

“Variolation” and vaccination in late imperial China, ca 1570-1911

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The first reliable record of smallpox in China can be dated to the 5th century¹ [1]. By the early Song period, around the 10th century, smallpox had become essentially a childhood disease, but it remained one of the most fatal childhood diseases until the 19th century.

Variolation using human pox against smallpox in China was one of the ancient popular inoculation practices existing in different parts of the world before Jennerian vaccination [2]. This paper deals with its historical development and its importance in the introduction of Jennerian vaccination in the country in the early 19th century.

The development of variolation in China

The practice of variolation in China can be documented to the 17th century, and be traced back to the 16th century². Joseph Needham's claim that the method could be dated to the 10th century [3] cannot be substantiated by any reliable sources. In the 16th and early 17th centuries, variolation made its way rather slowly. The first extant and available written record which actually described variolation was in a 1695 medical book by Zhang Lu (1617-?), a famous doctor. He noticed that variolation, a technique “bestowed by a Taoist immortal”, was first practiced in Jiangxi (right bank of the lower Yangzi River), then spread all over the country during his time [4].

He described three methods of variolation: putting a piece of cotton imbued with pox pus into the nostril of the healthy child, using squama the same way when a fresh pustule was not available, and making the healthy child wear clothes that had been worn by a child who had contracted the disease. After the child was thus variolated, he would have fever in about seven days, with a slight and benign case of smallpox [4]. This would prevent the child from getting smallpox again.

The techniques were increasingly refined in the 18th century during which a greater number of medical books on smallpox with descriptions of variolation were published. A 1713 work

¹ There are different hypotheses as to the time when smallpox was first recorded in China. The most authoritative argument remains that of Fan Xingzhun, who dates the first specific record of smallpox to the 5th century.

² Several variolation practitioners of the 17th century claimed that the technique was invented by a 16th-century doctor. It is very likely that variolation was practiced in the 16th century before it was written down in the following century.

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described a fourth method using powdered squama blown into the nostril of the healthy child through a thin silver tube. This was said to be convenient for bringing the technique to remote areas [5]. These four standard methods were later described in great details in the 1742 medical compendium endorsed by the Imperial court [6]. To a great extent, this compendium "legitimized" variolation's position in orthodox medicine which had until then snubbed the technique as being peculiar.

By the end of the 18th century, variolation was even divided into two schools, the Huzhou school (Zhejiang) which preferred the use of fresh pus, claiming that it was more effective. The other school, the Songjiang school (Jiangsu) preferred to use older, medically-treated squama: "cooked pox", claiming that it was safer [7].

The main reason for inhalation as the dominant variolation method was the belief that through the respiratory system, the effect of variolation could, starting with the *fei* (pulmonic orb), successively reach the five viscera (*zang*)³ and circulate within them. The affected five *zang*, considered to be impregnated with innate toxic matters would, in about seven days, release a "toxin" and produce external signs (fever, pox, thirst, etc). The signs would gradually diminish as the poison was duly liberated by the variolated matter, in about 20 days. The elimination of such poison, it was believed, would prevent the person from getting smallpox again in his life.

Upper classes of the society seemed receptive to variolation before the imperial "recognition" in the mid-18th century, though the progress was slow and gradual. This headway was revealed by both literary and medical sources [3, 8, 9]. Some late 17th and 18th-century variolation experts wrote that they acquired the technique from their fathers or grandfathers who had inoculated thousands of children in their lifetime. The *Père d'Entrecolles*, a Jesuite living in Peking in the early 18th century, thought, probably after being told by "*des médecins du palais*", that it had been in practice in China for about a century [10, 7a].

The rapid spread of variolation in the 18th century was likely to be a result of its effectiveness. One variolator of the time, Zhang Yan, boasted that out of the 8 to 9,000 persons he had inoculated, merely 20 to 30 died. Zhu Chungu, the expert who began to inoculate the Manchu imperial court in the late 17th century even said that the technique had never failed [5a,b, 11, 9a, 12].

