

## Oriental Medicine

## Understanding the prevention and cure of plagues in Daoist medicine

Bi-Sheng Peng<sup>1</sup>, Min Lu<sup>1\*</sup><sup>1</sup>School of Philosophy and Sociology, Lanzhou University, Lanzhou 730000, China.\*Corresponding to: Min Lu, Center for Studies of Ethnic Minorities in Northwest China, Lanzhou University, No. 222, South Tianshui Road, Lanzhou 730000, China. E-mail: [lumin@lzu.edu.cn](mailto:lumin@lzu.edu.cn).**Author contributions**

Bi-Sheng Peng contributed to raise of the question, collection, and analysis of the research literatures, drafting of the paper; Min Lu contributed to study supervision and polishing of the paper. All the authors have read and approved the final version of manuscript.

**Competing interests**

The authors declare no conflicts of interest.

**Acknowledgments**

This project was supported by the Fundamental Research Funds for the Central Universities (No. 211zujbkydx036). We thank Mathew Goss (TMR Publishing Group Ltd.), for editing the English text of a draft of this manuscript.

**Abbreviations**

TCM, traditional Chinese medicine; COVID-19, coronavirus disease 2019.

**Citation**

Peng BS, Lu M. Understanding the prevention and cure of plagues in Daoist medicine. *Tradit Med Res.* 2021;6(5):42. doi: 10.53388/TMR20210615236.

**Executive editor:** Shan-Shan Lin.

**Received:** 28 February 2021; **Accepted:** 17 May 2021;

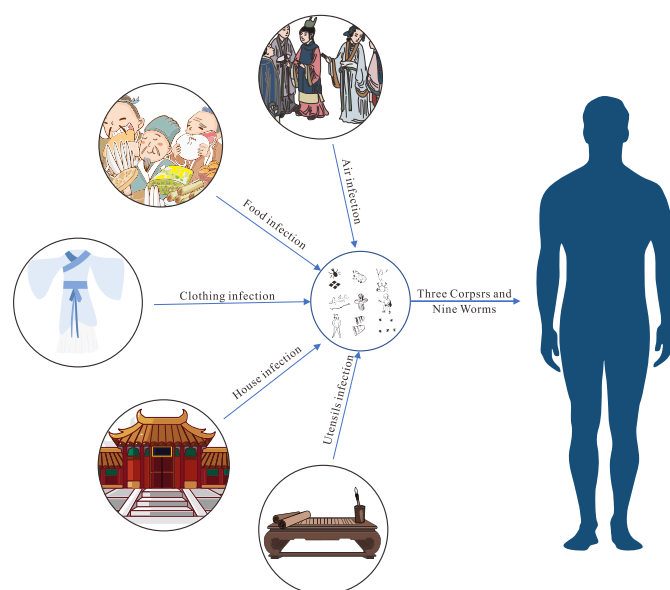
**Available online:** 01 August 2021.

© 2021 By Author(s). Published by TMR Publishing Group Limited. This is an open access article under the CC-BY license. (<http://creativecommons.org/licenses/by/4.0/>)

**Abstract**

Daoist medicine, a special form of traditional Chinese medicine with distinct Daoist styles, has played an important role in the history of plague control in ancient China. Emerged from the pandemics at the end of the Han Dynasty (146 C.E.–220 C.E.), Daoism, the native Chinese religion, has always had a religious mission to end the spread of plagues; thus, it has actively participated in treating plagues through various techniques of medicine and religion. In the practice of plague treatment for thousands of years, Daoist medicine has developed a special etiology of plague that includes Qi-based theories (Qi is considered to be the force that informs and animates all things in Daoism, thus, plague is also considered to be caused by specific and hazardous Qi.) and worm-based theories, forming a strategy of plague control that includes prevention before an epidemic, active treatment during the epidemic, and recovery after the epidemic; these developed plague prevention methods combine isolation, disinfection, and drug use. Additionally, it is the first to practice a primitive immunoprophylaxis method that uses tissues and secretions of infected persons and animals to infect healthy individuals to gain disease immunity. It has formed a plague treatment method mainly based on drug treatment and ritual treatment, supplemented by acupuncture and physical treatment. It has left behind many effective drugs and prescriptions for plague treatment, some of which have a wide clinical application. Hence, Daoist medicine has made great contributions to plague control in Chinese history. Its strategies, methods, medicines, and prescriptions for plague control still have considerable theoretical and application today, especially in the coronavirus disease 2019 (COVID-19) pandemic.

