uterus is unable to receive adequate blood flow, generating prolonged menstrual cycles with little bleeding or amenorrhea.[6]

Kidney yin deficiency

Yin deficiency and yang deficiency often occur together. Kidney yin deficiency also manifests with a short menstrual cycle, scant blood, and spotting between periods, indicating an energy imbalance in the kidney.

Thirst and dry throat become obvious. Patients tend to experience pain and weakness in the lower back and knees periodically, with anxiety and insomnia as common emotion. Stools can be dry and cause constipation.

On the other hand, the body of the tongue appears red, with red spots on the tip or sides, and the coating may peel off. Pulses tend to be fast and tense. Patients may also experience dizziness, tinnitus, a weak waist, periodic hot flashes, and night sweats.[6]

Kidney deficiency with blood stagnation

This pattern is usually due to congenital lack and/or prolonged use of oral contraceptives, causing a restriction or lethargy to kidney qi. The function of the kidney to control the metabolism of fluids is affected. If thisruns on, in time it ends up damaging the kidney yang, which stops heating the uterus. If the uterus cools, blood stagnation begins, causing very long menstrual cycles, the disappearance of the menstrual cycle, and therefore, infertility.

The most common symptoms are observed in very long menstrual cycles, amenorrhea, cold in the lumbar region, hands and feet, cold body feeling or aversion to it, dark complexion, acne on the face, chest, and back, swollen leg. Sometimes obesity, very rapid hair growth, and general feeling of heaviness may be witnessed. The tongue will be pale with a white coating on the top. The pulse will be deep and slippery.[9]

Spleen deficiency

Improper diet and over-activity of the liver are common causes of spleen imbalances. Fatigue, IR, a body mass index (BMI) over 25, or weight gain would be indications of spleen qi deficiency type of PCOS.

Internal dampness can evolve from spleen qi deficiency, characterized by vaginal discharge, development of large fluid-filled ovarian cysts, and a feeling of heaviness in the body. In addition, premenstrual syndrome pain is deep, acute, and is relieved with pressure or heat, indicating internal accumulations of cold moisture.

In TCM, this is identified as retention of phlegm in lower Jiao. It most often manifests with symptoms of obesity, weak muscles, facial hair, chronic productive cough caught in the throat, and nausea, and there could be feelings of sleepiness and tiredness.

Poor appetite and loose stools are also present. The tongue shows tooth marks on the sides and a thin layer of grease or thick white coating. Pulse feels slippery.[6]

Spleen deficiency with accumulation of phlegm-dampness

Excessive consumption of fatty and sugary foods, dairy products and alcohol, or excessive worry and physical work can compromise the function of the spleen, causing failures in the transport of liquids and food and their transformation into usable energy. The accumulation of body fluids turns into dampness and phlegm, obstructing the qi and blood circulation in the uterus, blocking Chong Mai and Ren Mai.

As a result, the uterus and ovaries are deprived of blood, leading to poor menstruation and even amenorrhea and infertility.[10]

Blood stagnation

The liver is the basis of the energy circulation of qi throughout the body; stagnation of the liver qi can stagnate the qi in the lower Jiao. Where the qi goes, the blood follows. Long period of qi stagnation can form blood stagnation. On the other hand, it is common in PCOS to have blockage of the flow of qi due to the accumulation of internal moisture.

Blood stagnation is characterized by sharp, fixed pain, severe abdominal pain, dull, or even aching pain that progressively intensifies toward menstruation. The volume of blood during a period varies from light to heavy, tending to be dark red or purple. After clot is discharged, pain reduction is the common result.

The period may be long or with drops of blood that continue after the main menstruation. An important sign for identifying blood stagnation is the discomfort resulting from pushing around the anus and uncomfortable intercourse, especially before, during, or immediately after menstruation. The tongue may be purple with a tight, uneven, and intermittent pulse.

The face may also look red or purple. On palpation, the lower abdomen, especially on the left side, may feel tender. Dizziness, lack of sleep, and palpitations are also possible indications that upport the diagnosis of blood stagnation.[6]

Liver qi stagnation

Prolonged stress, depression, and anxiety can impair the seven emotions, causing liver qi stagnation and stagnation of blood. The invasion of wind or pathogenic cold along with excessive consumption of cold food and drinks will "freeze" the blood. All of them will lead to the obstruction of Chong Mai and Ren

Table 1: Acupuncture points, anatomic position, and innervation

Points	Stimulation	Segmental innervation	Muscle localization
Shen Shu (肾俞 BL 23) (bilateral)	EA	C6-8, T9-12, L1-3	Fascia thoracolumbalis, mm. serratus posterior, erector spinae thoracolumbalis
Pang Guang Shu (膀胱俞 BL 28) (bilateral)	EA	L4-5, S1-3	Fascia thoracolumbalis, m. erector spinae lumbosacralis
San Yin Jiao (三阴交 SP 6) (bilateral)	EA	L4-5, S1-2	Mm. flexor digitorum longus, tibialis posterior
Yin Ling Quan (阴陵泉SP 9) (bilateral)	EA	S1-2	M. gastrocnemius
Nei Guan (内关 PC 6) (unilateral)	Manual	C8-Th1	M. flexor digitorum superficialis
Wai Guan (外关 TE 5) (unilateral)	Manual	C7-8	M. extensor digiti minimi
Bai Hui (百会 GV 20)	Manual	Nn. trigeminus (V), occipitalis menor (C2) and mayor (C2-3)	Aponeurosis epicranii

BL: Bladder channel, SP: Spleen channel, PC: Pericardium channel, TE: Triple energizer channel. GV: Governor vessel, EA: Electroacupuncture, M: Musculus, m: Minor

Mai that block up menstruation and as a result the presence of amenorrhea.[10]

People with stagnation of liver qi often suffer from stress, restlessness, nervousness, irritability, breast distention, acne on the cheeks, headache, long menstrual cycles, amenorrhea, and infertility, resulting in a blockage of blood and energy in the uterus and causing a shortage of blood in menstruations, even amenorrhea, and emotional disturbances.

The tongue will appear red, with more swollen edges and a thin layer of white coating. Pulse tends to be tense and sometimes thin.[11]

Correlation between traditional Chinese medicine syndromes and hormonal dysfunction in PCOS

A scientific study revealed the correlation between Chinese medicine syndrome patterns of irregular menstruation and anovulation and the biological processes of PCOS.

It is pointed out that there is a positive correlation between follicle stimulating hormone (FSH) levels and spleen and kidney yang deficiency syndrome. On the other hand, dampness and phlegm syndrome by spleen deficiency have shown to be related to high blood sugar, obesity, and hirsutism.

Regarding qi stagnation and blood stagnation, it presents high levels of prolactin and estradiol. In liver, stagnation syndrome and blood heat are linked to high levels of progesterone, FSH, and acne. Finally, an increase in LH is observed in kidney deficiency syndrome and blood stagnation.[12]

Menstruation and the capacity for conception depend on both the abundance of blood in the uterus pumped out from the heart and on the fullness of the essence sent from the kidney. Due to these connections, heart and kidney disorders (including their own disharmony) easily trigger gynecological disorders.[13,14]

The functions of the uterus, menstruation, and fertility will be affected by the amount of qi and blood that is received. Ren Mai supplies qi to the uterus while Chong Mai supplies it with blood. If the kidney essence is weak, Ren Mai and Chong Mai will be impaired and will alter the functions of the uterus. Internal humidity and other affections can cause blockages manifesting menstrual irregularities, amenorrhea, or fertility problems.[5]

Electroacupuncture Treatment in Gynecology

TCM is conceived as something within the holistic concept; therefore, treatments are focused on influencing all aspects of the patient's life including diet, lifestyle, nutritional supplements, medicinal herbs, and acupuncture sessions.[15]

The main objective to be addressed in this study is ovulation regulation and induction. Therefore, the main organs to attend to in this condition are the kidney, the spleen, and the liver.[5] To see positive results, the treatment procedures for women with PCOS usually last 3 months, with a continuity of 2-3 times per week, 30 minutes per session. TCM organizes a treatment plan depending on the syndrome.

Treatments using the diagnosis of TCM are known for being very successful in inducing ovulation, with the primary use of a combination of acupuncture, EA, and moxibustion. It has proven their efficiency in treating PCOS.[5]

Acupuncture has been shown to improve menstrual frequency and decrease circulating testosterone in women with PCOS. Another study conducted also at the University of Gothenburg in Sweden[6] showed that PCOS patients have higher sympathetic nervous system (SNS) activity than other women. The study demonstrated that the activity in the SNS and testosterone was lowered in women who received the EA treatment. Elevated testosterone levels are closely related to increased activity in the SNS of women with PCOS.[16] Favorable results have guided professionals to use EA as an additional tool to support and amplify the therapeutic power of acupuncture.

EA stimulates the points associated with the symptoms; it supports the regulation and activation of qi flow. The needles are placed at the acupoints; electrode clasp is attached to the needles connecting them with a machine that sends electrical impulse stimulation through the needle to the acupuncture points. It is an alternative to manipulating acupuncture needling by hand, and it shares the same range of indications as the manual style of filiform stimulation. This can be used for a wide spectrum of conditions. EA is intended to help enhance the potential healing effects of standard acupuncture.[17]

Existent Studies have shown the possibility of improving ovulation regulation with effective results for PCOS symptoms and signs, such as the one mentioned above at the University of Gothenburg in Sweden. The study proposed a treatment with acupuncture points, although the intention of their selection was to choose those points in somatic segments common to the innervation of the ovary and uterus.

The following were the acupoints chosen for the study: Shen Shu (肾俞 BL23), Pang Guang Shu (膀胱俞 BL 28), San Yin Jiao (三阴交 SP 6), Yin Ling Quan (阴陵泉SP 9), Nei Guan (内关 PC6), Wai Guan (外关 TE 5), and Bai Hui (百会 GV 20).[6] For more specifications, please refer to Table 1.

Methodology

The Study at the University of Gothenburg in Sweden[6] showed that EA can help women with PCOS and oligo-/amenorrhea by inducing and regulating ovulation. A prospective, longitudinal, and nonrandomized study was applied to 24 women, aged 24-40 years, suffering from PCOS and oligo/amenorrhea.

The selection parameters required for the diagnosis of PCOS are women with oligo-/amenorrhea experiencing four or fewer annual spontaneous hemorrhages, presence of multifollicular ovaries and thickened ovarian stroma in ultrasound examination. 19 of the 24 women showed resistance to clomiphene, without being able to ovulate after 150 mg of clomiphene citrate was taken for 5 running days. All ultrasound examinations were done by transvaginal ultrasound.[6]

Study Period

The study started 3 months before the EA. There was no hormonal treatment intake 3 months before or during the study; therefore, it lasted for a total of 6 months without hormonal treatment before EA. The study period was defined as the period that extends from 3 months before the first treatment of EA, to 3 months after the last treatment of EA, with a total of 9 months.

Menstrual and ovulatory patterns were verified through the recording of vaginal bleeding and the daily measurement of BBT. Blood samples were collected three times: 1 week before the first EA, 1 week after the last EA, and 3 months after the EA.

Two groups of women were formed: The first group – those who experienced a good effect if the BBT can show repeated ovulations (or pregnancy) during the treatment period and 3 months afterward; and the second group – those who have not experienced any effect if the ovulatory pattern did not have positive changes before, during, or after treatment.[6]

Electroacupuncture treatment

In the administration of EA treatment, two treatments per week were provided for 2 weeks and then a single treatment per week, resulting in a total of 10 to 14 treatments.

The needle insertion method was intramuscular with a depth of 15–40 mm at selected acupuncture points in somatic areas common to the innervation of the ovary and uterus. The same location and needle stimulation were applied to all the women in question.

The material of the needles was stainless steel. They were inserted and rotated to generate "de qi" . Known as the "needle sensation or arrival of qi", it is explained as a sensation of variable tension, numbness, tingling, and pain reflecting activation in the afferent muscular nerve in delta-A fibers and possibly fibers C. These manually stimulated needles were rotated five times during each treatment session.

At the time, four needles were placed at the thoraco-lumbar and sacrum level, and four other needles in the calf muscles. They were given electrical stimulation for 30 min with low-frequency pulses (2 Hz) of 0.5 ms interval. The intensity was high enough to cause local muscle contractions without pain.[6]

Temperature measurement

For the measurement of skin temperature, a digital infrared thermometer was used to take the temperature in between the acupuncture needles applied to the sacrum and the forehead, both in the midline. These measurements were taken during the 1st, 5th, and 10th EA treatment.

Measurements were made in each treatment after 10 min of rest and just before EA as "baseline" values. Actual measurements were taken every seven minutes during the EA and one minute after the EA, making sure that the room temperature remained constant during the three experimental sessions.[6]

Body mass index and waist-to-hip ratio measurement

Measurements of BMI (weight in kilograms divided by square of height in meters = BMI) and waist-to-hip circumference (waist-to-hip ratio [WHR]) were applied. It was measured with a soft tape at the level of the navel and the upper anterior iliac spine while standing. The measurements were taken before the EA treatments and after the study period.[6]

Biochemical measurements

Blood samples were taken from an antecubital vein, on three occasions;

- 1 week before the first EA treatment
- 1 week after the last EA treatment
- 3 months later.

Serum and plasma concentrations of gonadotropins, prolactin, steroids, and neuropeptides were measured from the selected samples [Table 2].

Statistical measures

For the statistical study, Fisher's permutation test was used for group comparison (good effect versus no effect) in regards to BMI, WHR, hormones, steroids, neuropeptides, and skin temperature.

Fisher's paired comparison test was used to analyze the difference before EA versus 1 week after EA and 3 months after EA, whose targeted persons include:

a. All women
b. In women with good effect
c. In women with no effect on ovulation, hormones, steroids, and neuropeptides.

