

# 2000 years of medical exchange

From the 6th to 15th centuries

by **Gunter Neeb**

## Byzantine and Euro-Arabian medicine in the second half of the first Millennium

**AFTER THE GREEK CITY** of Alexandria was lost, the city of Byzantine became even more important and the medical language changed gradually from Greek to Latin. Under the Byzantine influence clinical practice became more emphasised, as did pulse diagnosis and herbal knowledge.

When Christianity came to power in Europe, many rulers considered the ancient Greek and Roman knowledge as heathen and banished its books. There was enormous cultural loss when, in 390 AD under the emperor Theodorus (also known as Theodesius), the Great Library of Alexandria was burned by the Christian bishop Theophilus.

The Arabs, who controlled Spain and eastern Europe, did not have a large flora in their African home countries and were thus open for knowledge from everywhere on their trade routes. They gathered Greek and Roman, as well as surgical knowledge from Indian medicine, and herbal knowledge from China. Their caravans carried spices and fragrant substances to Europe to be used as incense such as myrrh (*Mo Yao*), frankincense (*Ru Xiang*), cinnamon (*Rou Gui*), sweet flag (*Chang Pu*), cardamom (*Cao Dou Kou*), licorice (*Gan Cao*)

and tumeric (*Jiang Huang*). They collected tumeric from India and used it to treat liver diseases and jaundice, sandalwood for pains and fevers, Indian pomelo skin (*Qing Pi*) for digestive disorders as well as zedoary (*Yu Jin*).

Galangal root (*Da Gao Liang Jiang*) from East Asia was used for promoting digestion and to treat impotence; hops (*Hu Lu Hua*) was used for calming the mind, camphor (*Zhang Nao*) for gout, rheumatic and ear diseases, dandelion (*Pu Gong Yin*) for liver inflammation and blood obstruction, nutmeg (*Rou Dou Kou*) for cholera, low appetite and nervous headaches, senna leaves (*Fan Xie Ye*) for cleaning the bowels, epilepsy and skin diseases, meadow saffron (*Qiu Shui Xian*) for gout and arthritis and equisetum (*Mu Zei*) for promoting urination.

Many of these were listed in the books of the most famous author of this time, Ibn Sina or Avicenna (980-1037). His five-volume work *Canon Medicinæ* was studied by medical students throughout the next half of the millennium.

In this way some ancient medical scripts found their way to western Europe via Spain, but the Arabs also combined their acquired knowledge of medicine with their own sciences, mainly mathematics and astrology.

It was definitely the Arabs who, at this time, linked European medicine with Chinese medicine through their trade. In 1236, when Ferdinand III liberated Cordoba, the capital of the

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TABLE 1

Latin name	Chinese	Used
Lily	<i>Bai He</i>	Cough
<i>Foeniculum offic.</i>	<i>Xiao Hui Xiang</i>	Cough, digestive problems
<i>Salvia offic.</i>	---	Sore throat, common cold
<i>Rosmarium offic.</i>	<i>Mi Die Xiang</i>	Internal: Dyspeptic, external: rheumatism-like disorders
<i>Mentha piperita</i>	<i>Ou Bo He</i>	Sweating, common cold
<i>Mentha arvensis</i>	<i>Bo He</i>	Respiratory infections, flatulence
<i>Levistoculum</i>	<i>Du Huo Cao</i>	Digestion, urinary infections
<i>Ruta graveolens</i>	<i>Yin Xiang</i>	Circulation, thrombosis
<i>Satureja hortensis</i>	---	Flatulence, digestion
<i>Pulsatilla vulgaris</i>	<i>Ou Bai Tou Weng</i>	Uterine spasms, eye diseases
<i>Angelica archangel.</i>	<i>Ou Dang Gui</i>	Gynaecology
<i>Glycyrrhiza offic.</i>	<i>Guang Guo Gan Cao</i>	Cough and stomach disorders

former Arabian emirate in Spain, a “manlike root” was found that the Arabs had traded from the Far East. From the descriptions we have, it must have been Ginseng from China.