**Keywords:** Daoism; plague; disinfection; immunization; COVID-19

**Three Corpses and Nine Worms theory of Daoism**

The tiny worms described in "Three Corpses and Nine Worms" are quite similar to bacteria and viruses.

### Tradition

In the late Eastern Han Dynasty (146 C.E.–220 C.E.), Daoism—the native Chinese religion—was born amid pandemics. The Daoist medical doctor Ge Hong (283 C.E.–363 C.E.), who was a physician and a Daoist priest, first documented smallpox as an infectious disease in his *Handy Therapies for Emergencies*, (283 C.E.–363 C.E.). This text is the earliest documented record of the disease in the world and describes the prevention and treatment of many other infectious diseases such as rabies, tuberculosis, and cholera. The contemporary Chinese pharmacologist Tu Youyou was inspired by the book's description of the treatment of malaria with herbal *Artemisia carvifolia* and discovered artemisinin, a specific medicine for malaria. In the Tang Dynasty (618 C.E.–907 C.E.), Sun Simiao (541 C.E.–682 C.E.), another Daoist doctor also wrote at great length about the prevention and treatment of several infectious diseases in his famous book *Invaluable Prescriptions for Ready Reference* (541 C.E.–682 C.E.). In conclusion, during the thousands of years of plague control practice, Daoist medicine has provided scientific understandings and methods of plague prevention and control, including theories of plague etiology based on climate and microbial factors, plague prevention by isolation and disinfection, immunoprophylaxis, and many prescriptions with potential medical value. These aspects are similar to modern immunological methods. Thus, these medicines and methods can provide valuable references for clinical treatment and scientific research of plague control today.

### Background

In human history, the demonic shadow of pestilence has continued to threaten people's lives. Conversely, human civilization has flourished in the struggle against pestilence, relying on medicine, acupuncture, other medical treatment methods and rituals, spells, and other religious practices.

Daoism, the native Chinese religion, is an important player in the history of plague control in China. During the late Eastern Han Dynasty (146 C.E.–220 C.E.), when plague outbreaks were frequent and widespread, Daoism emerged and rapidly grew, attracting followers through plague treatment [1]. Daoism emerged because of the plague epidemic; hence, to end the plague, it established a consistent religious mission and actively participated in controlling the plague with Daoist medicine—a special form of traditional Chinese medicine (TCM) with distinct Daoist styles. For example, Ge Hong (283 C.E.–363 C.E.), Tao Hongjing (456 C.E.–536 C.E.), Sun Simiao (541 C.E.–682 C.E.), and other Daoist medical scholars recorded the symptoms and preventive treatment methods of common plagues in detail in their medical works, such as *Handy Therapies for Emergencies* (283 C.E.–363 C.E.), *Variorum of Classics of Materia Medica* (456 C.E.–536 C.E.), and *Invaluable Prescriptions for Ready Reference* (541 C.E.–682 C.E.). The etiology of a plague, which is said to be caused by microorganisms, has also been proposed in the religious books *Body Maintenance Jing* (618 C.E.–907 C.E.), *Zichen' Mystery Book* (1344 C.E.), and *Supreme and Most Mystery Three Heavens' Great Law* (1120 C.E.–1127 C.E.). Many rituals and medicines have been recorded to treat plague in these books [2–4]. These knowledge and prevention methods of plague in Daoist medicine reveal both the wisdom of the predecessors and contain scientific ideas and values.

Here, the strategies, methods, and medicines for plague prevention and control are reviewed, which is a useful reference and can be applied in the present-day coronavirus disease 2019 (COVID-19) pandemic.

### Daoism and plague control

In his book *Civilization and Disease*, the American scholar Henry Ernest Sigerist pointed out that a plague was an essential factor affecting human civilization. Many human social and historical phenomena were related to plagues, and the origin and development of many religions were influenced by plagues [5]. The emergence of Daoism, the indigenous religion of China, was very closely related to the plague pandemic. At the end of the Eastern Han Dynasty, there were 18 historical records of pandemics from the reign of Emperor Huan (132 C.E.–168 C.E.) to the end of the Han Dynasty [6]. These records stated that “the dead were pillowed together in the counties and roads, everywhere [7].” The primitive Daoist sects began to appear and preached healing: they made patients confess their sins, drew charms and burned them in water for patients to drink, or recited spells for patients to cure diseases. The religious treatment of plagues attracted large numbers of followers [8]. Later, these early sects died out or developed further, evolving through mutual fusion to form Daoism, the dominant indigenous religion in China.