All tests were two-tailed and the differences were considered statistically significant when $P < 0.05$. The confidence interval (CI) was given when $P < 0.05$.[6]

Results and Conclusions

The most important results in the study showed that repeated treatments of EA with low frequency (2 Hz) worked positively in more than a third of the women with PCOS, inducing regular ovulations in their menstrual cycles.[6]

After EA, there was a curious decrease in the LH/FSH ratio, testosterone, and b-endorphin concentrations. In contrast, an increase was found in the skin temperature of the forehead of women with PCOS.

It is possible to infer that additional treatments of EA may produce higher success rates. Further scientific research to be done is suggested so as to deepen the understanding of the exact mechanism of EA.

In the induction of ovulation, it is recommended to support EA as an alternative therapy to perforation and gonadotropin

Table 2: Mean and standard deviation for serum and plasma concentrations of gonadotropins, prolactin, steroids, and neuropeptides from samples taken before, within a week after, and 3 months after electroacupuncture treatment in all women (n=24)

Element (s) evaluated	Mean (SD)			Significance *P* (CI)
	Before EA	Within a week after EA	3 months after EA	
LH (IU/l)	9.7 (4.0)	9.7 (3.6)	8.2 (3.9)	NS
FSH (IU/l)	5.5 (1.3)	5.6 (1.3)	5.5 (1.6)	NS
LH/FSH ratio	1.7 (0.6)	1.9 (1.2)	1.47 (0.5)	*P*=0.042 (−0.51, −0.01)
Prolactin (mIU/l)	154 (68.9)	166 (87.1)	181 (79.4)	*P*=0.010 (9.6, 66.7)
SHBG (nmol/l)	29 (15.9)	27 (14.4)	25 (13.2)	NS
Testosterone (nmol/l)	1.88 (0.89)	1.83 (0.85)	1.78 (0.82)	*P*=0.016 (−0.43, −0.05)
Testosterone/SHBG ratio	0.09 (0.07)	0.09 (0.07)	0.10 (0.07)	NS
Androstenedione (nmol/l)	9.1 (2.6)	9.3 (2.4)	9.3 (2.4)	NS
Cortisol (nmol/l)	272 (66.9)	265 (47.8)	241 (75.8)	NS
TSH (mIU/l)	1.6 (1.1)	2.0 (1.3)	1.9 (1.7)	NS
T3 (nmol/l)	1.4 (0.3)	1.4 (0.2)	1.3 (0.2)	NS
T4 (nmol/l)	91 (15.4)	90 (10.1)	89 (10.6)	NS
Basal insulin (mIU/l)[§]	16 (9.0)	19 (9.6)	28 (15.7)	NS
b-endorphin (pmol/l)	48 (18.1)	46 (17.8)	43 (17.4)	*P*=0.013 (−11.6, -1.6)
ACTH (pmol/l)	3.9 (2.5)	4.3 (2.8)	1.7 (0.4)	NS
CGRP (pmol/l)	35 (46.9)	23 (30.7)	31 (35.1)	NS
Galanin (pmol/l)	109 (40.4)	114 (47.9)	118 (41.6)	NS
NPY (pmol/l)	146 (15.4)	147 (17.7)	144 (15.8)	NS
Gastrin (pmol/l)	39 (14.2)	38 (14.0)	38 (13.4)	NS

[§]*n*=10, **P*<0.05, ***P*≤0.01, * and **Significance when comparing concentrations before electro acupuncture with concentrations within a week after and 3 months after electroacupuncture treatment. LH: Luteinizing hormone, FSH: Follicle stimulating hormone, SHBG: Sex hormone binding globulin, TSH: Thyroid stimulating hormone, SD: Standard deviation, CI: Confidence interval, NS: Not significant, ACTH: adrenocorticotrophichormone, CGRP: calcitonin gene-related peptide, NPY: neuropeptide Y

treatment, considering the evidence that 7 out of 9 women who were resistant to clomiphene experienced a good ovulation effect.

The study also found that the induction of ovulation by EA does not cause serious side effects or multiple pregnancies compared with side effects seen in pharmaceutical drugs used with the same intention. It is evident that EA restores the sympathetic system, acting on the levels of the hypothalamus and brain stem through b-edorfinergic mechanisms.[18]

On the other hand, a subgroup of women with PCOS who had shown good ovulation effect was found to have relatively low serum concentrations of BMI, WHR, basal insulin, and testosterone, but high serum SHBG concentrations. However, they all had common characteristics such as less pronounced altered metabolism and less presence of androgen level.

In the same group, a significant increase in serum prolactin was evidenced in response to EA. During the EA period, all women with good ovulation results responded with such serum prolactin increase except for one. It was also observed that 2 women from the same group showed disappearance of multi-follicular ovaries in the ultrasound images, which they took 3 months after the EA period.

The authors at the University of Gothenburg thus concluded that there is a need to verify the results with additional randomized and comparative studies together with ultrasound, to accurately identify events at the ovarian level and rule out nonspecific effects. Even by taking into account all the nonspecific effects, it is notable that the results are impressive.

All in all, EA is potentially more effective in treating women with PCOS with little metabolic alteration. This is an alternative to pharmacological drug-induced ovulation, and it can support effective fertility.[6]

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Conflicts of interest
There are no conflicts of interest.

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Decoding an Old 1907 Prescription of Dr. Ing Hay ("Doc Hay"): One of the Earliest Chinese Medicine Doctors in the United States

Arthur Yin Fan[1,2], Louis Lei Jin[1,3], Boling Huang[4], Mingxia Yu[4], Xiaoyin Zhao[4], Sarah Faggert Alemi[1,5]

[1]American TCM Association, [2]McLean Center for Complementary and Alternative Medicine, PLC, Vienna, [5]Eastern Roots Wellness, PLC, McLean, VA 22101, [3]International Institute of Systems Medicine, Inc., Milwaukee, WI 53222, USA, [4]Nanjing Institute of Chinese Medicine, Nanjing University of Chinese Medicine the Third Hospital, Nanjing, China

Abstract

Objectives: Chinese medicine doctors have practiced in the United States since April of 1854, the world's first Chinese medicine doctor's memorial is Kam Wah Chung Museum in John Day, Oregon, U.S., to commemorate Dr.Ing Hay ("Doc Hay" 伍于念) and his business partner Lung On (梁光荣). There were few studies to explore Doc Hay's real practice and prescription, while most of papers focused on Doc Hay's legend life. This paper aims to analyze and interpret one of the intriguing herbal prescriptions that Doc Hay had hand-written. **Materials and Methods:** Dr. Arthur Yin Fan made an academic travel to Kam Wah Chung museum on August 5, 2018 and examined the books and hand-written prescriptions of Doc Hay, which were not exhibited to the public at that time. This paper analyzes and interprets one of herbal prescriptions that Doc Hay had hand-written in 1907. Interpretation process included four steps: (1): Transform Doc Hay's hand-written prescription (with original herb names) to standard herb names in Chinese. (2): Induct and rearrange the herb name into groups based on herb property characteristics and then translate them into both PinYin names and English names. Analyzation of the prescription may include in what classic formula (s) routinely introduced in Chinese medicine textbooks. (3): Analyze the herbal action for each group and potential symptoms or conditions the patient may have had. An analysis of classic formula (s) used in the prescription may represent what clinical condition was being treated at that time. (4): Combine the analysis to give a comprehensive picture of the patient. **Results:** The prescription consists of 67 herbs, total 934.6 grams, and including Yin Qiao Powder (银翘散), Sang Ju Decoction (桑菊饮), Zhi Sou Powder (止嗽散), Qing Ying Decoction (清营汤), Xi Jiao Di Huang Decoction (犀角地黄汤), Long Dan Xie Gan Decoction (龙胆泻肝汤) and Chai Hu Shu Gan Powder (柴胡疏肝散). Speculation indicated that the prescription was for a patient who had obvious pulmonary infection accompanied by severe cough, and probably had prolonged pulmonary tuberculosis (TB) also with acute respiratory infection caused by other bacteria or viruses. Based on the analysis of composition of this prescription, it can be used for the treatment of epidemic diseases. **Conclusion:** The majority of herbs used in this prescription are commonly included in the herbal medicines in China used to effectively counter severe acute respiratory syndrome (SARS), H1N1 and currently COVID-19, it might be Doc Hay's basic formula for patients with "Spanish Flu" during the 1918-1920 pandemic.

Keywords: Prescription, composition, Ing Hay (伍于念), Kam Wah Chung (金华昌), epidemic disease, Spanish flu, COVID-19

Introduction

After 1848, a large number of Chinese workers came to the United States during the California Gold Rush. Some of them became Chinese medicine doctors to treat a variety of illnesses,

Address for correspondence: Mr. Arthur Yin Fan, American TCM Association, Vienna, VA 22182, USA. McLean Center for Complementary and Alternative Medicine, PLC, Vienna, VA 22182, USA.
E-mail: ArthurFan@ChineseMedicineDoctor.us

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Figure 1: Dr. Ing Hay. This photo was taken when he just arrived in the United States in late of 1880s

Figure 2: Dr. Ing Hay was in John Day, Oregon

Figure 3: The Kam Wah Chung Museum, Dr. Ing Hay's former clinic and residence

Figure 4: Dr. Arthur Yin Fan (right) visited Kam Wah Chung Museum on August 5, 2018, accompanied by the museum staff Ms. Lauren Ettlin (left)

Figure 5: Dr. Ing Hay's former clinic and residence was converted into the Kam Wah Chung Museum, a "State Heritage Site" issued by Oregon as well as an American National Historic Landmark issue by U.S. National Park Services

Figure 6: Herbs used by Dr. Ing Hay before 1950 are still on the shelf of Kam Wah Chung, half of them in the Cigar box (upper part of shelf) and another half in original herbal box

pains, and wounds of Chinese workers, and also treat patients from other ethnic groups with intractable conditions.[1-3] The earliest Chinese medicine doctor in the US might be Dr. Li Putai (1817–1893). From as early as April of 1854, Dr. Li Putai published an advertisement for his Chinese Medicine

Practice in San Francisco, in *The Golden Hills' News*.[4] Dr. Ing Hay, a.k.a. "Doc Hay" (伍于念 which Pin Yin spells as Wu Yu Nian, 1862-1952) [Figures 1 and 2], came to the US in 1883 and settled down in John Day, a small town in eastern Oregon, in 1887. At that time, John Day was the third largest Chinatown in the US." In 1888, he and his friend Lung On (梁光荣, Liang Guang Rong) registered Kam Wah Chung (金华昌 Golden Flower Blooms) & Company; this began his medical career in the US, where he was known as a "China Doctor." His patients mainly came from several states around the west coast, although some of them even traveled from as far as the eastern US and Alaska. Doc Hay was best known for his pulse diagnosis; in order to maintain the sensitivity of his fingers, he wore a glove on his right hand year round. To commemorate the most famous Chinese doctor in early US history his biography entitled "China Doctor in John Day" was published by historians.[5] And his former clinic and residence was converted into the Kam Wah Chung Museum [Figures 3-6], a "State Heritage Site" issued by Oregon as well as an American National Historic Landmark issued by the US National Park Services. From a professional perspective, it is the world's first Chinese medicine doctor's memorial built on the original site of his practice.

To date, there is one book and several papers that documented Doc Hay's personal background, practice experience, and analyzed effects of herbs stored in the clinic's pharmacy.[2-4] There is no current study published on analyzing his detailed day-to-day practice or academic contributions based on his prescriptions or case records. Our lead author (Dr. Arthur Fan) made an academic travel to *Kam Wah Chung* museum on August 5, 2018 and checked the books and hand-written prescriptions by Doc Hay, which were not exhibited to the public at that time. This paper aims to analyze and interpret one of the intriguing herbal prescriptions that Doc Hay had hand-written.

Materials and Methods

Prescription piece chosen

There were over 30 pictures taken for recording Doc Hay's hand-written prescriptions on August 5, 2018; one picture for one prescription. Prescriptions were hand-written by Doc Hay using traditional Chinese brush pens with black ink, mainly on paper 2 feet width by one & half feet length. The traditional Chinese writing style was adopted: the column (actually in Chinese old style used by Doc Hay was "line") is from the upper to lower (1 to 5) and the line (on Chinese old style was "column") is from right to left (far-right is the first, and the far-left is the last); the original herb name was written vertically. Patients' medical histories were not found in the *Kam Wah Chung* museum. Majority of the prescriptions have more than 50 herb names. One prescription was chosen for analysis due to Doc Hay's ability to effectively treat infectious diseases. In particular, he was famous because he had treated thousands of patients from 1918 to 1920, during the "Spanish Flu" pandemic and no patient of his died.[5] That prescription has some herbs commonly used in anti-infection herbal

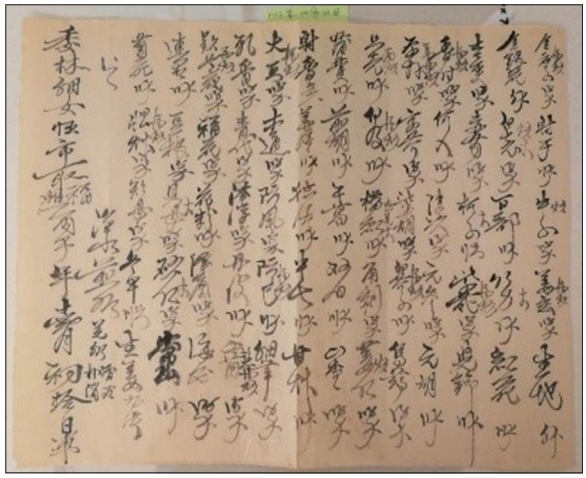

Figure 7: Dr. Ing Hay's hand-written prescription

medications. It should be noted that although the prescription was dated as January 23, 1907 that a small light-green paper attached, at the top-middle, to the prescription sheet by the Museum mistakenly marked the prescription date as December 10, 1906). His ability to effectively treat patients during the 1918 pandemic with a Chinese herbal formula is significant in that the US and the rest of the world are currently under a similar pandemic. It would be worthwhile to study the ability of this herbal prescription to effectively treat those infected with COVID-19 [Figure 7].