### Monastic medicine in Europe

After the Roman aristocracy had disappeared and western Europe was partially occupied and divided, all legislative and educational power was in the hands of the church. Latin was still the official language of the church, therefore the clerics were much more familiar with the Latin scripts of the old sciences than the worldly rulers. When a new Christian order called ‘The Benedictines’ was founded in 529AD, one of the recommendations for monks by the Chancellor Aurelius Cassiodorus (490-583) was to study medicine and herbs, to read Hippocrates and Galen. Many other orders followed this direction.

Medicine became once more linked to religion. Medical works were included in all monastery libraries and studied by the monks and applied in the name of Christian charity in the ‘sick chambers’ of the monasteries. Some monasteries gained even a famous reputation in surgery. One was Monte Casino in Italy, where a bladder stone of the Saxon emperor Henry II was removed.

For the first time larger amounts of medicinal herbs were grown in the gardens of the monasteries, which could be supplied to the people in need. In the 9th century medicinal plants were grown in the garden of the St Gallen monastery, directly next to the pharmacy (see Table 1). Many of them are nowadays used as spices, but some also as medicinal herbs.

Another German monastery of the 8th century, the Cloister Lorsch, produced the oldest herbal book of monastic medicine. It contains 200 herbal drugs and 500 prescriptions with exact instructions on manufacture. Some pre-

scriptions contain up to 10 herbs, often based on wine or honey as staple medicine. They were mostly arranged according to the galenic theory of the four elements. For moist diseases the following groups were applied:

- Dry and hot: pepper for solving stomach congestions and warming
- Dry and moist: aloe (*Lu Hui*) for purging yellow bile through the bowels
- Coloquinth (*Ku Xi Gua*) and euphorbia (*Qin Jin Zi*) for purging phlegm through the bowels
- Polypodium vulg. and wild thyme (*Bai Li Xiang*) for purging black bile when coughing
- Drying water through urine: juniper (*Du Song*) and parsley root (*Yuan Sui Cai*) for drying by diuresis.

Sometimes the herbs were not used according to this system, but only according to their empirically known effects, i.e. ginger (*Jiang*) for stomach pain, garlic (*Da Suan*) and caraway (*Zang Hui Xiang*) for abdominal distention and flatulence, celery root (*Jin Cai Gen*) for urinary stones. Often Germanic folk wisdom was mixed with Roman knowledge of the 2nd-5th centuries.

Among the Latin monastic tomes, which could be found in almost all libraries during medieval times, was the ‘Macer Floridus’ a medico-botanical poem written by a French author and published for the first time around the year 1100. It contains a list of 85 plants for medical use, many of which could not have come from Europe, such as ginger (*Jiang*), galangal root (*Gao Liang Jiang*), cinnamom (*Rou Gui*), curcuma (*Jiang Huang*), zedoary (*Yu Jin*), Myrrh (*Mo Yao*), Coriander (*Xiang Cao*) or Piper longum (*Bi Bo*), but must have been introduced by the Arabian trade.

On the other hand, many European plants, such as vervain (*Ma Bian Cao*), mustard seed

Some Arabian formulas found their way into Chinese formula collections...

(*Bai Jie Zi*), plantain (*Che Qian Cao/Zi*), opium poppy (*Ying Su Hua*), peony (*Bai Shao Yao*), cyperus (*Xiang Fu*), fennel (*Xiao Hui Xiang*), aloe (*Lu Hui*) and a few plants from the *Allium* and *Aristolochia* families are nowadays a part of the Chinese pharmacopoeia. But it remains uncertain whether they were introduced to China in the same way or just naturally spread throughout the Eurasian continent.