Daoism arose from the epidemic and grew in the treatment of a plague, forming a religious tradition that pays much attention to plague control. It was actively involved in the historical practice of plague control in China through four main forms.

The first was to hold regular group ceremonial rituals to dispel a plague. Historically, Daoism hosted annual rituals in several places to dispel the plague. In these rituals, people usually wore plague-repelling incense and medicine, drank plague-repelling soup and wine, and participated in folklore activities with the theme of dispelling the plague. The tradition of drinking *Realgar* wine (a Chinese alcoholic drink that consists of powdered Chinese medicine realgar) at the Dragon Boat Festival is one such ritual that remains popular in several places in China. Jiang Shoucheng said that it demonstrates “the ancient memory of the community's collective fights against the plague [9].” The knowledge of the plague is passed on in a folkloric way in various ceremonials. These ceremonials play a role in disseminating and educating people about the prevention and treatment of the plague.

Second, Daoist medicine has summarized and developed theories and methods of plague control in the books written by Daoist medicine scholars. Daoism is closely related to TCM. Many famous medical scholars, such as Ge Hong, Tao Hongjing, and Sun Simiao, were Daoist or had a Daoist background; they had a dual identity of Daoism and medicine. In the writings of these medical scholars, much unique Daoist understanding of plague and effective methods to prevent and treat plague were recorded. These recordings greatly contributed to the development of ancient Chinese plague theory and prevention.

The third is the clinical treatment of plague victims by Daoists (the “Daoist” is usually a legal priest with official certification in Daoism) [10]. Daoist doctors generally use medicine and acupuncture to treat the plague, which is the same as TCM. According to Gai Jianmin, from the Eastern Han Dynasty to the end of the Ming Dynasty (1368 C.E.–1644 C.E.), there were 129 Daoist doctors listed in the book *Biographies of Famous Doctors of Ancient and Modern Book Collection* (1650 C.E.–1741 C.E.), accounting for 9.9% of the total number of doctors in the book [8]. There were also countless unnamed Daoist doctors who performed medical activities throughout history, constituting an important medical force for plague control in ancient China.

Fourth, Daoist temples have charitable activities to aid in a plague. Daoist religious teachings regard healing and saving people as good deeds that contribute to Daoist cultivation. According to Jiang Shoucheng's research, such charitable relief activities include “giving medical consultation and medicine”, “giving foods to the victims”, and “comforting the wounded and mourning” [11]. Daoism has relieved the burden for the official medical establishment with these activities and played a positive role in plague control in ancient China.

### Daoist medicine's theory of the etiology of plague

The theory of the etiology of plague is the basis of Daoism for plague

prevention and treatment, which has medical and religious dimensions. It emphasizes climate and biological factors in the occurrence of infectious diseases, mainly in the form of “Qi-based theory” and “worm-based theory”. Qi is considered to be the force that animates and informs all things in Daoism, thus, plague is also considered to be caused by specific and hazardous Qi.

#### “Qi-based theory” of the etiology of plague

Like TCM’s view of epidemics, the etiology of plague of Daoist medicine is basically based on the “Qi theory” which considered Qi as the force that animates and informs all things. This theory considers epidemics to be the infestation of “irregular Qi” or “epidemic Qi”, and it is mainly based on climate change to explain the occurrence of plague. According to *Invaluable Prescriptions for Ready Reference*, “the plague diseases were caused by the change of environment Qi [12].” According to most Daoist medical scholars, everything in the world is affected by the circulation of the four seasons: spring, summer, autumn, and winter. If the four seasons are out of balance, then human health will be out of order. Extreme “Qi” will invade the human body and cause mass illness, in other words, a plague. The “Qi-based” theory of the etiology of plague has two characteristics. First, it recognizes the infectious origin of the plague. According to Yu Gengzhe, the “Qi-based” theory of plague explains the two main properties of “widespread existence” and “flowable and contagious” plague [13]. Second, it is aware of the connection between plague and climate. It is believed that the outbreak of plague is caused by abnormal climate change. This change can explain the association of plague with climate and its periodicity, confirmed by modern medical research [14]. One case is the prevalence of COVID-19, which is pointed out to be closely related to climate factors such as temperature, humidity, and airflow by Chen et al. [15]. Hence, it can be seen that the Daoist “Qi-based” theory of plague has considered climate as an important factor in its occurrence and prevalence and laid the foundation for effective prevention and treatment.