Interpretations

- Step 1: Transform Doc Hay's hand-written prescription (with original herb names) to standard herb names in Chinese.
  Three of the current authors (Fan, Huang and Jin) checked the hand-written prescription in Chinese, transformed the "wrong herb names" (while the sound was correct or similar to the standard herb names) or herbs' nicknames Doc Hay's had used into standard herb names in Chinese. Converting the lunar calendar date to the solar calendar date, and the old weight unit Qian (coin) to grams (g) that is in use currently. One Qian is equal to 3.125 g.[6] This was then discussed with other authors to make sure this translation was appropriate.
- Step 2: Induct and rearrange the herb name into groups based on herb property characteristics and then translate them into both PinYin names and English names. Analyzation of the prescription may include in what classic formula (s) routinely introduced in Chinese medicine textbooks.
- Step 3: Analyze the herbal action for each group and potential symptoms or conditions the patient may have had. An analysis of classic formula (s) used in the prescription may represent what clinical condition was being treated at that time.
- Step 4: Summarize the analysis to give a comprehensive picture of the patient.

Table 1: Herbs in original hand-written prescription and dose (g)

Column	Original name	Standard name	Preprepare	Original dose (coin)	Current dose (g)	Total (g)
			Line 1			
1	Jin Ying Zi (金应子)	Jin Ying Zi （金樱子）	stir-frying with wine	6	20	
2	Jin Yin Hua（金银花）			5	16	
3	Ji Geng (吉更)	Jie Geng（桔梗）		7	22	
4	Xiang Fu（香附）	Xiang Fu Zi（香附子）	stir-frying with wine	7	22	
5	Hou Po（厚朴）		stir-frying with yellow rice wine	7	22	
6	Zhi Qiao（只壳）	Zhi Qiao（枳壳）	stir-frying with flour	2	6	
7	Pu Huang（蒲黄）			2	6	
8	She Xiang（射香）	She Xiang（麝香）		0.5	1.6	
9	Da Huang（大黄）		stir-frying with wine	7	22	
10	Ru Xiang（乳香）			7	22	
11	Kuan Dong Hua（款冬花）			7	22	
12	Lian Zhao（连召）	Lian Qiao（连翘）		2	6	
13	Ju Hua（菊花）			2	6	
			Line 2			
1	She Gan（射干）			3	10	
2	Bai Yi（白薏）	Yi Yi Ren（薏苡仁）	stir-frying	6	20	
3	Chi Shao（赤芍）			7	22	
4	He Ren（何人）	He Shou Wu（何首乌）		2	6	
5	Jing Jie（京芥）	Jing Jie（荆芥）		6	20	
6	Bai Ji（白及）		stir-frying with wine	2	6	
7	Qian Hu（前胡）			2	6	
8	Jiang Huo（姜活）	Qiang Huo（羌活）		2	6	
9	Mu Tong（木通）			7	22	
10	Qing Dai（青代）	Qing Dai（青黛）		6	20	
11	Fu Hua（福花）	Xuan Fu Hua（旋覆花）		6	20	
12	Dou Gen（豆根）	Shan Dou Gen（山豆根）		6	20	
13	Dan Cao（胆草）	Long Dan Cao（龙胆草）		6	20	
			Line 3			
1	Niu Zi（牛子）	Niu Bang Zi（牛蒡子）	stir-frying	7	22	
2	Bai Bu（百部）			2	6	
3	Ke Zi（柯子）	He Zi（诃子）		2个	6	
4	Chen Pi（陈皮）			6	20	
5	Chai Hu（柴胡）			7	22	
6	Ju Hong（橘红）	Hua Ju Hong（化橘红）	unhairing and striking	2	6	
7	Gan Ge（干葛）	Ge Gen（葛根）		2	6	
8	Du Huo（独活）			2	6	
9	Fang Feng（防风）			6	20	
10	Ze Xie（泽泻）			7	22	
11	Hua Fen（花粉）	Tian Hua Fen（天花粉）		2	6	
12	Bei Mu（贝母）	Zhe Bei Mu（浙贝母）	striking	7	22	
13	Zhi Mu（知母）			6	20	

Contd...

Table 1: Contd...

Column	Original name	Standard name	Preprepare	Original dose (coin)	Current dose (g)	Total (g)
			Line 4			
1	Jiang Chong（姜虫）	Bai Jiang Can（白僵蚕）	stir-frying with wine	7	22	
2	Zhu Li（竹力）	Zhu Li（竹沥）		1	3	
3	Zi Yuan（紫苑）	Zi Wan（紫菀）	stir-frying with wine	6	20	
4	Yuan Shen（元参）	Xuan Shen（玄参）		7	22	
5	Bai Jie Zi（白芥子）		stir-frying with wine	2	6	
6	Jiao Ci（角刺）	Zao Jiao Ci（皂角刺）		6	20	
7	Shuang Bai（双白）	Sang Bai Pi (桑白皮)		3	10	
8	Chong Cao（虫草）	Dong Chong Xia Cao（冬虫夏草）		2	6	
9	Fang Ji（防己）		stir-frying with wine	2	6	
10	Dan Pi（丹皮）	Mu Dan Pi（牡丹皮）		2	6	
11	Ze Lan（泽兰）			7	22	
12	Sha Ren（砂仁）		striking	7	22	
13	Dong Zao（冬早）	Dong Zao（冬枣）		3只	10	
			Line 5			
1	Sheng Di（生地）	Sheng Di Huang（生地黄）		5	16	
2	Hong Hua（红花）			3	10	
3	Dang Gui（当归）			2	6	
4	Yuan Hu（元胡）	Xuan Hu Suo（玄胡索）		2	6	
5	Wu Yao（乌药）			6	20	
6	Lou Ren（蒌仁）	Gua Lou Ren（瓜蒌仁）	stir-frying	7	22	
7	Shan Cha（山查）	Shan Zha（山楂）		7	22	
8	Gan Cao（甘草）			2	6	
9	Xi Xin（细辛）			6	20	
10	Xiao Hui（小茴）	Xiao Hui Xiang（小茴香）		6	20	
11	Hai Shi（海石）	Hai Fu Shi（海浮石）		6	20	
12	Chang Shan（常山）			2	6	
13	Sheng Jiang（生姜）			9片	10	
Total (g)						934.6

净水煎服，兑付滑石、朴硝，委林细女恒市取福照，丙午年十二月初十日写。

Results

Transformation of Doc Hay's hand-written prescription to standard words is shown in Table 1. The prescription consisted of a total of 67 herbs including Hua Shi (Talc/Talcum), Po Xiao (Mirabilite/Natrii Sulfas), and a weight of 934.6 g. Hua Shi (Talc/Talcum) and Po Xiao (Mirabilite/Natrii Sulfas) did not have their dosage indicated.

Herb names categorized into groups based on herb property characteristics are shown in Table 2. Potential classic formula (s) included and their major actions are shown in Table 3.

Analyze each group's herbal actions and use for potential symptoms or conditions, and analyze classic formula (s) used in the prescription, as this may represent what clinical condition was being treated. The gender or age of the patient could not be determined, but the possibility of male is higher (due to the patient who might have "nocturnal emission," see below).

Main symptoms and signs (tongue and pulse reading)

The prominent symptoms were: sore throat (maybe with swelling), strong coughing and with difficult breathing; sputum difficult to expectorate (may be thick). Bad coughing that caused pain in chest, side of rib cage, abdomen, and even lower abdomen area. It also caused blood in the sputum; sputum color may be yellow. The patient had obvious chills, fever, pain in limbs (may have had joint swelling as well), indigestion, bloating, and constipation. The patient might also have nocturnal emission and also had obvious anxiety. Patient's tongue would be red, coating might be yellow, greasy, and dry. The pulse might be large and floating, and weak when pressing slightly hard.

Table 2: Herb names categorized into groups based on herb property characteristics

Category	*n*	Herb(s) in Chinese	Herbs in English (Origin)	For conditions
Clear heat and comfort throat, reduce swelling and relieve pain	5	Jin Ying Zi (金樱子)、	Cherokee rose fruit (*Rosa laevigata Michx*.)	Sore throat, hoarse voice
		Niu Bang Zi (牛蒡子)、	Great burdock fruit (*Arctium lappa* L.)	
		He Zi (诃子)、	Medicine terminalia (*Terminalia chebula* Retz)	
		Shan Dou Gen (山豆根)、	Vietnamese sophora root (*Sophora tonkinensis* Gagnep.)	
		Bai Jiang Can (白僵蚕)	Stiff silkworm (*Bombyx mori Linnaeus*)	
Clear heat and detoxify, cleaning lung heat	8	Jin Yin Hua (金银花)、	Honeysuckle Flower (*Lonicera japonica* Thunb.)	Obvious fever with chills, body aches, cough with yellow spitting
		Lian Qiao (连翘)、	Weeping Forsythia Capsule (*Forsythia suspense* (Thunb.)Vahl)	
		Ju Hua (菊花)、	Chrysanthemum(*Chrysanthemum morifolium* Ramat)	
		Sang Bai Pi (桑白皮)、	White mulberry root-bark (*Morus alba* L.)	
		Qin Dai (青黛)、	Nature indigo (*Baphicacanthus cusia* (Nees) Bremek)	
		Long Dan Cao (龙胆草)、	Gentiana root (*Gentiana manshurica* Kitag)	
		Zhi Mu (知母)、	Common anemarrhena rhizome (*Anemarrhena asphodeloides* Bge.)	
		Chang Shan (常山)	Antifebrile dichroa root (*Dichroa febrifuga* Lour.)	
Expel wind and relieve exterior pattern	7	Jing Jie (荆芥)、	Fineleaf schizonepeta herb (*Schizonepeta tenuifolia* Briq)	Chill, body or joint aches, neck and back pain and stiff
		Qiang Huo (羌活)、	incised notopterygium rhizome and root (*Notopterygium incisum* Ting ex H.T.Chang)	
		Du Huo (独活)、	Doubleteeth pubescent angelica root (*Angelica pubescens* Maxim. f. biserrata Shah et Yuan)	
		Fang Feng (防风)、	Divaricate saposhniovia root (*Saposhnikovia divaricata* (Turcz.) Schischk.)	
		Ge Gen (葛根)、	Pueraria root (*Pueraria lobata* (W.) Ohwi)	
		Xi Xin (细辛)、	Manchurian wildginger root (*Asarum heterotropoides* Fr. Schmidt var. mandshuricum (Maxim.) Kitag.)	
		Sheng Jiang (生姜)	Fresh ginger (*Zingiber officinale* Rosc.)	
Remove sputum and smooth breathing, esp. thin the thick (and old) sputum	12	She Gan (射干)、	Blackberry lily rhizome (*Belamcanda chinensis* (L.) DC.)	Cough with sticky sputum, difficult to cough up, short of breath
		Jie Gang (桔梗)、	Upright ladybell root (*Adenophora tetraphylla* (Thunb.) Fisch.)	
		Kuan Dong Hua (款冬花)、	Common coltsfoot flower (*Tussilago farfara* L.)	
		Zi Wan (紫菀)、	Tatarian aster root (*Aster tataricus* L. f.)	
		Qian Hu (前胡)、	Common hogfennel root(*Peucedanum praeruptorum* Dunn)	
		Zhu Li (竹沥)、	Bamboo juice (*Phyllostachysnigra* (Lodd.exLindl.) Munrovar. henonis (Mitf.)StapfetRendle)	
		Bai Bu (百部)、	Stemonae root (*Stemona sessilifolia* (Miq.) Miq.)	
		Tian Hua Fen (天花粉)、	Trichosanthis root (*Trichosanthes kirilowii* Maxim.)	
		Zhe Bei Mu (浙贝母)、	Thunberbg fritillary bulb (*Fritillaria thunbergii* Miq)	
		Bai Jie Zi (白芥子)、	White mustard seed (*Sinapis alba* L.)	
		Zao Jiao Ci (皂角刺)、	Honeylocust (*Gleditsia sinensis* Lam.)	
		Hai Fu Shi (海浮石)	Pumice (*Costazia aculeata* Canu et Bassler)	
Regulate Qi and relieve pain	10	Chai Hu (柴胡)、	Bupleuri root (*Bupleurum chinense* DC)	Discomfort or tight at chest, side of ribcage, stomach, or abdominal distension, gassy
		Xiang Fu Zi (香附子)、	Nutgrass galingale rhizome (*Cyperus rotundus* L.)	
		Xuan Fu Hua (旋覆花)、	Inula flower (*Inula britannica* L.)	
		Hua Ju Hong (化橘红)、	Tomentose pummelo peel (*Citrus grandis* 'Tomentosa)	
		Chen Pi (陈皮)、	Tangerine peel (*Citri Reticulatae* Pericarpium)	
		Sha Ren (砂仁)、	Amomi nut and shell (*Amomum villosum*)	
		Hou Po (厚朴)、	Officinalis bark (*Magnolia officinalis*)	
		Zhi Ke (枳壳)、	Immature trifoliate-orange fruit (*Fructus* aurantii)	
		Xiao Hui Xiang (小茴香)、	Fennel (*Foeniculum vulgare* Mill.)	
		Wu Yao (乌药)	Combined spicebush root (*Lindera aggregata* (Sims) Kosterm.)	
Cool blood and stop bleeding	4	Chi Shao (赤芍)、	Red peony root (*Paeonia lactiflora* Pall.)	"Blood heat" causing bleeding or bleeding tendency
		Mu Dan Pi (牡丹皮)、	Tree peony bark (*Paeonia suffruticosa* Andr.)	
		Sheng Di Huang (生地黄)、	Rehmannia glutinosa (*Rehmannia glutinosa* Libosch.)	
		Xuan Shen (玄参)	Figwort root (*Scrophularia ningpoensis* Hemsl.)	

Contd...

Table 2: Contd...

