

Medical Interchanges between Ancient China and the Ancient Middle East from 7th to 15th Century

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Abstract

The Silk Road witnessed the exchange, integration, and innovation of medicine between ancient China and the ancient Middle East. This article outlines a panoramic historical picture of medical interchanges between ancient China and the ancient Middle East along the Silk Road by multilingual literature research, textual criticism and scientific methods. Through the exchange of medicinal materials, the supplement of prescriptions, the reference of dosage forms, and the absorption of medical concepts, the two major medical systems along the Silk Road have interacted and integrated. Anchored in the political cooperation, sustained by translation network, and promoted by commercial intercourse, this medical dialogue shows the openness and adaptability of traditional medicine. This interchange history provides a historical paradigm for the modernization of traditional medicine, cross-cultural collaboration, and the building of the Silk Road of Health.

Keywords: Ancient China; Ancient Middle East; Medical Interchange; Silk Road

1 Introduction

The Middle East region includes West Asia and Northeast Africa, where Persian, Arabic and Islamic cultures originated and converged. Although located at the eastern and western ends of Asia, China has a long history of interchanges with the Middle East. It is speculated that as early as five to six thousand years ago, there may have been a “Jade Road” centered on Hotan Prefecture, extending to the Central Plain (中原) along the Hexi Corridor or the grasslands of northern China. In different periods, there was also an “Obsidian Route” from Asia Minor to Persia and a “Lapis Lazuli Route” extending from Afghanistan through Persia and the Mesopotamian Basin to the Mediterranean coast.¹ During Cyrus’ reign in the 6th century BCE, China and the Persian Empire had direct contact.² In the eyes of the Persians, China had outstanding achievements in philosophy and

technologies, and the Chinese were highly regarded as smart and as the most important trading partners. The Islamic world also circulates the Hadeeth that “Seek knowledge even if you have to go as far as China”. The Silk Road is not only the main channel for trade between the East and the West but also a bridge for cultural and knowledge interchanges.

Both the Chinese and Middle Eastern civilizations (Note 1) have splendid medical cultures, and their historical interchanges provided mutual impetus for their development between the 7th to the 15th century. Traditional Chinese medicine (TCM) is based on the philosophical theory of yin-yang (阴阳) and *Wu Xing* (五行 five elements) and emphasizes observation, listening and smelling, questioning, and pulse examination in diagnosis. In this period, the Islamic medicine is the mainstream of Middle Eastern medicine, which is based on the ancient Persian-Arabic medical culture and integrates the medical knowledge and philosophical thoughts of ancient Greece, ancient India, and its neighboring regions, the diagnosis of which features urine diagnosis, smelling, and pulse taking.³ Compared with TCM, Islamic medicine has distinct characteristics in the fields of medicine therapy, diet therapy, external treatment, and psychotherapy, and they have many similarities with TCM in terms of treatment thinking and diagnostic methods.⁴

However, due to the loss of historical materials, language barriers, and the multidisciplinary nature of the research methods required, the study of the history of interchanges of traditional medicine in ancient China and the ancient Middle East has just begun. Chinese scholar Song Xian’s (宋岷) *Gu Dai Bo Si Yi*

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Chinese Medicine and Culture (2025)8:4

Received: 18 February 2025; accepted: 21 August 2025

First online publication: 25 August 2025

<http://dx.doi.org/10.1097/MC9.000000000000162>

Xue Yu Zhong Guo (《古代波斯医学与中国》 *Ancient Persian Medicine and China*) explored the historical process of the emergence of medieval Persian medicine and its integration into TCM,⁵ and Song also conducted a preliminary study of *Hui Hui Yao Fang* (《回回药方》 *Medicinal Formulas of the Hui People*) from the perspective of cultural interchanges between China and foreign countries.⁶ Iranian-French scholar Aly Mazaheri's (1914–1991) *The Silk Road (La Route de la Soie)* introduced the history of cultural interchanges between ancient China and Persia, which explored the spread of TCM in ancient Persia.⁷ American scholar Berthold Laufer's (1874–1934) *Sino-Iranica* verified the plant cultural interchanges between China and Iran from the perspectives of botany, sinology, linguistics, and history.⁸ American scholar Edward H. Schafer (1913–1991) focused on the Tang dynasty and analyzed foreign civilizations on the Silk Road, among which the influence from the Middle East was particularly prominent.⁹ In addition, Chinese scholar Shi Guang (时光) studied, translated and annotated the earliest Persian translation of Chinese medicine in the Middle East, *Tanksūqnāmah (The Ilkhanate Treasure Book of Khatay's Sciences and Technologies)*, which provided an important reference for the medical interchanges between ancient China and the ancient Middle East.¹⁰ In recent years, with the advancement of the Belt and Road Initiative (BRI), the importance of medical interchanges between ancient China and the ancient Middle East has received more and more attention.^{11,12} Some studies have taken the perspective of economic and trade cooperation and knowledge interchanges,^{13–15} some have been based on the comparison of medical texts in these two places,¹⁶ and some have focused on the historical research of medical interchanges during the Yuan dynasty.^{17–20} These studies have provided references for the medical interchanges between ancient China and the ancient Middle East. Therefore, this article attempts to outline a panoramic overview of the history of medical interchanges between ancient China and the ancient Middle East to reveal the mutual dissemination, integration, and interaction process of the two significant medicines on the Silk Road and to provide references for continuing the friendship in the past and opening a new chapter in the future.