Many of these plants were already in medical use at the time of the famous monastic author Hildegard von Bingen (1099-1179). She used 213 herbal, mineral and animal ingredients and combined them into prescriptions, and was the first to include foreign plants such as galangal root (*Da Gao Liang Jiang*) in her formulas. She mentioned that Avicenna had recommended the use of *Gao Liang Jiang* for digestive diseases and of zedoary (*Yu Jin*) for depression and melancholy. It is also interesting that Avicenna used local names instead of the official botanical names, indicating that much of her knowledge was based on practical experience.

Monastic medicine became the heir of the Greek and Roman medicine for the second half of the first millennium. While the church was powerful, the Christian knight orders also began to use rooms and houses in the monasteries for the treatment of the sick. These were to become the first hospitals in the 14th and 15th centuries.

During the Tang and Sui dynasties, exchange of foreign ideas with China prospered. Arabs, Syrians and Persians came to Chang An from the West, and the Japanese and Koreans came from the East.

The silk road, which existed already in the 2nd century BC, permitted transport from China to the Mediterranean Sea. Chinese Buddhists searched for Buddhist sources in India, and Indian physicians went to China to practise and exchange their cultural and medical knowledge with the Chinese.

India imported ginseng (*Ren Shen*), aconite (*Wu Tou*), ephedra (*Ma Huang*) and angelica (*Dang Gui*) from China.

We can be sure that the Arabian trade exported Middle Eastern plants to China, most

of them also used as spices or fragrant herbs such as olibanum (*Ru Xiang*), myrrh (*Mo Yao*), *Sanguis draconis* (*Xue Jie*) and *Aucklandia* (*Mu Xiang*), and imported *Trigonella* (*Hu Lu Ba*) and also ginseng (*Ren Shen*) from the Chinese.

With the herbs, knowledge was also exchanged. Some Arabian formulas found their way into Chinese formula collections, and while purging and some surgical methods were brought from India or Arabia to China, the treatment of diabetes, measles and pulse diagnosis found their way into Arab books. For instance, some excerpts from the *Mai Jing* (Pulse Classic) were also found in Avicenna's pulse recordings.

### The beginning of the second millennium to the 15th century

At the start of the second millennium, the Arab influence on European medicine continued, as seen in the medical works of the 11th century medico Simeon Seth. His works clearly show influences from Arabian as well as Indian and Persian sources. After the liberation of Spain from the Arabs in the 11th–12th centuries many old sources and lost works found their way back to the Europeans, who expanded this old knowledge.

One was the Spanish Arabian Ibn Nafir (1210-1288), who dared to correct the anatomical animal studies by Galen, although it took a few centuries longer until Galen's anatomy was taught in a corrected way. Ibn Nafir's contemporary Myrepsos (1250) collected and published 2656 medical prescriptions; 100 years later Johannes Actuarius (13th century) made some early steps into psychology in his studies of the human spirit, attempting to explain influences between one's diet and one's mind.

Interesting also that in China, almost at the same time, Zhang Zi-He related diseases and treatment to emotions according to the five phases.

In 1453 the city of Byzantine fell to Turkish Islam. This put an end to the spreading of Greco-Roman medical knowledge eastwards.

With the development of larger cities the first universities were founded, where non-clerical

## Medical concepts of the medieval age

TABLE 2

<b>Theory, diagnosis</b>	Galen's humoral-pathology, pulse diagnosis and strong emphasis of urine diagnosis
<b>Herbal therapy</b>	Classification of herbs according their shape and color (signature) according to the four elements and humors, i.e. red = blood, fiery; yellow = bile, earthy, etc.
<b>Behavioral and diet therapy</b>	Trying to balance the four elements with dietetics and life regulation (air, food and beverage/excrements, motion/stillness, sleep/waking and balancing of emotions.
<b>Manual therapy</b>	Bloodletting and cupping according to astrological concepts, i.e. star and moon position etc.



citizens could study medicine. The first few universities were founded in the 12th century in Paris, then Bologna and Padua, followed by Valencia, Toulouse, Oxford, Naples and Siena. The university studies consisted of reading and interpretation of the classic works by teachers, but no critique on the classic authorities was allowed.