Category	*n*	Herb(s) in Chinese	Herbs in English (Origin)	For conditions
Stop hemoptysis	2	Pu Huang（蒲黄）、	Cattail pollen (*Typha angustifolia* L.)	Hemoptysis
		Bai Ji（白及）	Common bletilla tuber (*Bletilla striata* (Thunb.) Reichb. f.)	
Drain dampness	6	Yi Yi Ren（薏苡仁）、	Ma-yuen jobstears seed (*Coix lacryma-jobi* L. var. mayuen (Roman.) Stapf)	"Dampness" causing swollen, esp.at lower extremities; less urine
		Fang Ji（防己）、	Fourstamen stephania root (*Stephania tetrandra* S. Moore.)	
		Mu Tong（木通）、	Akebia stem (*Akebia quinata* (Thunb.) Decne)	
		Ze Xie（泽泻）、	Alisma orientale (*Alisma orientalis* (Sam.) Juzep.)	
		Ze Lan（泽兰）、	Herba lycopi (*Lycopus lucidus* Turcz.)	
		Hua Shi（滑石）	Talc (Talcum)	
Stop pain through activating circulation and removing the blood stasis	5	She Xiang（麝香）、	Forest musk abelmosk (*Moschus berezovskii* Flerov)	Pain in the limbs or the whole body, pretty severe and the course of disease may be already long
		Ru Xiang（乳香）、	Frankincense (*Boswellia carterii* Birdw)	
		Hong Hua（红花）、	Safflower (*Carthamus tinctorius* L.)	
		Dang Gui（当归）、	Chinese angelica (*Angelica sinensis* (Oliv.) Diels)	
		Xuan Hu So（玄胡索）	Corydalis (*Corydalis* yanh W.T,Wan)	
Laxative	3	Da Huang（大黄）、	Rhubarb root and rhizome (*Rheum palmatum* L.)	Constipation
		Po Xiao（朴硝）、	Mirabilite *(Natrii Sulfas*)	
		Gua Lou Ren（瓜蒌仁）	Mongolian snakegourd fruit (*Trichosanthes kirilowii* Maxim.)	
Add digestion	1	Shan Zha（山楂）	Crataegus pinnatifida (*Crataegus pinnatifida* Bge.)	Indigestion
Tonify lung	4	He Shou Wu（何首乌）、	Tuber fleeceflower root (*Polygonum multiflorum* Thunb.)	Fatigue, short of breath
		Dong Chong Xia Cao（冬虫夏草）、	Chinese caterpillar fungus (*Cordyceps sinensis* (Berk.) Sacc.)	
		Da Zao（大枣）、	Jujube (*Ziziphus jujuba* Mill)	
		Gan Cao（甘草）	Liquorice root (*Glycyrrhiza uralensis* Fisch.)	

Cook with clean water; Powder of *Hua Shi* and *Po Xiao* (did not mention the dosage) were directly taken with the decoction. Let young lady Lin help patient to get the herbs in Bethlehem, Pennsylvania. Good Luck. Prescribed on January 23, 1907.

Course of illness

Patient's disease or condition might already have persisted for a while and the body had weakness due to persistent illness.

Speculation based on the prescription

It indicated that the patient had obvious pulmonary infection accompanied by severe cough, and probably had prolonged pulmonary tuberculosis (TB) also with acute respiratory infection caused by other bacteria or viruses. The typical herbs used for TB are Chang Shan, Bai Bu, and Po Xiao.

Discussion

Doc Hay did not leave medical history notes for this patient. Therefore, we only can interpret based on the herbs that he used in this prescription. He was famous for treating various infectious and epidemic diseases, as well as other intractable diseases. Some examples are wound infections, flu, Rocky Mountain spotted fever, typhoid fever, polio, meningitis, mumps, venereal disease, frostbite, gangrene, appendicitis, and even sepsis (at that time, "blood poisoning" would have been the name used) caused by many diseases.[5,7] It is worth noting that none of his patients died during the 1918–1920 "Spanish Flu" pandemic in John Day under Doc Hay's herbal tea treatment. At that time, there were pretty large numbers of people who lived in John Day, local population was about 2,000 people plus additional many workers (whose number was unknown) for building-up the highway; while there were 3,500 patients who died throughout Oregon State during the same time. Doc Hay's herbal tea was his "name-card." The prescription discussed herewith is clearly one for an intractable or severe pulmonary infection, with either bacteria or viral origin, although it probably might be mixed with prolonged pulmonary TB. The typical symptoms were severe cough and high fever with body pain. The prescription or formulas inside this prescription, such as Yin Qiao San, Sang Ju Yin, and Zhi Sou San can be used for the treatment of epidemic diseases. In fact, the majority of herbs used in the above-mentioned formula are commonly included in the herbal medicines in China used to effectively fight severe acute respiratory syndrome, H1N1 and currently COVID-19, such as Lian Hua Qing Wen Capsule;[8-13] and supported by pharmacological studies.[10-13]

There is currently a world-wide COVID-19 pandemic, pretty similar to the 1918 "Spanish Flu", which caused a high rate of death and public panic. As of July 28, 2020, there are 16,883,769 COVID-19 cases globally, the pandemic has taken 662, 480 lives. while the number in the US is 4,498,323 and 152,319, respectively.[14,15] This has already caused heavy losses in both people's life and in the economy, especially in America and European countries. During a moment like this, Doc Hay is missed deeply and it is hoped that Chinese herbal remedies can be used in western countries for fighting COVID-19. The authors note that the adoption of Chinese herbal formulas, like the one prescribed by Doc Hay, could effectively fight the current pandemic. They encourage the use of herbal prescriptions for patients with COVID-19. However, at this time, there are many legal barriers within the US that make it difficult for Chinese medicine practitioners

Table 3: Classic formula included in Doc Hay's prescription and their major actions

Pin Yin (Chinese name)	English Name	Herbs included	Main actions	Main manifestations
Yin Qiao San（银翘散）	Lonicera and Forsythia Powder	Jin Yin Hua, Lian Qiao, Jie Geng, Bo He, Zhu Ye, Jing Jie, Tan Dou Shi，Niu Bang Zi	Resolve external pattern with cold-pungent, clear heat and detoxify	Fever, no or slight sweat, slightly chilly, headache, thirst, cough and sore throat; tongue red, tongue coat thin white or yellow, pulse quick
Sang Ju Yin（桑菊饮）	Mulberry Leaf and Chrysanthemum Drink	Sang Ye, Ju Hua, Xin Ren, Lian Qiao, Bo He, Jie Gen, Gan Cao, Lu Wei Gen	Expel wind and clear heat, open lung-qi	Early stage of Wind-Warm disorder/ pneumonia, coughing as a typical symptom, fever is not very high, slightly thirsty
Zhi Sou San（止嗽散）	Cough-Resolving Powder	Jie Gang, Jing Jie, Zi Wan, Bai Bu, Bai Qian, Gan Cao, Chen Pi	Remove Sputum to stop cough, resolve external pattern and open lung-qi	(1) Cough caused by Wind-Warm affecting Lungs, cough with throat irritate, or slightly cold and fever, thin tongue coating thin, and pulse is not very quick. (2) Cough with blood caused by Wind affecting Lungs, cough, sputum thin, tongue coating thin, and pulse floating, not very quick
Qing Ying Tang（清营汤）	Nutrient-Clearing Decoction	Xi Jiao(or Shui Niu Jiao), Sheng Di Huang, Xuan Shen, Zhu Ye Xin, Mai Dong, Lian Qiao, Dan Shen	Clean-Ying, expel heat, nourish Yin and resolve blood stasis	Febrile disease, heat reaches Ying-stage, Fever high at night, thirsty or not thirsty, sometimes with delirium, upset and insomnia, or with light rash, tongue dark red with dry, pulse fast
Xi Jiao Di Huang Tang（犀角地黄汤）	Rhinoceros Horn and Rehmannia Decoction ("Cornus rhinoceri" removed)	Xi Jiao(or Shui Niu Jiao), Sheng Di Huang, Shao Yao, Dan Pi	Clean heat and detoxify, cool-blood, resolve blood stasis	Heat affects Blood-stage. (1) Heat disturbs the mind, high fever with delirium, the tongue may be pricked, and the pulse quick. (2) Heat damages collaterals which causes spotted purple and black, vomiting blood, nosebleed, blood in stool or urine, etc., red tongue, pulse quick. (3) Blood stasis with high fever, consciousness disturbance such as mania-like, or thinking is unclear; thirst but do not swallow water, stool black and soft
Long Dan Xie Gan Tang（龙胆泻肝汤）	Gentian Liver-Draining Decoction	Long Dan Cao, Zhi Zi, Huang Qin, Mu Tong, Ze Xie, Che Qian Zi, Chai Hu, Gan Cao, Dang Gui, Sheng Di Huang	Drain Liver-gall bladder fire, and clean Liver meridian damp-heat	(1) Headache, red eyes, side of rib-cage pain, bitter mouth, deafness, ear swelling, tongue red with coating yellow, pulse thin-string; (2) Genital area swollen, itchy, sweat, urine cloudy, erectile dysfunction in men or yellow stinky vaginal discharge in women, tongue red, with yellow greasy coating, pulse string
Chai Hu Shu Gan San（柴胡疏肝散）	Bupleurum Liver-Soothing Powder	Chai Hu, Xiang Fu Zi, Chuan Xiong, Shao Yao, Chen Pi, Zhi Ke, Fan Cao	Regulating and Soothing liver-qi, promoting blood circulation and relieving pain	Pain in the rib cage, chest tightness and like to sigh; depressed and anxious; or belching, stuffy in whole belly; pulse string

to treat pandemic patients, at both the state and federal level. If more research, like that found in this article, can be made public, legal barriers to using Chinese herbs may be removed.

One of the unique characteristics of Doc Hay's prescription is that his formula composition is extremely broad, typically consisting of 50–80 herbs.[5] It is very rare to see a Chinese medicine doctor using such a large formula, which included 67 herbs and weighed approximately 934.6 g, discussed herewith. In general, Chinese medicine doctors' prescription includes an average of 10–15 herbs, and the herbs in each prescription weigh 100–150 g. The herbal weight of Doc Hay's prescription is about 5–10 times more to other Chinese medicine doctors. Doc Hay did not mention how many days the herbs in this big prescription (934.6 g/dose) can be used for. In common sense, it cannot be used for 1 day only. The current authors speculate that it is for a 5–7-day dosage, because when the patient saw Doc Hay, it was in the winter. Boiling one dose of 67 herbs with clean water with a big pot (Doc Hay did not mention how much water should be used, and how much decoction should get after the cooking), the decoction might be stored and used for 1 week without going rancid. In fact, doc Hay and Lung On let patients store the herbal tea in used glass beer bottles (about 350ml/bottle), and used beer bottles for measurement.[16] It looks like let patients drink one bottle a time, several times a day. A bigger

prescription (with the number of herbs much more than the routine number) has more active components and may be more fit for a patient with complicated disease, with multiple conditions or symptoms, although whether it is absolutely better than a smaller prescription is difficult to judge.

At the end of the prescription, Doc Hay mentioned that he will let patient go back to his hometown called Heng Shi (恒市 Heng city); the current authors speculate that this hometown is Bethlehem, Pennsylvania, but are not positive. The prescription was written on lunar calendar December 10, 1906 (丙午年十二月初十日), while a light green note attached to the prescription sheet only marked "December 10, 1906" as former researcher's translation may cause confusion, as actually it should be marked as "January 23, 1907" because currently the solar calendar has been adopted.

All photos are provided by Dr. Arthur Yin Fan. Due to the limitation of the authors' personal backgrounds, experiences, and perspectives, this article may have some omissions, limitations and errors; comments or corrections are welcomed and appreciated.

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An Important Acupuncture Demonstration in the History of Legalization of Acupuncture in the United States

Sam Xian Sheng Huang[1,2], Jun Hu[1,2,3]

[1]American Association of Chinese Medicine and Acupuncture, [2]Board Directors of Research Institute of Chinese Medicine, San Francisco, [3]Myway Health LLC, Hu Jun Chinese Medicine & Acupuncture Clinic, Sacramento, USA

Abstract

This article details a public acupuncture demonstration that took place on May 9, 1972, in San Francisco, California. It was conducted by two traditional Chinese medicine doctors Pien Bae Chi (卞伯岐) and Leung Kok Yuen (梁觉玄), and was observed by 500 American medical doctors. This was an important public acupuncture demonstration in the early history of acupunccture in the United States (US). It directly promoted the passage of the first acupuncture bill by California government and had a significant impact on the legalization of acupuncture in California.

Keywords: Acupuncture, Leung Kok Yuen (梁觉玄), legalization, history of Chinese medicine, James Reston, Pien Bae Chi (卞伯岐)

Introduction

As of 2015, there had been about 35,000 licensed acupuncturists in the US, the country with the most acupuncture doctors outside of China. California had nearly 12,000 licensed acupuncturists, about one-third of the country's total.[1] California is, and has been, an important state for traditional Chinese medicine (TCM) and acupuncture, with the legalization of acupuncture there over 40 years ago. However, the road to this legalization had been a bumpy one.

Forerunners to the Acupuncture Demonstration in San Francisco

The history of TCM in the US can be traced back to the 1850s when early Chinese immigrants began arriving, primarily through the port of San Francisco. Because of the native American Indians' traditions and customs of using herbal medicine to treat diseases, the use of TCM herbal medicine to treat diseases could be carried out openly without a license.[2] Due to its needling penetrating the skin, acupuncture was considered a medical practice and needed to apply for a medical license; otherwise, it was illegal. Therefore, those early Chinese acupuncturists could only practice acupuncture underground, making it impossible to have public acupuncture demonstrations.