2 Historical background of medical interchanges between ancient China and the ancient Middle East

There have been official records of interchanges between ancient China and the ancient Middle East since the Han dynasty. Zhang Qian's (张骞) mission to the Western Regions opened up the famous Silk Road building upon several "Gemstones trade routes". During the Wei and Jin dynasties, Chinese and Middle

Eastern merchants continued to exchange what they had. Persia was committed to maintaining a cooperative relationship with China, as the number of envoys between the two countries increased, the scale of cooperation also expanded.²¹ Zoroastrianism was introduced to China, and some Middle Eastern merchants began to settle in China. In the Tang dynasty, China's influence on the Middle East was greatly strengthened, and key technologies such as porcelain making, saltpeter making, papermaking, alchemy, and silk weaving were introduced to the Middle East, and even a Persian commandery (波斯都督府) was established. Tens of thousands of Arabic and Persian merchants lived in cities such as Chang'an (长安) and Guangzhou (广州).²² In the Song dynasty, maritime trade between China and the Middle East rose again. Middle Eastern merchants entered cities in southeastern China by sea, and their socioeconomic status was further improved compared with the Tang dynasty, and their relationship with the court was also closer.²³ The Mongolian destroyed the separatist forces in Central Asia and the Abbasid dynasty three times, and the interchanges between the Central Plain and West Asia became interchanges within the Yuan dynasty. During Ghazan Khan's reign, the Ilkhanate's post-road was directly connected to China. Both countries had sufficient reserves of translation talents, and frequent interchanges in science, technology, and culture. Many Muslims in the Middle East initially settled in China and gradually assimilated into the Chinese nation. In addition, the emperors of the Yuan dynasty attached great importance to medicine, and the medical interchanges between the two places reached a peak. After the establishment of the Ming dynasty, the land Silk Road stagnated, and the Maritime Silk Road was suspended by the increasingly stringent sea ban (海禁). The interchanges between China and the Middle East took a downward turn and gradually came to a halt.²⁴

3 Exchange of medicinal materials between ancient China and the ancient Middle East

3.1 Dissemination of Middle Eastern medicinal materials in ancient China

Due to the differences in geographical environment and medicine preparation technology, the medicinal material trade between ancient China and the ancient Middle East was highly complementary. Spices and medicinal materials are light in weight but high in value and are the bulk commodities of the Silk Road trade. Therefore, the exchange of medicines between ancient China and the ancient Middle East preceded the interchange of holistic medicine.

The use of Middle Eastern medicinal materials in Chinese medicine originated in the Han dynasty. Zhang Zhongjing (张仲景) in the Eastern Han dynasty

recorded in *Jin Gui Yao Lue* (《金匱要略》 *Essentials from the Golden Cabinet*) that taking *He Li Le San* (诃黎勒散 myrobalan powder) with porridge could warm and strengthen the intestines, astringe and stop diarrhea. *Hou Han Shu Xi Yu Zhuan* (《后汉书·西域传》 *History of the Latter Han Dynasty: Treatise on the Western Regions*) recorded the medicinal value of white grass, storax, and pepper.²⁵ During the Wei and Jin dynasties, various foreign religions, such as Buddhism and Zoroastrianism, were introduced into China along the Silk Road,²⁶ which boosted the consumption of spices. For example, Zoroastrianism attached great importance to burning incense and offering sacrifices, and five offerings were made a day.²⁷ At the same time, the elite emphasized refined living. They wore sachets, burned incense, or applied various aromatic medicines to cure diseases, maintain health, beauty, and hair care, and get scented. During the Wei and Jin dynasties, famous foreign aromatics began to be added to local herbs. The prevalence of religion and the popularity of health culture have significantly increased the demand for aromatic medicines,²⁸ and various spices have also appeared in the tributes from foreign countries to China.²⁹ Both *Wei Shu Xi Yu Zhuan* (《魏书·西域传》 *History of the Wei Dynasty: Treatise on the Western Regions*) and the *Zhou Shu Yi Yu Zhuan* (《周书·异域传》 *Book of Zhou: Treatise on Foreign Regions*) recorded aromatic medicines from the Western Regions, most of which were from Persia.