For this reason perhaps, in the mid-18th century, at about the same time variolation was "legitimized" by the Imperial court: many literati, especially those of the Lower Yangzi region⁴, strongly recommended the technique in their writings, using the experience of their family as an illustration. A contemporary Japanese doctor was told by his Chinese colleague that 80 to 90% of China's well-off families had their children inoculated [9b]. Though such figures cannot be taken at their face value, they certainly reflected a certain popularity of the technique, at least amongst the upper classes.

Variolation finally began to reach the poorer classes only in the beginning of the 19th century, just before Jennerian vaccination was popularized. At least one charitable institution in southern China began to provide the service free of charge around 1807 [9c].

³ The five viscera are: *xin* (orb of the heart), *gan* (hepatic orb), *pi* (splenic/pancreatic orb), *fei* (pulmonic orb), *shen* (renal orb).

⁴ An 18th century variolator regretted that not many northerners were inoculated so that thousands of children died during epidemics. Such tragedies were much less frequent in the south [9].

Variolation practiced by the Manchu imperial family

The Manchus, like the Mongolians and Tibetans, were more vulnerable to smallpox than the Chinese, especially as they left their sparsely populated original habitat and entered densely populated Chinese cities like Peking. Manchu troops died of smallpox in great numbers during and after the wars of conquest in the early half of the 17th century. Various draconian quarantine strategies were thus taken to protect the imperial family from contracting the disease in the 17th century, though they did not prevent the first Manchu Emperor Shunzhi from dying from it in 1662⁵ [9d, 12].

Given such background, it is not difficult to understand why the second Emperor, Kangxi (1662-1722), was so intent in fighting the disease. In 1681, he summoned two famous Jiangxi smallpox experts (one of whom, the above mentioned Zhu Chungu) to the court to variolate the royal family and banner troops stationing in Manchuria and Mongolia. We know that Kangxi's policy was maintained long after his death as lists of variolated children of banner troops can be found later in the 18th century⁶. Some scholars even think that variolation may have something to do with the long-term decline in infant mortality of the Manchu nobility in the 18th century⁷ [13].

Kangxi's choice for variolation to protect the nobility promoted the position of the technique in the medical orthodoxy. However, despite the court's interest, there was never a national policy to apply variolation against smallpox.

Introduction of Jennerian vaccination

In the Spring of 1805, the vaccine was carried on live subjects from Manila to Macau by a Portuguese merchant, Hewit. From Macau, Jennerian vaccination was introduced to China in Canton [14]. In this same place, a cowpox vaccination bureau was immediately established – under the auspices of Alexander Pearson, surgeon of the East-India Company's factory at Canton – by some Cantonese merchants and medical experts who began to study and apply the technique. Pearson also wrote a tract on the subject, which was translated into Chinese as *Zhongdou qishu* (*Wonder book on inoculation*), and published to popularize vaccination⁸ [15a]. Pearson noticed that this technique had been met with "fewer obstacles from prejudice than could be anticipated, especially in a Chinese community". In the first 12 months of the introduction of vaccination in Canton, thousands were inoculated, and Chinese doctors or merchants who were associated with the Company soon became vaccinators [15b].

⁵ These strategies include creating sites for seclusion (*biduosuo*) during smallpox epidemics, setting up "smallpox secretarial" to handle the banishment of all smallpox patients thirteen miles from the city wall with their families, forbidding those members of the imperial family who had never had smallpox to enter the capital. When the first Manchu emperor died at 23 of smallpox in 1662, the Kangxi Emperor was chosen to be the successor and not his elder brother precisely because he had had smallpox as a child and had a better chance to have a longer reign.

⁶ One very interesting list is found in box 4717 of the "Imperial Pharmacy" section of the Qing Archives in the No 1 Archives in Beijing. This box contains documents dated 1744, 1749, and 1755. Though this list is not dated, it should be of the mid-18th century. It contained 73 names of inoculated children of the red and white banner troops stationed in Chahar in Manchuria, the oldest of whom was 18 *sui*, the youngest 3 *sui*, implying that these Manchu children were inoculated at a much older age than Chinese children.