On July 26, 1971, James Reston, an influential journalist and the Vice President of *The New York Times*, published an article detailing his personal acupuncture experience in Beijing.[3,4] This article sparked a great interest in acupuncture. In fact, before and after Reston's visit, groups of American scientists and medical experts visited China and watched acupuncture anesthesia. From May 10 to 24, 1971, Arthur Galston, a botanist at Yale University, and Ethan Signer, a biologist at Massachusetts Institute of Technology, were the first group who visited China. The second group visited China in September 1971, including Paul Dudley White, a cardiologist at Massachusetts General Hospital and professor at Harvard Medical School; Grey Diamond, Dean of the School of Health Sciences at the University of Missouri; Victor Sidel, an epidemiology and population health professor at the Albert Einstein School of Medicine; and Samuel Rosen, a professor

Address for correspondence: Dr. Jun Hu,
American Association of Chinese Medicine and Acupuncture,
San Francisco, CA 94108, USA.
Research Institute of Chinese Medicine, San Francisco, CA 94108, USA.
Myway Health LLC, Sacramento, CA 95180, USA.
E-mail: ushujun@yahoo.com

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of otolaryngology at Mount Sinai School of Medicine. These scientists and medical experts, as well as other visitors, recounted, through pictures and articles to the American medical community and the general public, what they saw and heard about acupuncture anesthesia in China.[5,6] The astounding picture of acupuncture anesthesia surprised and shocked the American public. All of these communications contributed to creating a "acupuncture heat" in the country and the ensuing "China Heat" triggered by President Nixon's visit to China in February 1972.

At that time, although there was some awareness of educational and experimental acupuncture in the US, most medical doctors had almost no knowledge of acupuncture and had never seen it in practice. There was both doubt and mystery about acupuncture, though it boasted a history of over 5000 years. The medical community wanted to observe acupuncture therapy with their own eyes. The American Medical Association was planning to hold its annual conference at the Stanford University, near San Francisco, in June 1972. Acupuncture was anticipated to be a hot topic at the conference. Many California physicians were planning to attend and they hoped to acquire a preliminary understanding of acupuncture.[7]

San Francisco, the largest Chinese settlement and commercial center in North America, with the world's largest Chinatown, had abundant TCM and acupuncture resources. Thus, its geographic and human advantages made it an opportune place to have an acupuncture demonstration by TCM doctors.

The Acupuncture Demonstration

In the early 1972, Chinese medical doctor Jane Lee, introduced by a friend, met Dr. Pien Bae Chi [Figure 1], a well-known TCM doctor in San Francisco, and invited him to demonstrate acupuncture for the California Medical Association (CMA).

According to Dr. Pien's memoir,[8] he hesitated to give this acupuncture demonstration. On the one hand, he feared that the demonstrator would be accused of practicing medicine illegally. On the other hand, he worried that Dr. Lee had once been commissioned by the CMA to show through a public demonstration that acupuncture was not effective in treating illnesses, thereby denigrating TCM and acupuncture. After repeated persuasions, he finally agreed, on the condition that his former colleague in Hong Kong, an acupuncture expert, Dr. Leung Kok Yuen [Figure 2] must also be invited. Dr. Leung was then living in Vancouver, Canada.

The acupuncture demonstration, jointly organized by the San Francisco Medical Society and the San Francisco Medical School, was held in San Francisco on May 9, 1972, as a medical education experiment. The event received major media coverage in San Francisco and in Sacramento, California's state capital.[9-12] About 500 medical doctors, including surgeons and anesthesiologists, attended the demonstration. CMA President Dr. Thomas Elmendorf started the meeting and introduced Dr. Pien and Dr. Leung. An interpreter briefly introduced TCM and acupuncture to everyone. Next, three individuals received treatment; none of them had ever had acupuncture.

The first was Dr. Elmendorf. The 52-year-old doctor had suffered from severe arthritis in his hip for more than 4 years. He had pain in his buttocks and legs, accompanied by limping. Dr. Elmendorf laid himself onto the treatment table. Dr. Leung first applied moxibustion to the area where the needles were to be applied, and then pushed 2" needles into Dr. Elmendorf's legs and lower back. Four needles were used in total. Dr. Leung and Dr. Pien also applied short-term manipulations. Minutes later, Dr. Elmendorf arose from the table and said to the 500 colleague observers: "There's no question. There is considerable relief in my hip; I still have a little pain in my right leg. The relief feels good."

The second was Arlene Wong, a middle-aged, registered nurse. She had been injured in a car accident 7 years ago and suffered from lower back pain. She carried an electronic device called a dorsal stimulator which wires were attached to her back. When pressing a button, an electrical current would transmit through the wires to give her a temporary pain relief. Dr. Pien and Dr. Leung used acupuncture on her back, buttock, calf and ankle.

Figure 1: Pien Bae Chi (卞伯岐)

Figure 2: Leung Kok Yuen (梁觉玄)

In less than 10 min, Ms. Wong stated, "I don't feel the pain I had …. This is beautiful."

The third was George Noe, a 19-year-old student from the University of California. He hoped to use acupuncture anesthesia for his tooth extraction. Dr. Leung and Dr. Pien did acupuncture points on Mr. Noe's hands and feet, and withdrew the needles after 30 min. The student felt partial numbness in his arms but no numbness near his mouth. Dr. Leung explained that because of the large venue and too many people that day the noise had affected the effect. He also said that acupuncture anesthesia does have a clinical failure rate and was not always successful.[9]

This public acupuncture demonstration allowed hundreds of American medical doctors to witness the immediate effects of acupuncture in the treatment of pain.

Factors in the Success of the Acupuncture Demonstration

The success of the acupuncture demonstration was primarily due to the fact that the two TCM doctors had a very solid theoretical foundation as well as rich clinical experiences in TCM and acupuncture. They had both been taught by famous doctors and were reputed and outstanding, TCM doctors.

Dr. Pien Bae Chi was born in 1910 in Changwu, Jiangsu Province. He studied under Wang Daopin (王道平), a successor of the Menghe School (孟和学派); also Dr. Pien was specializing in laryngology and acupuncture. Dr. Pien practiced in Changwu and Changzhou and served as the President of the Changwu TCM Association. In 1949, he moved to Hong Kong and founded the "Daoshengtang" TCM store while also practicing TCM. His medical reputation spread throughout Hong Kong in the 1950s. The Hong Kong newspaper "Sing Tao Daily" opened a column for Dr. Pien called "Inquiry on Diseases and Treatments". It was later compiled and published as the book "Inquiry on Diseases and Treatments," and the book title was written by Zhang Daqian (张大千). Dr. Pien moved from Hong Kong to San Francisco in 1967 and continued to practice TCM in San Francisco's Chinatown.[13]

Dr. Leung Kok Yuen was born 1922 in Shunde, a city in the Guangdong province, China. His father was former Director of the Guangdong Provincial Department of Political Affairs. After his resignation, he worked as a TCM doctor for more than 40 years. Dr. Leung Kok Yuen followed in his father's footsteps to study and to practice TCM. He studied TCM and acupuncture under Dr. Deng Kunming (邓昆明), a disciple from the Chengjiang School (澄江学派). Dr. Leung began independent practice in 1941. In 1951, he was invited to teach acupuncture at the Hong Kong Modern College of TCM. He later served as a professor and the Dean of the Chinese Academy of Acupuncture. He also served as the Chairman of the Hong Kong Acupuncture Society, among other prestigious positions. He moved to Vancouver, Canada in 1969.[14]

During the acupuncture demonstration, Dr. Pien and Dr. Leung, two senior TCM doctors, faced hundreds of American medical doctors and three unknown patients. Under those conditions, it was undoubtedly a huge challenge to show the effects of acupuncture therapy. Had the demonstration failed, it would have caused not only great damage to their personal reputations but also an extremely negative impact on the entire TCM and acupuncture industry. They bravely accepted this challenge. This requires great confidence in their own medical skills.

Another factor in the success of the demonstration was that two of the demonstration cases were conditions for which acupuncture could produce immediate effects.

Post Acupuncture Demonstration Effects

One month later, on June 29, 1972, Dr. Pien and Dr. Leung were invited by CMA President Dr. Elmendorf to attend a press conference at the California State Capitol to promote the AB1500 bill and to give an acupuncture demonstration. Some government officials attended the press conference and watched the acupuncture demonstration[15] [Figures 3 and 4].

The AB1500 bill was proposed by a California Assembly member Gordon Duffy, and supported by the CMA. The bill mainly stipulated that acupuncturists could act as physicians' assistants to perform acupuncture treatment. Acupuncture treatment should be carried out as a clinical experiment in California medical schools. The AB1500 bill was passed in California in 1972. It was the first bill in the US that was related to acupuncture.[16] However, it was flawed. According to AB1500 Bill, acupuncturists could not perform acupuncture independently. Therefore, it did not solve the legal practice issue of practicing acupuncture. For this reason, the bill was criticized by acupuncturists and by some in the public community.

In Nevada, from March 19 to April 6, 1974, Dr. Lok Yee Kun (陆易公) from Hong Kong conducted acupuncture demonstrations for state legislators and the public.[17] These demonstrations successfully promoted and contributed to the passage of the nation's first legalization of acupuncture


At Capitol

MD Gets Point Of Acupuncture

PUC Names 1969 Law Grad, 28, As Chief Counsel, Draws Fire

Brazil Builds Nuclear Plant

Old Tradition

Dr. Tom Elmendorf

Needle is inserted.

Dr. Kok Yuen

FURNITURE RAW

Figure 3: Pian-Leung, 1972

State bill backs acupuncture

Assemblyman Gordon Duffy, R-Hanford, center, author of a bill that would allow a nonphysician to perform acupuncture in California medical schools, watches as Dr. Kok Yuen Leung of Vancouver performs the ritual on Dr. Thomas Elmendorf at a news conference in Sacramento.

Dr. Leung is shown burning a herb next to one of several needles inserted into Dr. Elmendorf's hip and leg to allow penetration of the herb into the body. Dr. Elmendorf is president-elect of the California Medical Association, and suffers from arthritis. At right is Dr. Jane Lee.

Figure 4: Kok Leung, 1972

in Nevada. The bill recognized TCM as a learned profession and was an important turning point in the history of TCM and acupuncture in the US.

In July 1975, the Governor of California Jerry Brown signed the SB86 Bill,[18] making California the eighth state in the US to legislate acupuncture.

Dr. Pien participated in the establishment of the California TCM and Acupuncture Research Association in San Francisco, the first professional organization of TCM and acupuncture in the US. He also served as the second term President of the Association. In 1998, Dr. Pien passed away in his hometown, Changwu, at the age of 88.

Dr. Leung was in the first batch of registered acupuncturists in Washington State in 1973 and became a registered acupuncture teacher at the Oregon Department of Education in 1986. He has trained a large number of overseas acupuncturists. He practiced TCM and acupuncture in Seattle until his retirement.[14] Dr. Leung passed away in Vancouver, Canada in 2013, at the age of 91.

History will always commemorate Dr. Pien's and Dr. Leung's important contributions to the development of TCM and acupuncture overseas.

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Research Advances of Traditional Chinese Medicine in Cancer Immunotherapy

Jing Li[1,2,3], Shengqi Wang[1,2,3], Neng Wang[1,3,4], Zhiyu Wang[1,2,3,4]

[1]The Research Centre of Integrative Cancer Medicine, Discipline of Integrated Chinese and Western Medicine, The Second Affiliated Hospital of Guangzhou University of Chinese Medicine, [2]Guangdong Provincial Key Laboratory of Clinical Research on Traditional Chinese Medicine Syndrome, Guangdong Provincial Academy of Chinese Medical Sciences, Guangdong Provincial Hospital of Chinese Medicine, [3]Guangdong-Hong Kong-Macau Joint Lab on Chinese Medicine and Immune Disease Research, Guangzhou University of Chinese Medicine, [4]Research Center of Integrative Medicine, School of Basic Medical Sciences, Guangzhou University of Chinese Medicine, Guangzhou, Guangdong, China

Abstract

Tumorigenesis are closely associated with the immune function of the human body. Immunotherapy has emerged as a novel and promising treatment strategy in multiple malignancies in the 21st century. Traditional Chinese medicine (TCM) has been extensively used for cancer treatment in China and surrounding countries for it exerts efficient therapeutic effects with few side effects. In recent years, studies have demonstrated that TCM plays a unique and reliable role in regulating tumor immunity. TCM can enhance the antitumor immune response function by regulating the secretion of cytokines, reshaping the balance of immune cells, and regulating immune checkpoints to relieve the immunosuppression. In addition, TCM can reduce the side effects (e.g., cytokine storm) of cancer immunotherapy. Based on the current research of active immunotherapy and passive immunotherapy, this review summarizes the potential applications and existing problems of TCM in tumor immunotherapy. This review may be helpful in illuminating the scientific basis of TCM in tumor immunotherapy, promoting its internationalization, as well as shedding innovating new strategies for the development of tumor immunotherapy.

Keywords: Cytokine, immune balance, immune checkpoint, traditional Chinese medicine, tumor immunotherapy

Introduction

Immunotherapy is one of the main clinical therapeutic strategies for cancer treatment, especially in the metastatic stage. Cancer immunotherapy came into being in the late 19th century, but it has developed rapidly in the past 30 years. In 1967, Burnet first proposed the concept of immune surveillance.[1] In 1991, the clinical application of cytokine-induced killer cells (CIK) against tumors was first reported by Stanford University in the United States (US).[2] In the past few years, immunotherapy has been extensively applied in clinical settings and has achieved success in treating several types of malignant tumors. By the end of 2016, the US Food and Drug Administration had approved approximately 50 kinds of antibody drugs for cancer immunotherapy. Clinical studies[3] have suggested that the 4-year survival rate of cancer patients treated by immunotherapy, which resulted in complete remission (CR) or partial remission, can be as high as 58%, five times higher than that of chemotherapy treatment. Cancer immunotherapy strategies can be divided into the active and the passive. Active immunotherapy strategies include cytokine therapy, immune checkpoint inhibitor therapy, and tumor vaccine, while passive immunotherapy strategies consist of lymphokine-activated killer cells (LAK), tumor-infiltrating

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Address for correspondence: Prof. Zhiyu Wang, The Research Centre of Integrative Cancer Medicine, Discipline of Integrated Chinese and Western Medicine, The Second Affiliated Hospital of Guangzhou University of Chinese Medicine, Guangzhou, Guangdong, China. Guangdong Provincial Key Laboratory of Clinical Research on Traditional Chinese Medicine Syndrome, Guangdong Provincial Academy of Chinese Medical Sciences, Guangdong Provincial Hospital of Chinese Medicine, Guangzhou, Guangdong, China. Guangdong-Hong Kong-Macau Joint Lab on Chinese Medicine and Immune Disease Research, Guangzhou University of Chinese Medicine, Guangzhou, Guangdong, China.
E-mail: wangzhiyu976@126.com

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lymphocytes (TIL), chimeric antigen receptor T-cells (CAR-T), T-cell receptor (TCR) chimeric T-cells (TCR-T), and CIK. The detailed process of passive immunotherapy is illustrated in Figure 1. Compared with the other treatments, cancer immunotherapy has wide-range application, good clinical prognosis, and significant survival trailing effect. Although significant advances have been made in clinical settings, there still exist several obstacles, such as low response rates and therapeutic resistance after initial benefit. These obstacles can be attributed to the instability of tumor genome. Multigene mutations in tumors lead to different gene phenotypes and immune-resistant molecule, which confuse the immune system and escape immune surveillance, resulting in the low response rate and drug resistance of immunotherapy. At present, the main obstacles of tumor immunotherapy include (1) how to enhance the lethality of antitumor effector cells and cytokines; (2) how to reverse the inhibitory effect of tumor cells on tumor effector cells; (3) how to mend the low response rates of tumor patients to immunotherapy; and (4) how to solve the drug-resistance issue of immunotherapy drugs.