In the Tang dynasty (618–907), foreign merchants, traders, envoys, priests, and immigrants flooded into China and also brought their lifestyle and medicines. *You Yang Za Ji* (《酉阳杂记》 *Random Notes from Youyang*) and other naturalis historia recorded the names, sources, and characteristics of foreign medicinal plants, animals, and minerals used by the people at that time, such as frankincense and dill. *Xin Xiu Ben Cao* (《新修本草》 *Newly Revised Materia Medica*) and *Ben Cao Shi Yi* (《本草拾遗》 *Supplements to Materia Medica*) have also included many foreign medicines. The first unique study of foreign medicines, *Hu Ben Cao* (《胡本草》 *Foreign Materia Medica*), describes the origin, color, and odor of foreign medicinal materials and retains the literary genre of naturalis historia, but it has been lost.³⁰ In addition, some Buddhist dictionaries in the Tang dynasty also include Persian medicines. For example, there is an entry on Long Pepper (Sanskrit: Pippala; Persian: Pipal; Chinese: 荜茇) in *Yi Qie Jing Yin Yi* (《一切经音义》 *Pronunciation and Meaning in Complete Buddhist Canon*).³¹

In the late Tang dynasty, medicinal materials from the Middle East and related theories and practices were further integrated with TCM. Li Xun was of Persian descent and settled in Sichuan (四川), China. His family was engaged in the aromatic medicine business. He was not only an active poet but also very interested in Taoist alchemy. His *Hai Yao Ben Cao* [《海药本草》 *Materia Medica from the (Southern) Seaboard Area*] directly quoted

Taoist literature such as “*Xian Jing* (仙经)”, “*Xian Zhuan* (仙传)”, “*Xian Fang* (仙方)”, and Taoist alchemy terms;³² when analyzing the properties of medicines, he often mentioned how Chinese Taoists used these medicines.³⁰ According to Chen Ming’s research, most of the medicinal materials recorded in *Hai Yao Ben Cao* were foreign medicines that had been integrated into the mainstream of traditional Chinese medicine, including 17 Persian-related medicines; *Zheng Lei Ben Cao* (《证类本草》 *Materia Medica Arranged According to Pattern*) of the Song dynasty included hundreds of medicinal materials from *Hai Yao Ben Cao*.

In the Yuan dynasty, the emperors’ emphasis on medicine and the expansion of territory once again promoted the introduction of Middle Eastern medicinal materials into China. In 1288, Xu Guozhen (许国祯) and nearly 30 other famous doctors of the Yuan dynasty completed the *Da Yuan Ben Cao* (《大元本草》 *Materia Medica of the Great Yuan Dynasty*) after four years of effort. This book took the longest time to compile among all the official materia medica in history, and its primary purpose was to supplement the medicinal materials from the expanded territory and neighborhood. A few decades later, Zhu Yuan (朱轅), a scholar of *Ji Xian Dian* (集贤殿 Jixian Academy), wanted to expand the materia medica with exotic products and compiled another *Da Yuan Ben Cao*. Although the latter book was dedicated to the Imperial Academy of Medicine, unfortunately, neither of the two was passed down.³³

Some scholars have verified the medicinal materials from foreign countries based on the records of Li Shizhen’s (李时珍) *Ben Cao Gang Mu* (《本草纲目》 *The Grand Compendium of Materia Medica*) in the Ming dynasty and found that among the 46 medicines that were clearly from Persia, only 3 medicines: silver ore, saffron and calamine, were introduced between the Song dynasty and the Ming dynasty (960–1644), and the remaining 43 were used by Chinese doctors earlier.³⁴

3.2 Dissemination of Chinese medicinal materials in the ancient Middle East

While Middle Eastern medicinal materials were introduced to China in large quantities, Middle Eastern medical practitioners were also studying and using medicinal materials from China.

Ibn al-Baitar (1197–1248) was a famous botanist in the Middle East. In *Collection of Simple Drugs and Foodstuffs* (*Kitāb al-Jāmi li-mufradāt al-adwiya wa’l-aghdhīya*), he described various medicinal materials, which were later recorded into the Greco-Arabic pharmacopeia. According to him, herbs such as *tutie* (zinc oxide), *bish* (aconite 乌头), and *rēwand chīnī* (rhubarb 大黄) originated in China.³⁵