#### “Worm-based theory” of the etiology of plague

This theory believes that a plague is caused by the infection of certain tiny “worms”. It is a unique theory of plague developed by Daoism on the basis of its religious theories. Daoism believes that parasitic organisms called “Three Corpses and Nine Worms” (“Three Corpses and Nine Worms” are the certain tiny “worms” in “Worm-based theory” of Daoist medicine, which are quite similar to bacteria and viruses in Western medicine) exist in the human body and are an important health risk factor. This religious theory, combined with the theory of TCM, has become the basis for Daoism’s explanation of the causes of several diseases. Jiang Sheng examined the “Three Corpses and Nine Worms” described in the Daoist scripture *Body maintenance Jing* and stated that “Daoist seem to have sensed that there are certain subtle pests that destroy human health [16].” He pointed out that the “Three Corpses and Nine Worms” can correspond to some infectious parasites and pathogens (Table 1).

From the Song Dynasty (960 C.E.–1279 C.E.), the “worm-based” theory became the main theory of Daoism to explain infectious diseases such as tuberculosis and leprosy. Compared with the “Qi-based” theory of plague, the “worm-based” theory of plague has the following advantages.

First, it can more accurately explain the phenomenon of plague infection. For example, for tuberculosis, the Song Dynasty Daoist book *Zichen’ Mystery Book* noted that the disease has “clothing infection”, “utensils infection”, “house infection”, “food infection”, and “air infection”. Thus, this disease is caused by the transmission of “six worms” among the “Three Corpses and Nine Worms” [4]. A Daoist medical text of the same period, *First Aid Immortal Prescriptions* (960 C.E.–1127 C.E.), details how the “Three Corpses and Nine Worms” spread tuberculosis through these channels [17]. Unlike the “Qi-based theory”, which could only explain diffuse infection of the plague, the “worm-based theory” could locate the specific transmission pathways of infectious diseases and better explain the spread phenomenon of the plague.

Second, it provides the basis for exterminating “worms” to prevent and control plague in Daoism. According to the theory that “worms” cause disease, Daoist scriptures such as *Zichen’ Mystery Book* suggested that clothing, tableware, and feces of the infected persons should be disinfected to avoid the spread of disease (Table 2).

Although the etiology of the plague is not completely accurate, the tiny worms described in “Three Corpses and Nine Worms” are quite similar to bacteria and viruses. This description undoubtedly demonstrates the genius of ancient medical insight. Hence, it can be said that the “worm-based theory” of the etiology of the plague has slightly taken on the characteristics of microbial pathogenesis.

#### Strategies and methods of plague control in Daoist medicine

Regarding specific plague control activities, Daoist medicine has developed basic plague prevention and treatment strategies of “prevention before the epidemic”, “active treatment during the epidemic”, and “recovery after the epidemic”. “Prevention before the epidemic” means that Daoist medicine emphasizes avoiding the source of infection, disinfecting, preventing the plague via [Daoist cultivation \(techniques of physical cultivation developed for immortality, such as Daoist meditation called as Internal Alchemy, Daoist Yoga called as Dao Yin, etc.\)](#), and immunizing before the plague has occurred or the individual has been infected. “Active treatment during the epidemic” means that once infected, Daoist medicine emphasizes taking treatment measures quickly, treating the epidemic through medicine, acupuncture, and Daoist cultivation to avoid worsening of the disease and infecting others. “Recovery after the epidemic” means that when the epidemic is about to be cured through treatment, Daoist medicine emphasizes nourishing the body through diet and rest to avoid disease recurrence and promote physical recovery.

#### Prevention before the epidemic

In line with the philosophy of TCM, Daoism attaches great importance to “treating the untreated” and emphasizes active prevention to avoid the occurrence and transmission of epidemics. Modern epidemiological research points out three necessary reasons for the prevalence of infectious diseases: the source of infection, the routes of transmission, and the susceptible population. Cutting off any of these three elements can prevent infectious diseases. In Daoist medicine, the following measures are proposed for preventing plague: avoidance and isolation of infected places, disinfection of the human environment, attention to dietary safety, improving physical fitness to prevent plague, and immunization to prevent and control plague. Obviously, although the principles of plague prevention have not been discussed in Daoist medicine, the methods of plague prevention clearly reflect the control of infectious sources, routes of transmission, and susceptible individuals; in fact, Daoist medicine applied the basic principles of infectious disease prevention of modern epidemiology.