There is no clear definition of immunotherapy in the theoretical system of traditional Chinese medicine (TCM). The understanding of immunity in TCM is mainly reflected in the term "healthy qi (正气)," according to which, "Sufficient healthy-qi inside the body will prevent the invasion of pathogenic factors," "Evil-qi will come and become entrenched when healthy qi accumulation is insufficient," and "Healthy-qi deficiency will lead to cancer.[4]" Nowadays, the functional activities of the human body, as well as its abilities to adapt to the external environment, to resist disease and dispel pathogens, and to regulate and repair, have been incorporated into "healthy qi" by modern TCM scholars. The functions of healthy qi in resisting harmful xenobiotics and regulating physiological homeostasis are consistent with the theories of immune defense, immune homeostasis, and immune surveillance in the modern medicine. *Su Wen* "Bao Ming Quan Xing Lun" (《素问·宝命全形论》 *Basic Question* "Discourse on Treasuring Life and Preserving Physical Appearance") recorded that "life is tangible and can't be separated from Yin and Yang." *Su Wen* "Sheng Qi Tong Tian Lun" (《素问·生气通天论》 *Basic Questions* "Discourse on how the Generative Qi Communicates with Heaven") explained that "the foundation of life is based on Yin and Yang. When the Yin and Yang are in equilibrium, one will be mentally healthy." In TCM theory, it is stated that human health is achieved only when the Yin and Yang regulations are dynamically balanced. The functions of the human body in identifying self-components and removing harmful xenobiotics to maintain physiological homeostasis are the important manifestations of Yin and Yang balance in the human body. For example, some immune cells and immune molecules can promote immunity, while others play feedback inhibitory effects on overactivated immune response, suggesting a close interaction balance between them. However, sufficient healthy qi is a prerequisite for maintaining the dynamic balance of Yin and Yang in the human body. Their balance will bring health, while their imbalance will result in sickness. TCM has been empirically employed in clinical settings for thousands of years. Modern researchers have demonstrated that TCM can enhance the immune function of the human body by regulating the secretion of cytokines, regulating the transduction of abnormal cell signals, promoting the proliferation and differentiation of effector cells, and reshaping Th1/Th2 balance as well as M1/M2 balance. With the continuous development of TCM, it is playing an increasingly important role in cancer immunotherapy.

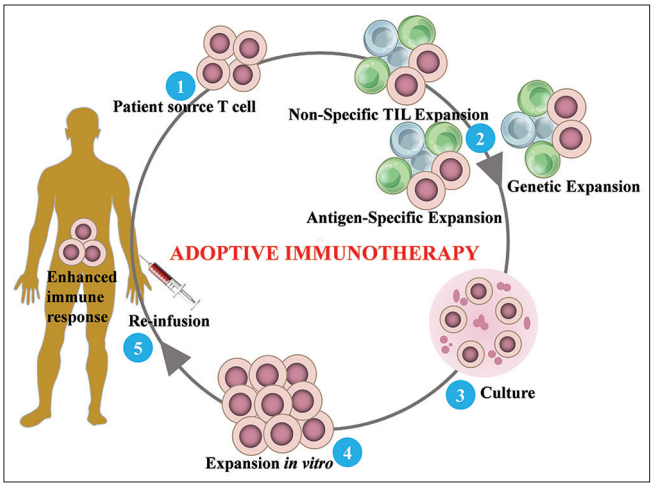

Figure 1: The process of adoptive T-cell Immunotherapy

Classifications and Advances of Cancer Immunotherapy

Active immunotherapy

Cytokine therapy

Cytokines are the cornerstone of cancer immunity. Cytokines are highly active multifunctional soluble proteins which are mainly secreted by activated immune cells and play an intermediary role in tumor immunity. Common cytokines include lymphokines, mononuclear factors as well as various factors secreted by other cells. So far, the roles of interferon-a (IFN)-a, interleukin (IL)-2, and granulocyte-macrophage colony-stimulating factor (GM-CSF) in the treatment of advanced malignant melanoma and renal cell carcinoma have been clinically validated.[5] At present, efficient cytokines have been developed with the application of genetic bioengineering technology in the field of medicine. The immune response of the human body could be significantly enhanced by combining cytokines with tumor vaccines. For example, a new vaccine with stronger immunogenicity can be prepared by transfecting cytokine genes into tumor cells. In addition, when transferring cytokine genes into antitumor effector cells, the local cytokine concentrations in tumors are greatly increased and therefore they can activate the antitumor immune response more effectively.

Tumor vaccine

In the 19th century, William Coley had suggested the idea of finding suitable tumor cell antigens to prepare tumor vaccines for activating the immune system.[6] Tumor vaccines have higher specificity and less toxicity than traditional radiotherapy and chemotherapy. At present, tumor vaccines can be divided into four categories including whole-cell vaccines, tumor polypeptide vaccines, genetic engineering vaccines, and antibody tumor vaccines. Although tumor vaccines have great potential effects, it is still embryonic in clinical application. In the late 20th century, the Bacillus Calmette–Guerin (BCG) vaccine became the standard therapy for superficial bladder cancer in the United States.[7] However, it is not effective for nonmuscular invasive bladder cancer (NMIBC) as the recurrence rate is relatively high. Steinberg *et al*.[8] found that the quadruple immunotherapy of BCG (BCG, IFN, IL-2, and GM-CSF) exhibited a good therapeutic effect on NMIBC. The median recurrence time of 52 patients was 16.3 months, while the 1-year relapse-free survival rate and 2-year relapse-free survival rates were 55% and 53%, respectively. Kamat *et al*.[9] suggested that BCG combined with PD-1 inhibitor could achieve an enhanced antitumor activity in the high-risk subgroup of NMIBC patients, although the combination effect still needed investigation proof. The rapid developments of high-throughput sequencing technology and bioinformatic technology have created novel opportunities for tumor vaccine. In 2017, both the Dana–Farber Cancer Center in Boston and the University of Mainz in Germany generated tumor vaccines based on peptide fragments and RNA, respectively; both the vaccines effectively activated T cell-mediated immune response in about 60% of patients with advanced melanoma.[10,11] In 2018, these two teams designed personalized tumor vaccines to treat refractory gliomas. The median overall survival (mOS) was lifted to be 16.8 months and 29 months. Altogether, the tumor vaccines have shown promising results in clinical practices.[12,13]

Immune checkpoint inhibitor therapy

Immune checkpoint inhibitors reactivate immune signals by relieving the immunosuppressive effect of tumor cells, allowing T-cells to re-recognize and kill tumor cells. Immune checkpoint inhibitors are regarded as breakthrough treatments for multiple malignancies and have significantly enhanced the overall survival (OS) opportunity of patients with advanced malignancies. At present, the main immune checkpoint inhibitors that have been used in the clinical stage include anti-Cytotoxic T-lymphocyte-associated protein 4 (anti-CTLA-4) and PD-1/L1 antibodies. Their representative drugs include pembrolizumab, nivolumab, and atezolizumab, which are mainly used in patients with unresectable or metastatic tumors or in patients with high microsatellite instability or mismatch repair defects.[14] In 2017, the combination regimen of pembrolizumab and pemetrexed/carboplatin was approved of as the first-line treatment regimen for advanced nonsmall cell lung cancer (NSCLC), regardless of PD-L1 expression status. Clinical studies demonstrated that the mOS of advanced NSCLC patients treated with nivolumab and atezolizumab was 9.2 and 20.5 months, respectively, which were 3.2 and 11.6 months longer than those in the docetaxel group.[15] Due to the broad anticancer spectrum and good prognosis, immune checkpoint inhibitors have revolutionized cancer therapy and have become the focus of clinical and basic research in recent years. Intensive efforts are being made to explore the underlying mechanisms of the existing immune checkpoint inhibitors, while more immune checkpoint inhibitors targeting new immunosuppressive checkpoint markers such as LAG3, TIM3, and VISTA are under way of development.

Passive immunotherapy

Lymphokine-activated killer cells and tumor-infiltrating lymphocytes

The precursors of LAK cells are natural killer (NK) cells, while the precursors of TIL cells are T-lymphocytes infiltrating in tumor tissues. Both of them can be amplified *in vitro* by IL-2 stimulation, and their antitumor effects are not major histocompatibility complex (MHC) restricted. The activated LAK cells can recognize and kill malignant cells without being restricted by specific tumor types. The proliferative response and anticancer effects of LAK cells are dependent on IL-2 dose. The antitumor activity of TIL cells is more lethal than LAK cells, but less dependent on IL-2 dose. Clinical studies have revealed that the complete response rate (CR) was 41% when melanoma patients with brain metastasis were treated with autologous TIL cells plus high-dose IL-2 (n = 17). For example, 5 of 17 patients had a treatment response duration ranging from 4 to 44 months, with an 8.5 months mOS, indicating that this treatment regimen can cause the complete and lasting regression of brain metastasis of melanoma.[16] Nowadays, the LAK and TIL cells are still under in-depth basic and clinical investigations. The main research directions include how to reduce the side effects of LAK and TIL cell therapy, how to activate their amplification, and gene modifications by transfecting with cytokine cDNA.

Cytokine-induced killer cells

CIK cells express both $CD3^+$ and $CD56^+$ membrane protein molecules, so they are also called NK cell-like T-lymphocytes. They exhibit both the antitumor activity of T-lymphocytes and the non-MHC-restricted tumor-killing activity of NK cells. CIK cells are highly proliferative, cytotoxic and can cleave or kill tumor cells by releasing perforin and granzymes, therefore resulting in host immunity improvement and suppression of the spread and recurrence of tumor cells. CIK cells have a wide antitumor spectrum and are widely used in the treatment of leukemia, lymphoma, and lung cancer. They are also effective on multidrug-resistant tumor cells. Luo *et al*.[17] reported that the advanced lung cancer patients treated with CIK have increased median progression-free survival (mPFS) (6 months vs. 4 months) and mOS (28 months vs. 22 months), compared with the best maintenance treatment group. Nowadays, CIK cell treatment is mainly used in cancer patients after surgery,

radiotherapy, and chemotherapy. Cancer patients who are unable to receive routine treatment could also achieve good clinical outcomes through CIK treatment.

T-cell receptor chimeric T-cells and chimeric antigen receptor T-cells

TCR-T and CAR-T are the two major innovations in the adoptive cellular immunotherapy field at present. Genetically modified T-cells can express synthetic receptors and specifically recognize tumor cells. TCR-T utilizes MHC class I-restricted TCR technology to genetically modify $CD8^+$ T-cells or bulk T-cells for patient treatments. Therefore, TCR-T is restricted by MHC, leading to its low selectivity and low efficiency. In contrast, CAR-T utilizes chimeric antigen receptor technology to genetically modify $CD8^+$ T-cells or bulk T-cells and therefore has no MHC restriction. CAR-T cells exhibit targeted inhibition effects on the immune escape and long-term *in vivo* survival of tumor cells. Rapoport *et al*.[18] transfected the NY-ESO-1 antigen-specific TCR gene into autologous T-cells for multiple myeloma treatment. They found that 70% (14 out of 20) patients achieved CR or PR, a 19.1 months mPFS. Furthermore, 75 patients with relapsed and refractory acute lymphoblastic leukemia were treated with anti-CD19 CAR-T cells. It was found that the 6-month event-free survival rate (EFS) and the 6-month OS were 73% and 90%, respectively, while the 12-month EFS and the 12-month OS were 50% and 76%, respectively.[19] Since CAR-T and TCR-T can express synthetic receptor genes and specifically recognize target cells, their treatment applications have been extended to the field of chronic infection and autoimmune diseases.

Security problems

Despite the success of the above cancer immunotherapy strategies in the treatment of malignancies, their safety concerns have limited their clinical applications. Most of the immunotherapy strategies can promote the secretion of cytokines. However, excessive secretion of cytokines can lead to immune-associated pneumonia, increased vascular permeability, tumor metastasis and is often accompanied with risk of secondary infection during treatments.[20] Some patients may also have clinical symptoms such as rash, fatigue, diarrhea, and joint pain. Early intervention and prevention are paramount concerning the above circumstances.[17] In addition, the severe complications of cancer immunotherapy include off-target effect-related toxicity, cytokine storm, and neurotoxicity, of which the underlying pathophysiological mechanisms have not been fully elucidated.[15] Immunotherapy-related adverse reactions are unpredictable and cannot be effectively prevented and treated using Western medicine alone. At present, according to the clinical symptoms of adverse reactions of immunotherapy, TCM attributes them to the syndromes of "upward invasion of fire toxin" or "internal accumulation of dampness and heat." Therefore, TCM herbs with heat-clearing, detoxicating, or dehumidifying efficacies are empirically used for the prevention and treatment of immunotherapy-related adverse reactions, and the clinical effects are reliable. A combination of TCM and immunotherapy is expected to become an effective and promising strategy for tumor therapy in the near future.