Abū Mansūr Muvaffaq bin’Alī alharavī of the Samanid Empire published *The Book of Remedies Based on the Realities of Medicines* (*Kitāb-ulabniyat’an haqā’iq-*

uladviyat) in 970–975, which recorded new medicinal materials from the East.³⁶ The Samanid Empire was located in central Asia, not far from the Western Regions under the Tang Empire, so these medicinal materials were highly possible came from China.³⁷ Abū Mansūr clearly pointed out that celandine was produced in Gansu, China, and explained its medicinal properties and its application in clinical ophthalmology; he also mentioned that *māmīrān* (*Coptis chinensis* 黄连) originated in China and was famous for healing swollen eyes.³⁸ Bai Juyi (白居易) of the Tang dynasty wrote a poem, “Receiving letter from friend Qian asking my eye problem (得钱舍人书问眼疾)”, which also mentioned the fact that *coptis* root was common in treating eye diseases in China at that time. In addition, Abū Mansūr also mentioned that *rattan* (*Sanguis Draconis* 血竭) was from China, and it was hot and dry, able to treat chronic diseases and various poisonings, and the pit was edible. Additionally, there were *nisrīn* (Chinese roses 中国玫瑰) used to treat headaches, fever, and inflammation of sores, and the best ginger was produced in China.

Moreover, ancient Middle Eastern scholars such as Tabari (870), Rāzī (925), Majusi (982), Ibn Sīnā (Avicenna, 1037), and Jurjani (1137) all described Chinese medicinal materials in their works. The most commonly mentioned Chinese medicinal materials in Middle Eastern medical books from the 8th to the 13th century were *dar sini* (cinnamon 肉桂, meaning “Chinese herb”), *Aaron* (wild ginger 野姜), *rivand-e sini* (rhubarb 大黄), *basbasa* (nutmeg 肉豆蔻), *ood* (agarwood 沉香), *sandal* (sandalwood 檀香) and China rose (Ibn al Baytār called it “Gul-e Chini”),²⁴ as well as *ephedra* (*Ephedra vulgaris*), camphor (*Camphora officinalis*), pomegranate (*Punica granatum*), angelica (*Angelica sinensis*), hemp (*Cannabis sativa*), calamus (Acorns calamus), castor oil plant (*Ricinus communis*), etc.³⁸ There are also many similarities in the clinical application of these medicines in the Chinese and Middle Eastern medical systems.¹⁴

3.3 Preliminary summary of the exchange of medicinal materials between ancient China and the ancient Middle East

There are more types of medicinal materials imported from the Middle East to China than those imported from China to the Middle East. Merchants brought peaches, apricots, rhubarb, *coptis* root, ginger, sandalwood, camphor, cinnamon, celandine, China rose, musk, and tea from China to the Middle East. During the same period, many medicinal materials were imported from the Middle East to China,^{8,39} and they are still commonly used in traditional Chinese medicine today; furthermore, many plants are both medicinal and edible (Table 1).

Table 1 Common Chinese medicinal materials originating from the Middle East

Classification	Medicinal Materials
Herbal medicine	Asafoetida (阿魏), saffron (藏红花), turmeric root tuber (郁金), <i>curcuma longa</i> (姜黄), nutgrass galingale rhizome (香附), <i>amomum villosum</i> (砂仁), fennel (小茴香), <i>elecampane inula</i> root (青木香), long pepper (荜茇), figwortflower <i>picrorhiza</i> rhizome (胡黄连), natural Indigo (青黛), aloe, <i>nigellae semen</i> (草鼓), alfalfa (苜蓿), coriander, sesame
Plant-based medicine	Frankincense (乳香), myrrh (没药), dipterocarpaceae (龙脑香), dragon's blood (血竭), agarwood (沉香), clove (丁香), terminalia (诃子), pepper, storax (苏合香), phoenix dactylifera (椰枣), jasmine, almond, pistachio (阿月浑子), olive, fig, walnut, grape, jackfruit
Animal medicine	Ambergris (龙涎香), rock honey (石蜜)

4 Interchange of prescriptions between ancient China and the Middle East

4.1 Dissemination of Chinese prescriptions in the ancient Middle East

During the Abbasid dynasty, influenced by Chinese alchemy,⁴⁰ the Middle East made significant progress in chemistry, forming a knowledge system for identifying medicinal materials, analyzing medicinal properties, and prescribing.^{7,41} In the early 9th century, Middle Eastern scholars learned about ammonia, ammonium chloride, ammonium carbonate, sal ammoniac, saltpeter (potassium nitrate), copper, mercury, and sulfur through the Chinese. The caliphs and princes also asked people to make elixirs, and their preparation methods were very similar to those of Ge Hong's (葛洪).⁴² Middle Eastern scholars were proficient in various techniques such as distillation, filtration, sublimation, crystallization, and dissolution, and they divided medicines into monomers and synthetic based on the number of elements and natural components. For instance, a synthetic medicine has different characteristics, such as cold, hot, dry, and wet, while a monomer medicine only has one character. They also classified medicines according to their efficacy, such as antipyretics, antidotes, digestants, etc.