⁷ Lee, Wang & Campbell claim that child mortality of the Manchu nobility fell from 400 per 1,000 during the early 18th century, to 100 and below by the late 18th century, at the same time, life expectancy at birth doubled from the low twenties to the high forties. They suspect that variolation could have contributed to this change.

⁸ One of the earliest account of the activities of the Canton establishment is by Rev. William Milne, in his *Life in China*, London, 1859.

One of the technical difficulties in practicing anti-smallpox vaccination was the preservation of the vaccine. By 1816, it had already been twice extinct in Canton, and the "hope that... the vaccine might be found upon the cows in some of the remoter provinces, proved fallacious", as Pearson observed [15c]. Despite this obstacle, due to the effort of a number of Chinese enthusiasts, vaccination rapidly spread. By the early 1820s it was popular in other provinces through merchant guilds, concerned officials, and private individuals⁹ [16].

Unlike variolation, Jennerian vaccination was first tried on the poorer classes¹⁰ [14a]. Chinese indigenous charitable institutions, especially foundling homes, soon provided free vaccination, sometimes alongside with traditional variolation, as a service for the community (In the 1840s, many foundling homes vaccinated children of the district) [9e].

One of the first charitable vaccination organizations was established in Nanking in 1834-35. This "Vaccination Bureau" (*niudou ju*) was officially set up during a smallpox epidemic of that winter. Another early bureau was established by a scholar-official of the Weixian district of Shandong who sent some dozen children with their parents to Peking around 1833 to transmit the vaccine back home from arm to arm [17]. The vogue was only temporarily halted by the Taiping upheaval in the 1850s. As soon as peace was restored in the 1860s, the spread of charitable vaccination bureaus quickly regained momentum. At least 43 vaccination bureaus were set up from the 1860s till the end of the Qing in 1911 all over the country¹¹.

By the mid-19th century, general rules about vaccination were already well known and observed by charitable bureaus: vaccinators were urged to make the preservation of the vaccine a priority; children with skin diseases were not to be vaccinated; special attention was to be paid to avoid patients of leprosy; four to five days after vaccination, the child was to be inspected by the vaccinator, the healthy pustule of about eight or nine days was to be transmitted to other infants as vaccine; poor families were sometimes paid to have their infants vaccinated so that the vaccine would not become extinct; expenses were paid by merchant guilds, donations by local officials, notables, shops, and sometimes by miscellaneous taxes [17, 18].

The acceptance of Jennerian vaccination by the Chinese society was relatively quick (less than 50 years) when we compare it with the slow progress of variolation (over a century). The reason is that the cultural and psychological block hindering the initial spread of variolation had already broken down when vaccination was introduced. For many, the two techniques were similar. In fact, for reasons of convenience or technical difficulties, some of the late 19th

⁹ A report by Pearson of March 19, 1821 stated that vaccination had, by that time, spread to the provinces of Jiangxi (Kiangsi), Fujian (Fukien), Jiangsu (Kiangsu), and reached Beijing. The French surgeon was sent by Vannier, Minister of Cochinchina. *Ibid*, p 40.

The Chinese historian Chen Yuan (1880-1971) found out from Chinese sources that vaccination was spread chronologically in the 1820s from Canton to Hunan, Peking, Fujian, Jiangsu, Jiangxi, Sichuan. Some vaccinators paid wet nurses with infants to travel from one spot to another to transmit the vaccine from arm to arm.

¹⁰ Pearson reported in 1816 on the first vaccinations in 1805-06, "it was from the beginning conducted... by inoculations at stated periods among the natives, and of them, necessarily, the poorest classes, who dwelt crowded together in boats or otherwise..."