The Potential Application of Traditional Chinese Medicine in Cancer Immunotherapy

TCM is extensively used for cancer treatment in China and Asia with a history of several thousand years. In the *Huang Di Nei Jing* (《黄帝内经》 *Huangdi's Internal Classic*), the process of tumorigenesis and metastasis was summarized to be the "Chuan She (传舍)" theory that contained the three elements of (1) cancer toxin, (2) Yang deficiency, and (3) Qi stagnation, blood stasis, and phlegm coagulation. The "Chuan She" theory is consistent with the western "seed and soil" theory in nature. According to the "Chuan She" theory, the occurrence and development of tumors can be attributed to both the exuberance of evil Qi and the deficiency of healthy qi in the metastatic site. They contribute to tumor progression by inducing the formation of stagnant soil and environment. The above process has been summarized thus: "The region where pathogenic factors gather together must be accompanied by healthy qi deficiency" theory.[21] Besides, as stated by the "Chuan She" theory, the disease of a single visceral organ can also affect the function of relevant viscera. Therefore, the prevention and treatment of diseases should be guided by such a holistic view. To achieve this, pretreatment of the undiseased viscera by regulating the Qi function and balance of them is to be done. This will help improve the premetastatic microenvironment and prevent the invasion of cancer toxin, both of which are the main strategies for cancer prevention and treatment in TCM. The above treatment principles have been summarized as the "protecting the unaffected viscera and curing the fundamental pathogenesis first"[22] theory in TCM. A number of clinical and basic studies have suggested that the underlying mechanism of the anticancer effects of TCM lied in the systematic regulation of the host-tumor microenvironment, especially on the immune cells. Given the complex molecular network in the tumor microenvironment, the therapeutic effect of a mono-target intervention strategy is usually very limited; therefore, it precisely brings an opportunity for TCM to demonstrate its therapeutic advantages.

Cytokine regulation

Cytokines play an important role in regulating the type and intensity of the immune response. Modulating the concentrations of cytokines in the tumor immune microenvironment can enhance the anti-tumor immune response. There are many types of cytokines, which can be roughly divided into six categories according to their functions including ILs, IFNs, tumor necrosis factors (TNFs), Colony stimulating factor (CSFs), chemokines (CKs), and growth factors. Accumulating researches have demonstrated that TCM can modulate the secretion of cytokines in multiple ways. (1) IL: Zhao *et al*.[23] reported that saikosaponin A could increase the levels of serum IL-12 and IFN-γ, whereas it could also decrease the levels of

IL-4 and IL-10. Meanwhile, saikosaponin A could promote the differentiation of Th1 cells by increasing the expression of IL-12 receptor and phosphorylated Signal Transducers and Activators of Transcription 4 (STAT4) and therefore it could significantly inhibit the growth and proliferation of breast cancer cells. On the other hand, the IL-6 expression dysbiosis could induce the occurrence and development of tumors. IL-6 could induce the expression of COX-2 by activating signal transducer and activator of transcription 3 (STAT3), upregulating Bcl-xl to resist Fas-L-induced apoptosis.[24] ChungKyung-Sook *et al.*[25] found that *Aster tataricus* L. f. could reduce the secretion of IL-1β, IL-6 and TNF-α in the intestine of mice, as well as reduce the expression of inducible nitric oxide synthase and COX-2 protein, exhibiting the chemopreventive effect on colitis-associated cancer in mice. (2) IFN: Ming *et al.*[26] suggested that tanreqing injection combined with chemotherapy could significantly upregulate the expression of IFN-γ and TNF-α mRNA in Lewis lung cancer tissue of mice and therefore strengthen the killing activity of Cytotoxic T Lymphocyte (CTL) cells and NK cells against the tumor, which finally enhanced the antitumor immune response of mice. Cai *et al.*[27] reported that trichosanthin could significantly increase the proportion of $CD4^+$ and $CD8^+$ T-lymphocytes, which secreted IFN-γ in tumor-grown mice, thus promoting the Th1 cell-mediated antitumor immune response activity. (3) TNF: TNF-α has the antitumor effect in the early cancer stage. However, it could promote tumor survival and metastasis by stimulating the nuclear factor kappa B (NF-κB)-dependent pathway during tumor progression. TNF-α expressed in tumor cells could promote the formation of paracrine "TNF network" and regulate tumor growth in coordination with IL-6 and CXCL12.[28] Jihye Choi *et al.*[29] announced that the ethanol extract of *Alisma canaliculatum* could significantly suppress TNF-α-induced CXCR3 and CXCL10 expression at the gene level, thus inhibiting TNF-α-induced migration of breast cancer cells. (4) CSF: Gilcy K George *et al.*[30] found that *Emilia sonchifolia* could significantly downregulate the expression of CSF, vascular endothelial growth factor (VEGF), and matrix metalloproteinases (MMPs), thus inhibiting the formation of lung metastatic foci and prolonged the survival duration of tumor-bearing mice. (5) CKs: Goranova *et al.*[31] demonstrated that *Tribulus terrestris* saponins could inhibit metastasis and induce apoptosis of breast cancer cells by downregulating the gene expression of CXCR4, CCR7, and Bcl-2 in breast cancer cells. Sun *et al.*[32] demonstrated that bufalin could attenuate the expression of pro-inflammatory mediators including CXCL1, CXCL2, CXCL5, COX-2, TNF-α, IL-1β, and IL-6 and thus suppress the occurrence of inflammation. Further studies indicated that bufalin could exhibit a chemoprevention effect on the inflammation-related colorectal carcinogenesis and antigen-presenting cells (APCs) germline mutation-induced colorectal carcinogenesis in mice. (6) Growth factors (GFs): Moradi-Marjaneh R *et al.*[33] released their report saying that curcumin could exhibit anti-proliferation, anti-migration, and pro-apoptosis activities *in vitro* and could modulate miRNAs to inhibit angiogenesis by inhibiting VEGF signal. Transforming growth factor (TGF)-β is the key regulator of epithelial–mesenchymal transformation (EMT) and is closely involved in tumor metastasis.[34] Feng *et al.*[35] demonstrated that osthol could inhibit TGF-β1-induced EMT, migration, and invasion of lung cancer A549 cells by inactivating the NF-κB pathway. Liu *et al.*[36] discovered that triptolide could dramatically suppress tumor growth by decreasing the proportion of regulatory T-cells and inhibiting the secretion of TGF-β, VEGF, and IL-10 in tumor-grown mice.

Immune checkpoint regulation

Immune checkpoint inhibitors remain the most mature and widely used immunotherapy strategy at present. Checkpoint molecules, such as CTLA-4 and PD-1/PD-L1, are negative regulators of the immune function of tumor antigen-specific CTLs. Their overexpression could induce the immune escape of tumor cells.[37] Immune checkpoint inhibitors, such as CTLA-4 and PD-1/PD-L1 inhibitors, could relieve the negative regulation of effector T-cells and restore their antitumor immune response by blocking the CTLA-4 or PD-1/PD-L1 signaling. Multiple natural plant drugs could block the inhibitory effect of checkpoint molecules on CTL cells and thus restore and enhance their killing effect on tumors. For example, Jiang *et al.*[38] proved that ginsenoside Rg3 could significantly attenuate the expression of PD-L1 in human lung adenocarcinoma cell lines A549 and A549/DDP and thus rescue the cytotoxicity of CTL cells. Zhang *et al.*[39] reported that triptolide could reverse the immune tolerance/inhibition status of CTL cells by inhibiting the expression of PD-1/L1 in glioma cells and thus recover the killing effect of CTL cells on glioma cells. By conducting a prospective randomized controlled clinical trial, Jiang *et al.*[40] compared the differences of serum sCTLA-4 (soluble CTLA-4) of advanced NSCLC patients between the comprehensive TCM treatment group and the chemotherapy group. It was found that the expression of sCTLA-4 in the comprehensive TCM treatment group was significantly lower than that in the chemotherapy group, which might benefit the survival of advanced NSCLC patients. Xie *et al.*[41] suggested that the TCM injection of kanglaite could significantly increase the proportions of $CD4^+$ T-lymphocytes in the peripheral blood of patients with advanced breast cancer, and reduce the proportions of $CD4^+$/$PD\text{-}1^+$ T-lymphocytes, and therefore reverse the immune suppression effect of the tumor on the human body.

Immune cell regulation

It has been found that when TCM exerts a bidirectional modulation effect on immune cells, it not only positively regulates antitumor effector cells but also negatively modulates the immunosuppressive cells. (1) NK cells: NK cells are the main effector cells involved in antitumor immunity in innate immunity, and the failure of immune clearance against tumor cells by NK cells is a critical mechanism of tumor immune escape.[42] Yu *et al.*[43] suggested that Ganoderma lucidum polysaccharides could enhance the cytotoxicity of mice NK cells and CTL cells on tumor cells.

Luan *et al*.[44] discovered that ligustrazine could enhance the killing activity of NK cells on tumor cells by inducing NKG2DLs expression and promoting the binding between NKG2D and NKG2DLs. (2) Dendritic cells (DCs): DC cells are the most potent Antigen Prestenting cell (APC) of the immune system. DC cells could initiate the antitumor immune response of effector T-cells, induce specific CTL production, and enhance the cytotoxicity of NK cells. It has been reported that multiple natural herbs could perform an obvious role in promoting the differentiation and maturation of DC cells. Sun *et al*.[45] suggested that Shengyu decoction could promote the differentiation and maturation of DC cells in the spleen of mice. Meanwhile, Shengyu decoction could also induce the differentiation of T-lymphocytes into CTLs, enhance their lethality, thus improve the antitumor immunity function of mice. Zhang *et al*.[46] proved that Ganoderma lucidum polysaccharide-loaded gold nanocomposites could effectively induce the activation of DC cells, characterized by increased CD80/CD86/CD40/MHCII expression and elevated phagocytosis efficacy of DC cells. Meanwhile, it also directly stimulated the proliferation of T-cells, thus enhancing the recognition and killing effect of the immune system on cancer cells. (3) Tumor-associated macrophages (TAMs): TAMs could activate the antiapoptotic pathway of tumor cells under a hypoxic microenvironment by modulating inflammatory signal pathways and transcription factors (e.g., NF-κB and STAT3).[47,48] TAMs could stimulate angiogenesis by secreting VEGF and platelet-derived growth factor.[49,50] In addition, TAMs-derived metalloproteinases (MMPs) could promote tumor invasion and migration by inducing degradation of the extracellular matrix.[51] Li *et al*.[52] demonstrated that the polysaccharide extracted from *Ilex asprella* could regulate TAMs function by modulating TAM polarization. Meanwhile, it could also promote macrophages to secrete cytokines with antitumor activity and induce their antitumor activity through NF-κB and STAT3 pathway. (4) Effector T-cells: Effector T-cells are the "top killer" of the immune cell family that possess a strong killing effect on tumor cells. It has been reported that increased infiltration of effector T-cells predicts better clinical prognosis of cancer patients.[53,54] Qi *et al*.[55] reported that yifeitongluo formula could significantly increase the proportion of $CD8^+$ T-lymphocytes, $CD4^+$ T-lymphocytes, and NK cells in the *Lewis* lung carcinoma mice model and enhance the lethality of these immune cells to tumors, which finally inhibited the growth of tumors and prolonged the OS of tumor-bearing mice. In addition, Th1/Th2 balance plays an important role in the regulation of the antitumor immune response process. Th1/Th2 ratio imbalance, characterized by an increased transformation of Th1 into Th2, usually occurs in blood and tissue samples of cancer patients, and is an important mechanism for tumor immune escape.[56] Ma *et al*.[57] reported that NSCLC patients who received treatment with a combination of ginseng polysaccharides and DC cells exhibited increased expression of Th1 cytokines (IFN-γ, IL-2) and decreased expression of Th2 cytokines (IL-4, IL-5) when compared with that of DC cells-treated NSCLC patients, suggesting that ginseng polysaccharides could regulate the balance of Th1/Th2, and therefore improve the antitumor immunity activity in NSCLC patients. The potential effects of TCM on immune cell regulations are summarized in Figure 2.