Avicenna's *The Canon of Medicine* was a representative work of Middle Eastern medicine. The second volume “Materia Medica” not only quotes ancient Greek medical elements but also quotes materials from the academy of Jundishapur,⁴³ which had invited Chinese scholars to translate Chinese materia medica and religious literature during the reign of Khosrau I of the Sassanid dynasty (531–579); the fifth volume is “Prescriptions and Pharmacy (Qarabadin)”, which contains more than 600 compound medicines created by famous doctors from many places around the world, such as Andromache's *taryaq* (antidote), Erazistrat's eye medicine, Filag's *iyaraj* (laxative), etc., not only herbal but also preparations containing animal or mineral materials and their combinations.⁴⁴

What's more, Avicenna mentioned that *suk* is a secret formula from China, the primary materials of which are *amlaj* (余甘子, *Emblica officinalis*, Indian gooseberry) and many other herbs originating from the Middle East (Note 2). It is usually used as a liver protector and is also effective for palpitations.

During the Ilkhanate period, Prime Minister Rashīd al-Dīn recruited professionals and translators from all over the country and established a science, technology, culture, and education center in the eastern suburbs of Tabrīz. He attached great importance to science and technology from China, so he organized the translation and compilation of many scientific works from China, including *Tanksūqnāmah*. According to Mitsuaki Endō, the part "Pharmacology" of *Tanksūqnāmah* should be the Persian translation of the only official prescription book of the Yuan dynasty, *Yu Yao Yuan Fang* (《御药院方》 *Imperial Pharmacy Prescriptions*). Engraved in 1338, *Yu Yao Yuan Fang* collected more than 1,000 prescriptions made by the imperial medicine institutions of the Song, Jin, and Yuan dynasties.⁴⁵ However, the part "Pharmacology" of *Tanksūqnāmah* was lost in China.

4.2 Dissemination of Middle Eastern prescriptions in ancient China

Bei San Tang (悖散汤 Counterflow-ceasing Decoction) was originally a Persian-Syrian prescription. It was introduced to China no later than the beginning of the Tang dynasty and spread among the Chinese people. According to *Qian Ding Lu* (《前定录》 *Records of Predestined Fate: Supernatural Stories from Tang China*), Emperor Taizong of Tang (唐太宗) suffered from dysentery, and none of the doctors' treatments proved effective, so he issued an imperial edict to ask for a prescription. Zhang Baozang (张宝藏), the imperial guard in charge of the security of the capital, had suffered from a similar disease and had been cured after taking *Bei San Tang*, a decoction prepared by boiling milk with long pepper, so he offered this decoction and cured Emperor Taizong. Later, this decoction was included in Sun Simiao's (孙思邈) *Qian Jin Yi Fang* (《千金翼方》 *Supplement to "Important Formulas Worth a Thousand Gold Pieces"*).

The emergence of pre-made medicines and changes in dosage forms reflect the influence of Middle Eastern medicine on TCM, which was particularly prominent after the Song dynasty. The number of pre-made medicines in *Tai Ping Sheng Hui Fang* (《太平圣惠方》 *Formulas from Benevolent Sages Compiled during the Taiping Era*) and *Sheng Ji Zong Lu* (《圣济总录》 *Comprehensive Recording of Divine Assistance*) in the Song dynasty reached over 20,000, showing exponential growth. At the same time, the application of aromatic medicines increased significantly compared with medical prescriptions in the Tang dynasty: some pre-made medicines were primitive chemical medicines,⁴⁶ and the dosage forms were mainly pills, powders, and

soups, followed by ointments, snowy powders, buccal tablets, aromatics, etc. According to statistics, in 1221, prescriptions mainly based on Middle Eastern herbs had already appeared in China. For example, there were 10 such prescriptions in *Tai Ping Hui Min He Ji Ju Fang* (《太平惠民和剂局方》 *Beneficial Formulas from the Taiping Imperial Pharmacy*); from 1225 to 1227, the number was increased to 17, and further increased to 28 from 1241 to 1252.²⁴ Simultaneously, the Middle East exported asphalt glue and borax as ingredients for pre-made medicines to China. In addition, many Arabic prescriptions were also recorded in Chinese medical classics such as *Yin Shan Zheng Yao* (《饮膳正要》 *Principles of Correct Diet*), *Rui Zhu Tang Jing Yan Fang* (《瑞竹堂经验方》 *Empirical Formulas from the Auspicious Bamboo Hall*), and *Hui Hui Yao Fang*. The emergence of pre-made Chinese medicines, changes in dosage forms, and innovations in pharmaceutical technology were influenced by Middle Eastern medicine.⁴⁷

