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Chao Yuanfang: Imperial Physician of the Sui Dynasty and an Early Pertussis Observer?

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Early Chinese texts contain extensive disease descriptions, including various texts that contain descriptions of modern-day conditions. During the Sui Dynasty, a leading scholar, Chao Yuanfang, may have authored a leading treatise 1400 years ago. Although these texts are the subject of ongoing research, evidence suggests that a clinical syndrome consistent with pertussis was observed in ancient China.

Over the past several decades, historical and archeological records have revealed that human populations have suffered from the scourges of epidemic diseases for hundreds of years [1]. Indeed, the application of modern tools such as polymerase chain reaction have been instrumental in confirming the presence of agents responsible for plague (Black Death) epidemics in Europe in the 14th, 16th, and 18th centuries [2]. Scientific analysis of the surviving texts is a developing science, and there are important ancient texts, such as those in China, that have yet to undergo full translation into English. One such text was believed to be authored by Chao Yuanfang.

Chao Yuanfang (see Figure) lived in the Sui Dynasty (581–618 AD)—a relatively brief 38-year period in China’s history that encompassed the reigns of Emperors Wen and Yang (father and son, respectively) [3–5]. Based on historical records, it is believed that Chao Yuanfang, a highly reputed imperial physician, lived during the latter years of the Sui Dynasty (581–618 CE) through the beginning of the Tang Dynasty (618–906 AD). It is believed that he was most active during the Daye reign (605–618 CE) of the Sui Dynasty when he was



Statue of Chao Yuanfang, Qingjiao Ciji Temple, Xiamen, Fujian Province, China.

appointed as the Academician of Imperial Medical Academy and later promoted to Court Physician.

Other known details in the life of Chao Yuanfang are limited. Historical notes of Chao Yuanfang have been found in the novel entitled, *The Story of the Great Canal Era*. In this text, it was said that in August of the fifth year of the Daye reign, the general superintendent of the Great Canal project developed a disease called “Feng Ni Zheng” (a condition akin to arthritis or rheumatism). Chao Yuanfang was called upon by Emperor Yang to treat the ailing superintendent using traditional medicine that incorporated the consumption of steaming tender sheep.

Today, we continue to benefit from early pertussis observers such as Chao Yuanfang even as we consider improved methods for prevention of pertussis with vaccination [6]. Historically, one of the most important Chinese medical texts is the *Zhubing yuanhou lun* (*Treatise on the Origin and Symptoms of Diseases*; [7]). Conflicting information suggests that this Treatise may have multiple authors. During the reigns of the Sui and Song dynasties, official bibliographies note Wu Jingxian as the author of the Treatise. In contrast, 1 edition (the so-called Northern

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Song) of the Treatise states that Chao Yuanfang and others, under royal decree, had written the treatise during the Daiye period (605–618 CE) of the Sui Dynasty. It is believed that the Treatise represents an authoritative compilation of medical theories, concepts, and knowledge. It was in this text that we find some of the earliest descriptions of clinical diseases and meridians that are considered to be channels of energy also known as qi.

In later periods, this major Treatise was also referred to as the Chao Shi Bing Yuan (*Causes of Diseases by Doctor Chao*) by common people and suggests that Chao Yuanfang was regarded as a medical scholar with influence over a sustained period of time in China.

Throughout Chinese history, several renowned medical practitioners have emerged including Si Miao Sun of the Tang Dynasty (618–907 CE), who is recognized as the author of 2 illustrious texts including Qian Jin Yao Fang (*Essential Prescriptions Worth a Thousand Pieces of Gold*) and Qian Jin Yi Fang (*Additions to the Prescriptions Worth a Thousand Pieces of Gold*). These well known treatises addressed a range of diseases including their clinical presentations, and they include citations from the *Treatise on the Origin and Symptoms of Diseases*. Another ancient text, the Wai Tai Mi Yao or *Secret Ways of Treatment*, compiled by Wang Tao of the Tang Dynasty, references seminal *Treatise (Zhubing yuanhou lun)*, attributed in part to Chao Yuanfang.