The first record of a dissection of a body dates back to 1302, when a court in Salerno (Italy) wanted to find out whether the man died of natural causes or was poisoned. While the rest of Europe did not dare or care, the study of anatomy began to flourish in Italy.

In 1363 a manual of surgery was published with drawings from sections performed on buried, dried and then cooked bodies. But since no anatomical studies were performed outside Italy, Galen's human anatomy, based on animal organs, was not corrected. If any sections on human bodies were performed at all, it was only to show that the classic works could be verified. No new knowledge was desired.

While the church had guarded medical knowledge and practice for at least 600 years, the first split between the church and medicine began in the 12th century, when monks were prohibited to perform surgery because of the danger that someone could be killed. This led to a decline in surgery, which was increasingly performed by laymen like hairdressers, barbers and common folks.

In the 13th century the worldly rulers also introduced many other new laws concerning medicine. For instance, a law passed by Frederic II made it illegal for a physician to sell his own medicine. From this time pharmacists and physicians had their independent professions.

A university study required a familiarity with the scripts of Hippocrates, Galen and Avicenna as well as a book on pathology and fevers by the famous Arabian author Rhazes. Requirements for medical students were to study five years, including surgery after a study of three years, and to practise at least one year under an experienced physician. Unfortunately,

ly, emphasis was less on clinical aspects and experience and much on a sophisticated deduction of disease origin according to theoretical principles.

While bloodletting was performed in Europe according to the constellation of stars and the moon, similar methods such as *Zi Wu Liu Zhu* and *Ba Ling Gui* were applied in China. Although more complex, they were also applying acupuncture according to times calculated to be beneficial.

Marco Polo (1254-1324?), who had travelled to the court of Genghis Khan in 1271 and lived in China for 21 years, brought the first record of Chinese medicine back to Europe. His manuscript was published in 1298/99 but was considered fictive by his contemporaries.

In the early medieval times a bathing culture appeared in the crowded cities, similar to the one at the end of the Western Roman Empire around 1000 years earlier. And similar to the Roman baths, bodily pleasures were combined with bodily hygiene, as many poems and songs will tell us. But all frolicking ended when dense settlement and a lack of hygiene in the streets led to the outbreak of the plague in 1347. This epidemic, together with other infectious diseases such as the smallpox, leprosy, measles and influenza, caused the death of 25 million people, a quarter of the European population.

Other diseases were also common; tuberculosis, malaria and colitis as well as hunger and war were killers of the time. Mainly the poor fell prey to illnesses related to undernourishment, but poisoning due to food also occurred, the most famous being the 'St Antonys Fire' (ergotism), caused by the ergot fungus in the grain used for baking bread.

**Nutritional concepts in the 11th – 16th centuries**

Nutrition was arranged according to the following theories:

The first mayor concept was that warming is the main process in digestion, as it is in life: the sun warms the seeds in and the fruits on the ground to become mellow, and cooking

**Temperature concepts of the medieval age**

TABLE 3

Degree	Cold 1°	Cold 2°	Cold 3°	Warm 1°	Warm 2°	Warm 3°
Dry 1°						Pepper, chili
Dry 2°		Carrot, roots			Cardamom	
Dry 3°			Beans, peas	Beef, cumin cinnamon		
Moist 1°		Fresh fruits	Cabbage, spinach	Sugar, poultry almonds	Milk	Ginger
Moist 2°		Fish, cucumber			Onions	

and baking made them further digestible by adding more heat. After eating, the stomach warms them further and the liver digests them a second time and transforms the food into black bile, yellow bile and the purest into blood. The turbid rest of the chylus is excreted as urine via the urinary system and the bladder. So heat was considered the main principle of digestion, as mentioned in the 'Health Guide of Salerno' (11th century). This theory was accepted by Moslems in the East as well as by their European contemporaries.