5 Interchange of medical knowledge between ancient China and the ancient Middle East

5.1 Dissemination of Chinese medical knowledge in the ancient Middle East

During the Tang dynasty, China and the Middle East had close economic, cultural, and medical interchanges. The exchange of medicinal materials gradually evolved into the interchange of diagnostic and treatment techniques. In the middle of the 8th century, in order to popularize medicine, the Xizang king Me Agtsom (Tridē Tsuktsen) and Tri Songdetsen invited doctors from the Central Plain, Tazi (West Asia), India, Nepal, and other places to teach medicine in Xizang and translated the books they brought into Xizang language. They also sent outstanding students to study in various places, which led to the birth of the *Four Tantras* at the end of the 8th century⁴⁸ and promoted the direct interchange of medical knowledge between China and the Middle East.

Acupuncture is one of the basic treatment methods of TCM, and it was known to Middle Eastern scholars during the Tang dynasty. Iraqi merchant and traveler Suleyman Sirafi wrote in *The Travels of Suleyman* that the Chinese have medicine, and the most used one is moxibustion.

Completed around 850, *Firdaws al-hikma* (*Paradise of Wisdom*) was a typical encyclopedia integrating with Chinese, Indian, and Greek sciences. It contained rich content in pharmacy and clinical treatment and cited many historical materials of Chinese Buddhism. The works of two Syrian-Persian doctors, Galen and Dioscorides, also quoted the contents of the Chinese Pharmacopoeia.⁴⁸ In short, the spread of Chinese medical knowledge and practical techniques to the West before the Tang dynasty was sporadic.

Pulse diagnosis is an essential diagnostic method of both Chinese medicine and Middle Eastern medicine, and they have something in common, which might be the result of long-term interchanges between the two sides. Avicenna's *The Canon of Medicine* is regarded as the culmination of Middle Eastern medicine. Among the 48 pulse conditions recorded in it, 35 are very similar to those recorded in Wang Shuhe's (王叔和) *Mai Jing* (《脉经》 *The Pulse Classic*).⁴⁹ In terms of language style, in contrast to the use of figurative metaphors to describe pulses in TCM classics, Avicenna rejected metaphorical expressions and even introduced music as a means of analyzing and classifying pulses, reflecting the pursuit of rationality.⁵⁰ Therefore, although Avicenna did not explicitly point out the source of the pulse diagnostic methods, it can be speculated that pulse diagnoses in the Middle East have incorporated that of TCM.⁵¹ Rāzī also studied pulse diagnosis, and he had students from China. Unlike the radial artery pulse diagnosis practiced by Avicenna, Rāzī touched *Taiyang* (EX-HN5), and he pointed out the difficulties doctors encountered in learning pulse diagnosis in *Kunnāsh al-Mansūrī*. By the Ilkhanate period, the Middle Eastern pulse diagnosis that originated in the 10th century had absorbed rich knowledge from Chinese medicine. According to research, the pulse-taking science in the fragment of *Tanksūqnāmāh* came from *Mai Jue* (《脉诀》 *Verse on Pulse Diagnosis*),⁵² which was popular in the Song and Yuan dynasties and collected various pulse diagnosis theories produced before the Song dynasties.⁵³

Due to the close relationship between the Yuan dynasty and the Ilkhanate, the interaction between Chinese medicine and Middle Eastern medicine in the Yuan dynasty expanded and deepened. In the early 14th century, Rashīd al-Dīn and his team members translated many famous Chinese medical books, compiled that knowledge into *Tanksūqnāmāh*, and brought Chinese pulse diagnosis, meridians, pharmacology, and materia medica to the Middle East.⁵⁴ More importantly, this book systematically explains ancient Chinese medical theories such as “three positions and nine pulse-takings (三部九候论)”, “yin-yang (阴阳)” and “twelve meridians (十二经水)” for the first time by quoting some passages from works such as *Su Wen* (《素问》 *Basic Questions*), *Nan Jing* (《难经》 *The Classic of Difficult Issues*), *Zhen Jiu Jia Yi Jing* (《针灸甲乙经》 *The Systematic Classic of Acupuncture and Moxibustion*), *Zhu Bing Yuan Hou Lun* (《诸病源候论》 *Treatise on the Origins and Manifestations of Various Diseases*), etc., expounds on the philosophy of TCM, quoting rich illustrations and annotations in the original TCM classics.^{18,55} The Persian interpretation of TCM terms in this book is almost entirely accurate, expressive, and reasonable.⁵⁶

The world history compiled by Rashīd al-Dīn, *Jami' al-Tawarikh* (*The Compendium of Chronicles*), records the spread of Chinese medical classics in Arabia and Persia. There are several records, including *Theory and*