¹¹ On the number of bureaus: see Angela Leung, "Charitable institutions of the Ming and Qing". Unpublished research report. National Science Council, Taipei, Taiwan, 1991. I have used more than 2000 local gazetteers to count different types of charitable institutions in this project. For vaccination bureaus the preliminary count in 1991 was 34, but after recent checking, I found out that at least 9 bureaus had been erroneously left out. This is certainly still an underestimation.

century charitable institutions provided both variolation and vaccination to fight smallpox (a founding home in Shanghai stated in 1883 that children could be variolated or vaccinated in the Spring) [19].

Acceptance of Jennerian vaccination

However, the Chinese did not accept Jennerian vaccination exactly as it was understood in the West. There was a construction of the Chinese interpretation of vaccination, deciphering its effectiveness in terms conforming to Chinese orthodox medical thought. Basically, the classic notion of *taidu* (foetal toxin), to which the principle of variolation and vaccination was accommodated, persisted. According to this concept, toxic matters from the father and the mother – a result of physical desires, emotional instability, or unbalanced nutritional habits – were inevitably passed onto the fetus the moment it was conceived. The toxin would express itself at one moment or another during the lifetime of the child. Smallpox, like measles, chickenpox, all sorts of skin eruptions, boils or ulcerations, were different manifestations of *taidu*. Vaccination, like variolation, was a way of controlled release and elimination of the *taidu* before any occurrence of smallpox epidemic.

The principle for traditional variolation by inhalation is explained above. Chinese vaccinators justified the incision method of vaccination by borrowing from principles of meridian points in acupuncture. The two spots on each arm where the vaccine was to be injected were considered reflexive points corresponding to the "Triple Burners" (*sanjiao*) of the body controlling the "five viscera and six bowels" (*wuzang liufu*)¹². Some vaccinators prescribed ways to measure the whereabouts of the spots (eg, the first spot was at the length of the middle finger of the child up the elbow, the other was at the palm's length from the first spot up the arm) [20]. In other words, the vaccine injected into the "correct" reflexive points would most effectively liberate *taidu* deep inside the body [19a].

Moreover, Chinese vaccinators preserved certain traditional rituals: boys were to be vaccinated on their left arm first, and girls on their right arm. As for variolation, spring and winter were sometimes recommended as better seasons for vaccination. Post-vaccination care, including the taking and application of medicine for the release of "remaining toxin", was also very similar to post-variolation care. Some early vaccinators even recommended the squama for the preservation of the vaccine as in variolation [17a]. One of them, Deng Liu (1774-1842), suggested that powdered squama mixed with milk could be used as vaccine [21]. Jennerian vaccination was thus conceived as an improved version of variolation, perfectly understandable in Chinese medical terms. Vaccination therefore reinforced rather than changed the Chinese etiology of smallpox: it remained a disease caused by innate factors.

The sinicized vocabulary of vaccination, the familiar explanation of the way it worked made it easier for Chinese social elites and the general public to accept the western technique. Very rarely was it seen as an instrument of Western imperialism. When compared to opium, another importation from the West, many admitted that while one was detrimental to health, the other was unquestionably beneficial [22]. However, despite the initial ease of its introduction in early 19th century, vaccination had then only achieved its first step into China. It still had a few hurdles to clear: the licensing of vaccinators necessitating the institutional recognition of

¹² *Sanjiao*, the biggest of the 6 bowels (*liufu*), consisted of the 3 portions of the body cavity, commanding the circulation of fluid and air (*qi*). Some western medical doctors believe that the reflexive points commanding the *sanjiao* actually are controlling glandular excretion. The two reflexive points corresponding to *sanjiao* are called the *xiaoshuo* and the *jinglengyuan*.

the technique (as late as 1909, scholars observed that "doctors of our country do not know how to vaccinate, and vaccinators are not doctors, how strange it is") [23], the uninterrupted supply of the vaccine (several vaccination bureaus noted that parents still needed constant persuasion to have their infants vaccinated; winter was a particularly poor season as parents were hesitant to bare the arms of the child. Thus, it was usually during the winter that the vaccine became extinct) [18b, 19b], just to name a few. These difficulties could only be solved much later in the 20th century when China imported not only the western technique, but also the medical thought and institution that came with it.

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