Zhang Zi-He, of the Cold School of the Jin-Yuan dynasty, had taken some ideas from Indian sources, like his 'three purging therapies' with diaphoretics, emetics and purgatives, showing that Western ideas must have been available in China. Moslem and Christian countries alike had accepted the 'warming' idea and it was common practice to prescribe warming and tonifying prescriptions, which was strongly criticised by Zhang.

The second major nutritional concept was based on Galen's 'humoral' pathology:

The human body ideally was slightly warm and slightly moist, but age, sex and dwelling also influenced the combination of the four elements in one's body:

For example, older people were said to be dryer and colder, menstruating women colder and moister than men, and southern Europeans warmer than northerners.

The ideal food, of course, was also slightly warm and slightly moist, but in order to balance health the food for older persons should be warmer, for menstruating women dryer and for southerners cooler, and so on.

All foods were classified according to this pattern into three degrees (see Table 2). This system was applied to food as well as spices and herbs, and provided as such a framework for herbal prescriptions.

### The spread of epidemic diseases

The outbreak and the spreading of the plague in the 14th century brought changes in city politics and hygiene. The cities raised their standards of disease control, quarantine and sealing of infected areas and also by eliminating rat infestations, although it was not yet known that the rats were one of the causes of the plague. If someone showed signs of leprosy, a commission of physicians would perform a diagnosis, and if found positive, the diseased would be sent to live in special leper-houses outside the city. These houses provided the initiative for the first hospitals, when some religious orders, in the spirit of mercy, opened similar houses for the poor suffering from other diseases.

In the 15th century, citizens of other cities followed this idea and provided special centers where poor, old, weak or diseased citizens without a home could live and were supported. The hospitals of the Christian orders were religiously motivated, but took the same care for this group of homeless or sick people.

Later on, the services were expanded and those houses included birth centers and orphanages. When the services gradually improved and the hospitals also received wealthy citizens, who paid for the services, hospitals became a source of income for the cities, while its poorer citizens found help in the hospitals of the church.

But despite this development, the split between religion and medicine was almost complete by the end of the 15th century: while for 500 years, from the 5th to the 10th centuries, the church had kept medical knowledge alive inside its monasteries, it had decreed over the following 500 years that its priests and monks should practise less medicine, and thus drove medicine back into the hands of the people.

The exchange of medicinal herbs with China was continuing during the first half of the 2nd millennium: a ship from the Song Dynasty was unearthed in 1973 in Fujian and contained fragrant woods like rosewood (*Dalbergia* — *Jiang Xiang*), sandalwood (*Tan Xiang*) and *Aquilaria* (*Chen Xiang*) as well as betelnut (*Bing Lang*), pepper (*Hu Jiao*), *Ambra* (*Long Xian Xiang*) and cinnabar (*Zhu Sha*) for export to another country.

China imported ginseng and thyphonium (*Bai Fu Zi*) from Korea, sappanwood (*Su Mu*) and cloves (*Ding Xiang*), styrax (*Su He Xiang*) from Vietnam and peppermint and spearmint (*Hu Bo He*) from Arabia.

There was even a trade exchange with Arab traders, the 'Shi Po Si', established in 971 in Guangzhou. More than 60 kinds of medicine were sent there, some of them, such as *Calculus Bovis* (*Niu Huang*), were packed in gold or silver boxes.

Marco Polo recorded in his travel notes: "Many Chinese ships are found in Marabo, which traded medical materials from far away. It is said that they will be transported to Aden and then to Arlisanta."

In 1263 the Yuan court appointed even an Arabian physician, Erank Isaiah, and in 1272 an office of Islamic medicine was established in Dadu.

The Mongol rule over Europe and Asia brought therefore a great deal of medical exchange between the two continents.

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