Practice of Chinese Pulse Diagnosis, Herbal Medicine We Are Using and Going to Use, and Introduction to Chinese Pharmacy in two parts: Pulse Diagnosis and Formulas. Scholars of the Ilkhanate took great pains to find copies of these previously lost books. They first translated them from Chinese into Persian and then into Arabic. *Jami' al-Tawarikh* also records that Mahmud Ghazan (Ghāzān Khān, 1271–1304) was proficient in multiple languages and multi-ethnic medical knowledge. After he suffered from eye disease, he received various medical treatments, including Chinese moxibustion, which effectively promoted the spread of TCM in the Middle East and the mutual learning between TCM and Middle Eastern medicine.

5.2 Dissemination of Middle Eastern medical knowledge in ancient China

The earliest introduction of Middle Eastern medical theories, diagnostic, and treatment methods to China likely occurred between 865 and 925 when Rāzī lived. In the book *Kitāb al-Fibrīst* (*The Fibrīst of al-Nadīm*), Ibn al-Nadīm, a Baghdad scholar in the 10th century, tells the story of a Chinese student of Rāzī. This student mastered the spoken and written Arabic language in just five months. After studying with Rāzī for a year, and a month before he left for China, he transcribed the core content of *The Sixteen Books*, a summary of Galen's most influential books in Arabic, in a ‘shorthand’ writing in Rāzī's library.⁵⁷

The emperors of the Yuan dynasty attached great importance to medicine. Medical talents from all over the world were allowed to enter government positions based on their medical expertise, which undoubtedly significantly promoted the spread of Middle Eastern medicine in China. Ngai-Sie (1227–1308), the Director of the royal hospital in Khanbaliq (元大都), came from Syria. He was proficient in multiple languages. In 1246, he joined the Mongolian army and became a doctor for Kublai Khan, Timur, the Mongolian Empress Dowager Sorghaghtani Beki, and other nobles.⁵⁸ In 1270, Kublai Khan ordered the establishment of the Western Region Medical Department (西域医药司) in Khanbaliq, Xanadu (元上都) and Mongolia to treat illnesses and injuries for dignitaries. Ngai-Sie was the general of these medical departments and was also in charge of astrology. He also served as an envoy to visit the Middle East. There were 36 Middle Eastern medical books ever preserved in the Khanbaliq court. Therefore, it can be inferred that Ngai-Sie may have communicated with Rashīd al-Dīn and organized a batch of Middle Eastern medical books to be translated into Chinese.¹⁹

The prescriptions from the Middle East will inevitably led to the introduction of relevant medical concepts because they crystallize medical theories. *Hui Hui Yao Fang*, probably completed in the late Yuan and early Ming dynasties, is an integration of TCM and Middle Eastern medicine. Some passages in the book come from

Avicenna's *The Canon of Medicine*, but most of them were carefully rewritten, so the style of the whole book is more like a compilation of various prescriptions. From a linguistic perspective, the language sources in *Hui Hui Yao Fang* include Persian, Arabic, and possibly some Syriac and Turkic.¹⁹ Among the three existing volumes, there are 517 medicines named in Arabic or Persian, each with a Chinese transliteration,⁵⁹ while Persian served as the third official language after Chinese and Mongolian in the Yuan dynasty. The author of *Rui Zhu Tang Jing Yan Fang* was Shatumusu (or Sademishi), a color-eye official in the Yuan dynasty. *Gan Shi Gao* (甘石膏 Calamine ointment) recorded in the book was the experience prescription passed down by the Hui-Hui people Wumar (Sayyid Ajall Shams al-Din Omar).⁶⁰

The dietary therapy of TCM has a long history, and it also absorbed the concept of diet therapy from Middle Eastern medicine in foreign exchanges. *Yin Shan Zheng Yao*, written by Hu Sihui (忽思慧) in the Yuan dynasty, reflects the scientific and cultural interchanges among ethnic groups along the Silk Road. Western scholars note that some content of *Yin Shan Zheng Yao* is similar to Arabic dietary literature, such as *Taqwīm as-Ṣiḥḥa (Taccuinum Sanitatis, Almanac of Health)* by Ibn Butlān (1001–1063).⁶¹ However, the recipes in *Yin Shan Zheng Yao* mainly use Middle Eastern cooking techniques and ingredients⁶² and clearly incorporate Chinese Taoist thought into the composition.^{63,64} It can be seen that the Yuan dynasty was an era of full integration between Chinese and Middle Eastern medicine, and the interchange and mutual learning between the two greatly enriched each other.