**Avoid isolated places of a plague.** According to the Daoist “Qi-based” and “worm-based” theory, a plague is caused by exposure to “epidemic Qi” “poisonous gas” or by certain “poisonous worms”. Thus, Daoist medical literature summarizes and warns people to avoid or take precautions against geographic environments that likely cause plague. For example, the *Handy Therapies for Emergencies* says, “In some mountains where pestilence spread, if there is black fog and warm wind from the southwest, it is a sign of epidemic [18].” *Sanyuan’s Book of Extended Life* (1271 C.E.–1368 C.E.) says, “Some ancient wells and deep pits are full of poisonous gas, so you should not enter them at any time [19].” It warned people to avoid miasmatic mountains and forests, houses that have been uninhabited for a long time, and places such as ancient wells and deep pits. If they must enter, they should take or wear medicines with plague-preventing effects. *Supreme and Most Mystery Three Heavens’ Great Law* says, “In empty houses where few people live for many years, there was air that causes disease. Because the room is blocked, the air does not disperse, and the source of the disease is always present [3].” People should not enter these houses. Mervyn Susser and Ezra Susser pointed out that the occurrence of infectious diseases is mainly influenced by biological,

physicochemical, and social environments [20]. In ancient societies, infectious diseases were directly related to the geographical environment in which people lived. Such as in southwest China, because of the hot and humid climate, dense mountains and forests, and the proliferation of mosquitoes, malaria, and other infectious diseases were often prevalent. This is why Daoist doctors emphasized staying away from “mountain miasma” to avoid epidemics. The Daoist medical warning to avoid “epidemic gas”, “poisonous gas”, and “poisonous worms” is an observation and summary of the law of epidemic occurrence, which was an effective measure to reduce the risk of infectious diseases in ancient society.

**Disinfect the environment.** Daoism believes that disinfection of “epidemic gas” and extermination of “worms” that cause epidemics can prevent epidemics. It is also suggested in Daoist literature that one can prevent epidemics by using medicines to disinfect the house, water sources, and utensils. The *Zishu Dafa of the Jade King of Supreme Gods* (1127 C.E.) states that one can burn Daoist elixirs to avoid epidemics in a room where epidemics are spreading [21]. In the *Handy Therapies for Emergencies*, moxibustion was used to treat the plague. It was said that moxibustion could be used to fumigate the four corners of the patient’s bed to stop the transmission of the plague [18]. In the *Invaluable Prescriptions for Ready Reference*, the method of disinfecting the water source with medicinal wine and placing it in well water to avoid epidemics is recorded [12]. There are some controversies about using medicine to disinfect the environment to prevent the plague in TCM. According to Gao TA, most of the plague-repelling drugs in traditional medicine consist of herbs with volatile properties, such as realgar and estrogen. The active ingredients volatilized when burned, hung, or soaked can kill pathogens [22]. Dong Lijuan, conversely, claimed that “hanging mugwort at the entrance of the house can prevent summer diseases, which sound like a good idea, but it is not practical [23].” She argued that it is difficult to achieve the effective concentration of drug ingredients needed to disinfect the environment by burning or

hanging. However, this way of disinfecting the environment to prevent plague undoubtedly reflects a certain level of scientific guessing and action of ancient medical practitioners to prevent plague. It can be considered a meaningful practice of ancient preventive medicine.

Some Daoist texts also suggest special disinfection of the clothing and excrement of plague-infected patients to avoid contagion. For example, the *Supreme and Most Mystery Three Heavens’ Great Law* states that “When the patient has died, the clothes, draperies, and utensils need to be steamed, because filthy air and pathogenic worms are contained therein [3].” The *Zichen’ Mystery Book* also suggests the need to steam the clothes and vessels of the plague patients and the deceased; burn the patient’s excrement; and avoid eating together and talking with the patient to block the spread of plague through clothing, food, and residence [4] (Table 3). In medieval Europe, people also burned patients’ clothing and bodies to stop infectious diseases. The disinfection method in Daoist medicine reflects similar ideas and effects. In fact, in ancient societies with relatively rudimentary medical conditions, physical disinfection was more convenient and effective than pharmaceutical disinfection. Moreover, it was an effective measure that could reduce the spread of a plague.