It is far from certain that the sole author of *Zhubing yuanhou lun* is Chao Yuanfang. There is conflicting information about the authorship in several official bibliographies written before the Song period. For example, the *Suishu jingjizhi*, or bibliography from the Book of Sui Dynasty, mentioned Wu Jingxian as the author. *Jiutangshu jingjizhi*, the bibliography of the Old Book of the Tang Dynasty, listed Wu Jing as the author. Chao Yuanfang is only cited as the author of *Zhubing yuanhou lun* in historical records from the Song Dynasty (960–1279 CE) to the present time. The preface to the Northern Song edition of *Zhubing yuanhou lun* also records that the “*Zhubing yuanhou lun* was written during the Daiye period of Sui (605–618 C.E.) by the imperial physician, Chao Yuanfang and others who had received the imperial decree to undertake this work. They brought together the most authoritative writing from various schools of thought and immersed themselves in a detailed study of their essential concepts and theories.”

Although it would be presumptuous to assume that Chao Yuanfang entirely authored the *Treatise*, subsequent texts suggest that Chao had an enduring legacy that extended hundreds of years after the *Treatise* was published. Chinese medical scholars writing in the Tai Ping Sheng Hui Fang (*Holy Prescriptions for Universal Relief*) during the Song Dynasty (960–1279 CE) reference the *Treatise* including its text on the theoretical basis of human diseases. The *Treatise* itself is written in 50 scrolls covering more than 1739 syndromes with diseases classified into 71 symptom classifications for a wide range of internal and external

diseases affecting every organ system in both children and adults. The *Treatise* is regarded as a seminal text due to its extensive disease descriptions, concepts, and theoretical basis of disease. It is notable that the *Treatise* also contains extensive descriptions of treatment regimens in the form of 198 daoyin or breathing and stretching exercises [8].

The *Treatise* represents an extensive catalog of diseases including categories such as the Symptom of Wind Diseases, Symptoms of Epidemic Pestilential Diseases, and Symptoms of Cough Diseases among many others. More importantly, however, reference in this expansive *Treatise* (the *Zhubing yuanhou lun*) to the cough of a hundred days (100 days cough) appears in the category discussing pediatric diseases and not in Symptoms of Cough Diseases. In this category discussing pediatric diseases, the last sentence of the original text translates to English as follows: if the back [of the child] is cold, there would be a cough. [If] it is not cured within 1 month and there is a cough within 100 days, only 1 or 2 of 10 will recover. The *Treatise* text, perhaps authored by Chao Yuanfang and other leading Chinese medical authorities, describing the observed prolonged cough illness in a child over time has been simplified as the “cough of 100 days”, but this phrase represents an adaptation of the original text translation. Other early observations of pertussis including outbreaks recorded in Persia in the 15th century and outbreaks noted in Paris during the 16th century suggest that pertussis has been widely distributed in human populations for at least several hundred years [9]. Years later, clinical pertussis observations and laboratory studies by Jules Bordet and others [10–14] confirmed the etiology of pertussis as *Bordetella pertussis*.

Does the above passage in this monumental Chinese medical *Treatise* truly represent clinical pertussis observed as a pediatric condition with prolonged cough? Although it is not entirely clear, the text does clearly indicate that the condition described carried with it a high mortality if cough persisted. Thus, this text (possibly authored by Chao Yuanfang and others) provides what may be one of the earliest historical references to the prolonged cough illness in children with high mortality (in other reports described as the “100 days cough”) and a condition consistent with clinical pertussis. Even as modern day scholars dissect the medical texts and writings from ancient China, more work is needed to understand the implications of work originally described for a range of diseases found in the *Zhubing yuanhou lun (Treatise on the Origin and Symptoms of Diseases)*.

CONCLUSIONS

Such historical research work may lead to an improved historical understanding of how diseases evolved with human development and may help to further our understanding of genetic, ethnic, and racial variations in disease over time in different populations. Even today, full translation of the *Treatise*

from Chinese to English and other languages remains an unfinished task that may shed new light on the earliest observations of pertussis and many other notable diseases of humans.

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