6 Conclusion

Medical exchanges between ancient China and the Middle East were a prominent part of the Silk Road civilization exchange, with a long history and far-reaching influence. The exchanges between the two major medical systems in terms of medicines, prescriptions, diagnosis and treatment techniques and theories not only enriched each other's medical practices, but also promoted the integration and development of cross-regional scientific and technological culture. The spices and medicinal materials introduced from the Middle East to China (such as frankincense, myrrh, saffron, etc.) and the medicines exported from China to the Middle East (such as rhubarb, coptis, cinnamon, etc.) have formed a complementary trade, reflecting the differences in geographical environment and medical needs. Chinese doctors actively absorbed foreign medicines and incorporated them into the local pharmaceutical system, demonstrating the openness and adaptability of TCM; while Middle Eastern scholars integrated Chinese medicines into the Greek-Arab medical tradition through literature records and clinical applications.

Middle Eastern medical preparations (such as pills, powders, and pastes) and chemical pharmaceutical

technologies (such as alchemy) had a significant impact on the development of Chinese prescriptions after the Song and Yuan dynasties. TCM pulse diagnosis, acupuncture and other diagnostic and treatment technologies were also introduced to the Middle East through translation and clinical practice, and were absorbed and improved by scholars such as Avicenna. The compilation of works such as *Hui Hui Yao Fang* and *Yin Shan Zheng Yao* during the Yuan and Ming dynasties marked the systematic integration of medical knowledge on both sides.

TCM's yin-yang and *Wu Xing* theory, pulse theory and Middle Eastern medicine's four body fluids (humours) theory and rational diagnosis methods achieved in-depth dialogue during the Ilkhanate period (such as the compilation of *Tanksūqnāmah*). The translation of TCM classics by scholars such as Rashīd al-Dīn systematically introduced TCM philosophy into the Persian-Arab medical system for the first time, and China also absorbed Middle Eastern diet therapy and external treatment techniques through institutions such as the Western Regions Medical Bureau.

The medical exchanges between ancient China and the Middle East benefited from political cooperation (such as the bond between the Yuan dynasty and the Ilkhanate), multilingual translation capabilities, and business travel networks. Although the exchanges declined during the Ming and Qing dynasties, historical experience shows that the progress of medical civilization is inseparable from cross-cultural mutual learning. Re-examining this history of exchanges can not only provide a model for the modernization of traditional medicine and international cooperation, but also help build the historical foundation for a community of shared health for humankind.

Despite challenges posed by fragmented historical records and the multidisciplinary nature of research, recent initiatives under the Belt and Road framework have revitalized academic interest in this field. By reconstructing the historical panorama of China and Middle East medical exchanges, this study highlights the dynamic interplay between these two great medical traditions, offering insights for contemporary cross-cultural medical collaboration and the Silk Road of Health. Future research should leverage multilingual textual analysis, archaeological findings, and scientific methods to further unravel the intricacies of these exchanges, bridging past wisdom with future innovation in global medical heritage.

Notes

1. The Middle East has been known as the cradle of multiple civilizations, but during 7th to 15th century CE, all Middle East empires were Islamic, except Byzantine. However, their medicines shared the same root from ancient Graeco-Roman medicine. The term "Middle Eastern medicine" here encompasses the interconnected Persian, Arab, and Graeco-Arabic

medical traditions (7th–15th centuries) that shared theoretical frameworks (e.g., humoral theory) while maintaining regional variations, reflecting current scholarly practice for comparative studies.

2. The term “*suk*” (a transliteration) for medicine/formula may derive from localized variants in Cantonese (e.g., Siyi dialects), Hakka, or minority language influences (e.g., Zhuang/Yao loanwords), though no standardized Chinese dialect currently uses this pronunciation.

Acknowledgements

The authors sincerely thank al-Malawi Abdulrahman Ahmed Ali for his detailed Arabic-to-Chinese/English translation and insightful interpretation of Arabic texts, and Zhou Linqi for her idiomatic translation and thorough linguistic review of the entire manuscript in English.

Funding

This work is supported by the grant from The MUST Faculty Research Grants (FRG-25-031-FC) and Fundação Macau.

Ethical approval

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

Author contributions

LIANG Qiuyu conducted literature research, designed the overall historiographic framework, synthesized the narrative, drafted the original manuscript, performed the final cross-check of references and reviewed the final manuscript. ZHENG Min checked historical materials, provided historical insights on medieval Arabic medical texts and critically revised the manuscript.

Conflicts of interest

The authors declare no financial or other conflicts of interest.

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Edited By YANG Yang

How to cite this article: Liang QY, Zheng M. Medical interchanges between ancient China and the ancient Middle East from 7th to 15th century. *Chin Med Cult* 2025;8(4):378–386. doi: 10.1097/CMC9.0000000000000162