**Focus on food safety.** Noting that many plagues were transmitted through diet, Daoist medicine especially emphasizes the need to pay attention to dietary safety; for example, the *Sanyuan’s Book of Extended Life* warns people not to drink “stagnant water from a pool” [19]; the *Handy Therapies for Emergencies* warns not to eat livestock and poultry that have died for unknown reasons [18]; the *Health Theory of Peng Zhu* states “do not drink cold water while bathing with cool water” [24], and *Recorder of Blended Common Life* (960 C.E.–1279 C.E.) also cautions against drinking water without boiling [25]. The emphasis on dietary safety is an important initiative in Daoist medicine to prevent plague, effectively reducing the occurrence and spread of several infectious diseases. In the late 18th century, George Macartney (1737 C.E.–1806 C.E.) was dispatched by the British

**Table 1 Diseases and pathogens corresponding to the “three corpses and nine worms” in Daoism**

Nine worms recorded in Daoism	Corresponding diseases or pathogens
Fu worm	Hookworm
You worm	Roundworm
Cun-Bai worm	Tapeworm
Red worm	Fasciolosis
Stomach worm	Gastric ulcer ( <i>Helicobacter pylori</i> )
Ge worm	Hepatic coma
Lung worm	Tuberculosis pathogen ( <i>Mycobacterium tuberculosis</i> )
Qiang worm	Leprosy pathogen ( <i>Mycobacterium leprae</i> )
Yi-Yang worm	Insects in feces*

\* In the article “*Daoism and parasitology in ancient China*” of Jiang Sheng, he believed the lung worm among the “Three Corpses and Nine Worms” corresponds to lung cancer, but according to the symptoms described in the Daoist scriptures, such as the *Body maintenance Jing* and the *Zichen’ Mystery Book*, we believe that the lung worm should correspond to the pathogen of tuberculosis, that is, *Mycobacterium tuberculosis*.

**Table 2 Methods of tuberculosis transmission and prevention methods recorded in the *Zichen’ Mystery Book***

Methods of infection	Methods of tuberculosis prevention
Clothing infection	Steaming clothes worn by the patient.
Utensils infection	Steaming utensils used by the patient.
House infection	Avoiding rooms that patients have occupied.
Food infection	Avoid eating food from the patient’s home and eating with the patient.
Air infection	Avoid talking to patients in proximity.

**Table 3 Disinfection in Taoism medicine**

Environment and objects	Methods of disinfection
Houses	Hanging and fumigation of plague prevention drugs.
Water sources	Immersion of plague prevention drugs.
Patient’s clothing, utensils	Disinfection by steaming.
Patient’s excretion	Burning.

government to lead a mission to China, and in his book *An Embassy to China, Travels in China*. He discussed the differences between Chinese concepts and eating habits between China and the West [26]. Sutherland comments, “Drinking boiled water was the most prominent example of disinfection for disease prevention in ancient China. This method is still one of the most effective and widely used methods of disinfection [27].”

**Prevention of a plague through Daoist cultivation.** Like TCM, Daoist medicine has the same medical philosophy of “if the good Qi exists within, diseases do not occur”. According to the *Supreme and Most Mystery Three Heavens’ Great Law*, in a plague epidemic, there is a clear correlation between the degree of health and the degree of illness, and those who are physically strong can often avoid infection or be less ill, whereas those who are weak can easily be infected with the plague. Daoist texts have recorded often used moxibustion to prevent plague when they served in Sichuan, where plagues frequently occur [12]. Acupuncture therapy has also been currently applied in the COVID-19 pandemic, and Sun and Zai et al. noted that acupuncture therapy showed significant effects in several cases in Lei Shen Shan Hospital of Wuhan [37, 38]. Moreover, Luo et al. suggested that acupuncture therapy regulates the immune function through the “neuro-endocrine-immune” system, in which the stimulation of acupuncture points is transmitted to the central nervous system, filtered and integrated to send signals through the “hypothalamic-pituitary-adrenal” pathway, producing a holistic and bidirectional regulation of nerve endocrine immunity [39]. Zhang et al. further noted that acupuncture therapy relies on multiple synergistic mechanisms to act in COVID-19 treatment, including the activation of neuroactive ligand-receptor interactions and calcium signaling pathways, suppressing inflammatory stress, improving immunity, and regulating neurological function [40].

**Plague treatment via Daoist rituals.** In ancient China, Daoist rituals were widely used in treating and preventing plague. According to the *Zichen’ Mystery Book*, several groups of Daoist specialized in the treatment of plague in the late Song and early Yuan Dynasties (1300 C.E.–1320 C.E.) in China, numbering nearly 100, who passed on the rituals of plague expulsion through family or teacher–apprentice [4]. In the *Invaluable Prescriptions for Ready Reference* of Sun Simiao, many incantations (special words believed to have mystical powers to alleviate or cure disease symptoms by reciting them) were also recorded under the name of *Forbidden Scriptures* [41]. This kind of ritual therapy was incorporated into TCM as the form of “forbidden spell healing” or “prayer healing”.