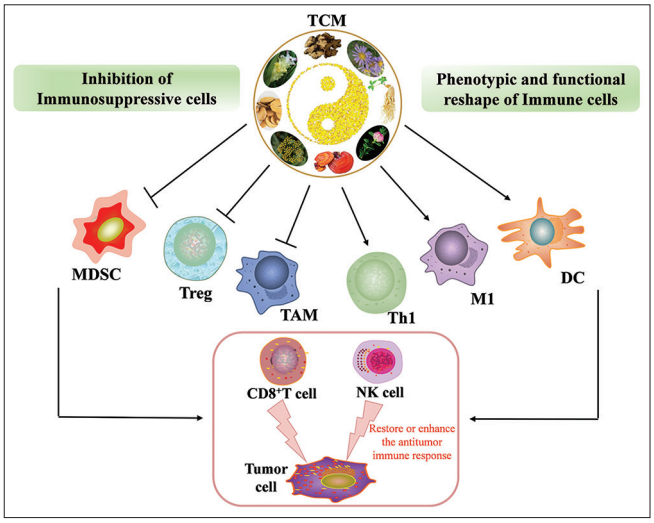

Figure 2: The antitumor immunomodulatory effect of traditional Chinese medicine

Cytokine storm inhibition

Cytokine storm, also known as cytokine release syndrome (CRS), ranks as the number one obstacle for successful tumor immunotherapy in the clinic. Cytokine storm is an overactivated immune-inflammatory response. It is characterized by excessive release of pro-inflammatory cytokines (e.g., IL-6, IL-8, IL-10, IL-1, TNF-α, and IFN) in a short time, which causes systemic inflammatory reactions. The clinical manifestations include high fever, hepatosplenomegaly, hepatic insufficiency, lymphadenectasis, rash, neurological symptoms, and even respiratory failure and multiple organ failure in severe cases. CRS can greatly increase the permeability of vascular intima, destroy the normal tissues of the human body, and subsequently lead to secondary infection and tumor metastasis. At present, etoposide and inflammatory factor blockers (e.g., anti-IL-6/6R antibody and emapalumab) remain the limited choice for CRS treatment in Western medicine. Although there have been no TCM-related researches focusing on the prevention and treatment of CRS caused by tumor immunotherapy, CRS can be classified into the category of warm-heat disease in TCM according to the clinical symptoms of CRS patients. A plenty of studies have suggested that TCM herbs with heat-clearing, detoxicating, or dehumidifying efficacies may be effective for the prevention and treatment of CRS. For example, Resveratrol is a bioactive substance of many kinds of natural Chinese herbal medicine, including veratrum grandiflorum, polygonum cuspidatum and cassia toraLinn.[58] Rieder *et al*.[59] demonstrated that resveratrol could significantly reduce vascular permeability and inflammatory response, promote myeloid-derived suppressor cells, and inhibit T-cell activation and thus alleviate CRS. Chen *et al*.[60] suggested that Xuebijing injection could stimulate the

differentiation of Treg cells *in vitro*, while it could promote the amplification of IL-10$^+$ Treg cells in mice sepsis model *in vivo*. Meanwhile, Xuebijing injection could significantly reduce the levels of serum TNF-α and IL-6, improving the survival rate of septic shock mice. These results indicated that Xuebijing injection may be useful for CRS prevention and treatment. In addition, a single-center, double-blind, randomized controlled trial demonstrated that Xuebijing injection could attenuate IL-1β, IL-8, and C-reactive protein expression, but increase IL-10 expression, thus protecting the lungs of patients.[61]

Outlook

TCM is the quintessence of the medicine in China. In recent years, the Chinese government strongly encourages and supports the development of TCM. By the above reviewing of the research progress of TCM in cancer treatment field, it can be concluded that growing efforts are being made by TCM clinicians and researchers to prevent and treat cancer by regulating the immune function of tumor patients. The immune function of the human body gradually declines along with the occurrence and progression of tumors, especially tumors in their advanced stage. Both the innate immunity function and the specific immunity function of the cancer patients are significantly suppressed. Accumulating studies have demonstrated that TCM not only enhances the immune function of the human body but also enhances the sensitivity of tumor patients to radiotherapy, chemotherapy, targeted therapy, and immunotherapy. However, there are still some obstacles to surmount for successful cancer immunotherapy by TCM. The main problems are as follows: (1) the antitumor efficacies of TCM drugs are mainly based on experience inheritance or personal long-term application experience, whereas there is a lack of high-quality randomized controlled clinical trials to verify them; (2) it is difficult to control the quality of TCM drugs because of the complexity in wide dosage range and multiple sources of TCM drugs; (3) lack of standardization in the syndrome differentiation and curative efficiency evaluation, as well as the lack of a reliable system for safety evaluation; and (4) the complicated and unclear action mechanisms of TCM drugs. To solve the above shortcomings, the standardization of TCM research is of urgent need and has obtained enormous support from the China government. We are confident that TCM will play more and more important roles in the tumor immunotherapy field in the near future.

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Conflicts of interest

There are no conflicts of interest.

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Wang Shixiong's Medicine Career

Lin Yu

Shanghai Museum of Traditional Chinese Medicine, Shanghai University of Traditional Chinese Medicine, Xuhui, Shanghai, China

A Brief Profile of Wang Shixiong

Wang Shixiong (王士雄1808–1868), courtesy name Mengying (孟英) and art name Banchi Shanren (半痴山人), Suixi Jushi (随息居士), and Shuixiang Sanren (睡乡散人), was a doctor of traditional Chinese medicine (TCM) in the Qing dynasty. Wang Shixiong, Ye Tianshi (叶天士), Xue Shengbai (薛生白), and Wu Jutong (吴鞠通) are called the Four Masters of Warm Diseases.[1]

Wang's family was originally from what is now known as northwestern Anhua (安化) of ancient China (present-day Qingyang, Gansu province). The 14th generation of his family moved to Haiyan (海盐) County of ancient China (present-day, Haining, east China's Zhejiang province). Afterward, his great grandfather Wang Xuequan (王学权) moved to Qiantang (钱塘), modern-day Hangzhou, Zhejiang. Wang Shixiong and his three brothers are the 24th generation of his family. His courtesy name is Mengying in order to memorialize his three dead brothers. Wang's great grandfather, Wang Xuequan, well known in the circle of TCM, wrote *Yi Xue Sui Bim* (《医学随笔》*Jottings of Medicine*), also named *Chongqing Tang Sui Bi* (《重庆堂随笔》*Jottings from Repeated Celebration House*) which was annotated and edited by Wang's grandfather Wang Guoxiang (王国祥) and his father Wang Sheng (王升). This book was later published by Wang Shixiong. This is an achievement born of four generations of Wang's and represents their massive ambition to carry on and pass down TCM to future generations. Wang was 14 year old when he lost his father, so he had to work in the salt industry to make a living. At the same time, he began to learn medicine with the help of his uncle Yu Guiting (俞桂庭). Influenced by his ancestors, Wang diligently studied medicine in his spare time. At the age of 17, he was already known for curing the owner of the salt business Zhou Guangyuan (周光远). Deeply impressed by his uncle's principle that "related manuscripts must be saved if the disease is to be cured of," Wang managed to save >800 prescriptions.[2] Living in the middle of the late Qing dynasty ravaged with plagues and wars in the turbulent southern area, Wang absorbed the knowledge from numerous medical masters and was finally able to sort out their principle-method-recipe-medicinal to create *Wen Re Jing Wei* (《温热经纬》*Warp and Weft of Warm-Heat Disease*) which was published in 1852. In 1855, Wang's family rented a place to live in at Tingxi (亭溪) to avoid the havoc caused by the Taiping Heavenly Kingdom. During that period, Tingxi is the place where he wrote *Gui Yan Lu* (《归砚录》 *Gui Yan Recording of Medicine*).[3] Wang died in Xiushui (秀水), Jiaxing, East China's Zhejiang Province, in 1868, at the age of 60. He was subjected to many relocations due to financial hardships and wars all his life.

Major Medical Achievement of Wang Shixiong

Born into a long line of medicinal practitioners, and by accumulating over 800 medical records from all over the world, Wang wrote, classified, and edited >30 kinds of medical textbooks, including *Sui Xi Ju Chong Ding Huo Luan Lun* (《随息居重订霍乱论》*Revision of the Discussion of Sudden Turmoil)*, *Warp and Weft of Warm-Heat Disease*, and *Gui Yan Recording of Medicine*.[4]

In the Daoguang period of the Qing dynasty (around 1837–1838), choleras with muscular spasm was spreading in the south of China. Moreover, there is no related monograph to consult about it. Therefore, Wang wrote *Huo Luan Lun* (《霍乱论》 *Discussion of Sudden Turmoilcoil*), a text on the pathogenesis of cholera. In 1862, there was a pandemic of cholera. As *Discussion of Sudden Turmoilcoil* was lost during the wars, Wang supplemented and revised the original version and renamed it as *Revision of the Discussion of Sudden Turmoil*.[5] The book has four parts that depict symptoms

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Address for correspondence: Prof. Lin Yu,
Shanghai Museum of Traditional Chinese Medicine, Shanghai University of Traditional Chinese Medicine, Xuhui, Shanghai, China.
E-mail: shtcmbgs@163.com

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and signs of the disease, its treatments, medical records, and prescriptions which greatly contributed to the prevention and control of cholera. Wang differentiated cholera into two types, true cholera (heat cholera) and cholera with vomiting and diarrhea (cold cholera), with detailed descriptions of cholera's progression, as well as its characterizations and prescriptions in his book. Furthermore, Wang listed both the food and medicine that led to a cholera cure, such as the seed of Job's tears, mung bean, as well as garlic.[6] It was pointed out that a sanitary environment was crucial to check cholera's infection rate and spread. Wang also pointed out that the environment should remain sterile, but sterility should also be extended to one's personal life by eating fewer fats and sugars. He also believed that taking measures like keeping the room more ventilated and sanitary as well as burning Chinese rhubarb and capillary Artemisia would dramatically reduce outdoor contamination. Finally, Wang advocated purifying the water to avoid cholera transmission through using alum and realgar.[7]

Warp and Weft of Warm-Heat Disease is the representative work of Wang Mengying, it being completed in 1852, in 5 volumes. Therefore, Wang is honored as the master of tackling warm diseases as he was the one who systematically combed through the texts and summarized the study of warm diseases. As for Warp (经) and Weft (纬), the texts of Huangdi, Qibo, and Zhang Zhongjing are Warp (经), while the comments made by Ye Tianshi and Xue Xue are Weft (纬). This medical masterpiece includes articles of *Huang Di Nei Jing* (《黄帝内经》*Huangdi's Internal Classic*), *Shang Han Lun* (《伤寒论》*Treatise on Exogenous Febrile Diseases*), and *Jin Gui Yao Lue* (《金匮要略》 *Synopsis of the Golden Chamber*), as well as 113 recipes, and some related discussion of Zhang Zhongjing (张仲景), Ye Tianshi, and Xue Shengbai and others. Wang distinguished between the new contraction and latent-qi of warm diseases, bringing forward two different disease etiologies stemming from the exterior to the interior and from the interior to the exterior. Pungent-cool exterior-releasing medicine is used to treat new disease contraction, while clearing and nutrient-yin medicine functions well in mild cholera cases. The clearing qi phase can be used as a therapeutic option, while critically ill patients should follow the clear yin phase.[8]

Appreciation of Wang Shixiong's Letter

A letter written to Jiang Guang (蒋光焴) by Wang is kept in Shanghai Museum of TCM [Figure 1], containing 2 pages, 10 lines per page, and 328 characters in total, and all of them is written in cursive handwriting. One page is light pink, and the other is beige, with light red square seals stating "Collection of Medical History Museum of Shanghai College of TCM," at the lower right and left corners.

The Chinese text of the letter [Figure 2] is as follows:

寅昉先生大人执事, 仆仆道途, 久未趋谒, 缅怀芝范, 时切驰思。昨在禾中, 为沈君雪江善后, 而省垣许康侯茂才, 专人招视其母夫人之证。匆匆返棹, 至舍一转, 正欲解缆, 忽奉到, 手书藉谂, 侍福安康, 近祺佳邕为慰。《洄溪医案》得阁下梓以行世, 真造福无涯也。又承辛翁、葆兄校閱, 更属可感。此因浼友缮录之时, 雄适他游, 未曾过目耳。顷于镫下将原稿对过。暑门优人母案， 已补其脱简。血痢葛案, 系脱血数石, 其余悉依许、吴二君校正可也。惟紫雪二字原是方名, 古书并无丹字, 俗呼紫雪丹乃后人所加之字。恶痘门此一条, 丹字可勿加也。是否, 候酌之。雄处尚有拙选俞东扶先生《古今医案按》二本, 世无刻本, 如阁下济世心殷, 寿之梨枣, 亦医林一盛举也。候示下, 即于省中检寄。辛翁所要拙辑, 印出即寄上。兹将《洄溪医案》先行邮缴, 以便付梓, 乞瞥收。余俟返里, 再图踵晤。肃复顺颂潭祉, 希鉴不宣。愚弟士雄顿首。二十八日檠侧。[8]

This letter begins with a greeting to Jang, praising him for engraving and publishing *Hui Xi Case Records* representing his benevolence, as well as expressing his gratitude to Xu Mei, and Wu Baoshan who revised it. Moreover, Wang raised his suggestions in the revision of Jang's edition as compared with the original edition.

1. Wang completed the damaged parts of the *Shu Men You Ren Mu An*
2. Second, he corrected the inaccurate amount of blood loss in *Xue Li Ge An*
3. Most importantly, he argued that the name of a prescription should be " Zi Xue (紫雪)"rather than "Zi Xue Pill (紫雪丹)" in *Malign Pox*, which demonstrates his conscientious scholarship and familiarity with classic medical works.

The letter reflects in a smooth expression and humble tone Wang's phenomenal literary accomplishments and superior morality of unselfishness as a doctor.

Conclusion

Although living in turmoil, Wang stuck to his aspiration to be a TCM master. He inherited wisdom left by his predecessors, having an innovative spirit and focusing on clinical experience. Wang's masterpiece, *Warp and Weft of Warm-Heat Disease,* made him a remarkable master of warm diseases. With productive works of originality,

Figure 1: Shanghai museum of traditional Chinese medicine

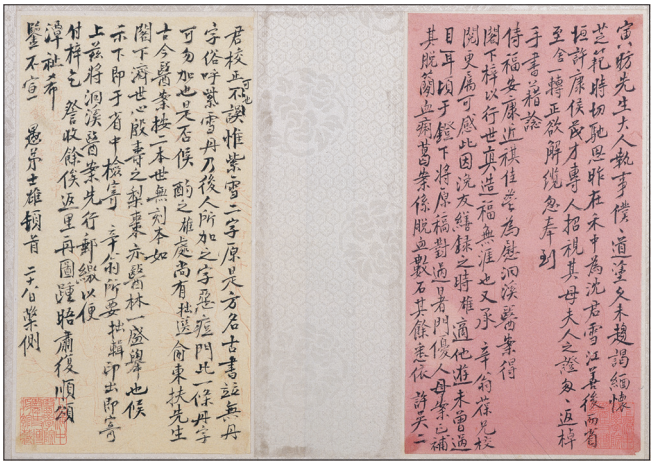

Figure 2: Letters of Wang Shixiong (王士雄)

medical argument, and annotation, he made progressive contributions to the development of medical literature, clinical medicine, and treatment. Today, we are still using his prescriptions.

Translator: Yanqing Li (李颜青)

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Conflicts of interest

There are no conflicts of interest.

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