The ritual therapy of Daoist medicine contains a lot of mystical elements. Still, stripped of its religious trappings, this plague treatment also had a certain positive value in ancient societies with limited medical conditions and a relatively low level of cognitive ability. On the one hand, ritual therapy could play the role of psychiatric treatment, giving the patient confidence to cure the disease. This therapy has been confirmed in a specific religious environment, through psychological suggestion, with a clear placebo effect, alleviating the condition of some patients [42]. On the other hand, it also serves to stabilize social order and improve the moral level of society. Ritual therapy usually can, to a certain extent, alleviate the world’s fear of the plague and the physical torment of the disease on a psychological level, reflecting the Daoist concept of humanistic care [11].

**Plague treatment via Daoist cultivation.** In the *Seven Prophecies from the Cloud* (1001 C.E.), it is stated that “if one can take **Yuan Qi (a kind of Qi which is believed to be the basic driving force of life, and can be enhanced by special breathing exercises in Daoist theory)** and perform it for a long time, all poisons cannot be hurt and all epidemics are not infected [43].” The unique Daoist health techniques of Inner Alchemy, Daoist Yoga, and Daoist breathing are also often used to treat a plague. The so-called Inner Alchemy is a meditation technique unique to Daoism. It is believed that people can actively regulate the internal flow of Qi and blood under a specific state of mind, and after long-term practice, they can keep their bodies healthy. It is said that Hua Tuo (145 C.E.–208 C.E.), a famous Daoist doctor during the Three

Kingdoms period (145 C.E.–208 C.E.), invented the *Five Animal Exercises* in imitation of five animals: tiger, deer, bear, ape, and bird. This fitness technique was widely spread in ancient China [44]. Sun Simiao recorded in the *Invaluable Prescriptions for Ready Reference* the “Six Characters Secret Method of Breathing”, which is considered a form of breathing that can exercise different internal organs, preventing and treating plague [12]. Modern medicine has conducted many studies on the medical effects of Daoist cultivation. An article published in *Nature* by Zhang et al. showed direct interrelationships between the brain and the immune response in lymphoid organs such as the spleen, which provides a possible explanation for the medical effects of traditional regimens [45]. Traditional wellness techniques have also been applied in the treatment of the COVID-19 pandemic. Daoist yoga and breathing techniques are included in the Chinese government’s guidelines for TCM prevention and control of the COVID-19 pandemic. At the same time, at the Jiangxia Fangcang Hospital in Wuhan, the *Baduanjin* exercise, which belongs to Daoist yoga, and “**breathing and Tu Na**” (**Tu Na is a special breathing technique that requires conscious control of the rhythm of breathing and the movements of the lungs and abdomen**), have been used as adjunctive treatment in patients with COVID-19 with good clinical results [46].

#### Recovery after an epidemic

In the aftermath of an epidemic, Daoism also places particular emphasis on recovery. The *Invaluable Prescriptions for Ready Reference* states that patients who are about to recover from a plague or are first recovering from a plague must be carefully conditioned in many ways including diet and living [12]. For chronic infectious diseases such as tuberculosis and leprosy, the main technique used by Daoism is rehabilitation. For example, the *Zichen’ Mystery Book* records the precautions for tuberculosis patients during recovery—“It is necessary to avoid foods that can cause disease recurrence...and advisable to practice abstinence. A daily diet should not be excessive, do not travel far, no heavy work, or the disease will recur. It is advisable to abstain from sex at least for a year...with light disease there must also be rest for half a year till full recovery [4].”—and pointed out the importance of rehabilitation and recovery in the treatment of tuberculosis. According to the literature, Sun Simiao used rehabilitation-based medical treatment for leprosy on a large scale and achieved good results. It was believed that the most important thing in the treatment of leprosy was to carry out careful care in terms of living, diet, and medication while requiring the patient to reduce various desires and maintain a good state of mind [12]. This type of treatment is essentially rehabilitative. Daoism attaches great importance to the role of recovery in the prevention and treatment of leprosy. The “prevention-treatment-recovery” approach constitutes a trilogy of Daoist medicine in preventing and treating leprosy.

#### Conclusion

Daoism has played an important role in the history of China’s struggle against the plague. Numerous accounts of Daoist figures who fought against the plague are recorded in history books and religious text, and Daoist medical scholars such as Ge Hong, Tao Hongjing, and Sun Simiao made great contributions to the development of plague control medicine. The Daoist “worm-based” theory of plague etiology, the disinfection, immunization, rehabilitation of Daoist medicine, and other plague control methods are the pioneers of related medicine, showing the theoretical value in medical history. The many plague control methods and medicines left behind in Daoism have also shown amazing medical applications under the discovery of modern science.

#### References

1. Lin FS. Epidemics and religion in the late Eastern Han Dynasty. *Inst Hist Philolo Acad Sin.* 1995;66(3):724–725. (Chinese) <https://www1.ihp.sinica.edu.tw/Publications/Bulletin/116>
2. *Daoist Sutra · Tai Shang Chu San Shi Jiu Chong Bao Shen Jing.*

- Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
3. Lu SZ (Song Dynasty). *Daoist Sutra · Wu Shang Xuan Yuan San Tian Yu Tang Da Fa*. Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
  4. Zhang CX (Yuang Dynasty). *Daoist Sutra · Zi Chen Xuan Shu*. Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
  5. Sigerist HE. *Civilization and Disease*. New York: Cornell University Press;2018.  
<https://www.cornellpress.cornell.edu/book/9781501723438/civilization-and-disease/#bookTabs=1>
  6. *A Compilation of Three Thousand Years of Chinese Epidemic History (Pre-Qin to Ming Dynasty Volume)*. Jinan: Qilu Book Company;2019. (Chinese)  
<https://book.douban.com/subject/34839696/>
  7. Fan Y (Southern Dynasty). *Hou Han Shu*. Beijing: China Book Store;2000. (Chinese)  
<https://book.douban.com/subject/1041622/>
  8. Gai JM. *Daoist Medicine*. Beijing: Religious Culture Press;2001. (Chinese)  
<https://book.douban.com/subject/1086150/>
  9. Jiang SC. *The Daoist Rites of Plague-Exorcism: From Song Dynasty to Contemporary China*. Beijing: People's Publishing House;2017. (Chinese)  
<https://book.douban.com/subject/26996504/>
  10. Kristofer S. Vernacular and classical ritual in Taoism. *J Asian Stud*. 1985;45(1):21–57.  
<https://doi.org/10.2307/2056823>
  11. Jiang SC. Medicine and Daoism rites: ancient Daoist measures against plague. *World Relig Cult*. 2020;3:21–22. (Chinese)  
<https://mall.cnki.net/magazine/article/RELI202003004.htm>
  12. Sun SM (Tang Dynasty). *Qian Jin Fang*. Beijing: China Traditional Chinese Medicine Publishing House;1998. (Chinese)  
<https://book.douban.com/subject/1000795/>
  13. Yu GZ. Diffusive gas: ancient Chinese thinking about the “c ause” and “cure” of plague. *J Liter Hist Philos*. 2016;356(5): 138. (Chinese)  
<https://doi.org/10.16346/j.cnki.37-1101/c.2016.05.011>
  14. Martinez ME. The calendar of epidemics: seasonal cycles of infectious diseases. *PLoS Pathog*. 2018;(14) 11:1–15.  
<https://doi.org/10.1371/journal.ppat.1007327>
  15. Simiao C, Klaus P, Michael K, et al. Climate and the spread of COVID-19. *Sci Rep*. 2021; 11:1–6.  
<https://doi.org/10.1038/s41598-021-87692-z>
  16. Jiang S. Daoism and parasitology in ancient China. *J Sichuan Univ (Philosophy and Social Science Edition)*. 2010;169(4):64. (Chinese)  
<http://scdz.chinajournal.net.cn/WKE/WebPublication/paperDigest.aspx?paperID=90E6B996-BA5F-429F-A3D0-ODC48A48F1DD>
  17. *Daoist Sutra · Ji Jiu Xian Fang*. Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
  18. Ge H (Jin Dynasty). *Daoist Sutra · Ge Xian Weng Zhou hou Ji Bei Fang*. Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
  19. Li PF (Yuan Dynasty). *Daoist Sutra · San Yuan Yan Shou Can Zan Shu*. Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
  20. Susser M, Susser E. Choosing a future for epidemiology: II. From black box to Chinese boxes and eco-epidemiology. *Am J Pub Health*. 1996;86(5):674–678.  
<https://ajph.aphapublications.org/doi/10.2105/AJPH.86.5.674>
  21. *Daoist Sutra · Gao Shang Shen Xiao Yu Qing Zhen Wang Zi Shu Da Fa*. Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
  22. Gao TA. *Mineral Medicines and Their Applications*. Beijing: China Chinese Medicine Publishing House;1997. (Chinese)  
<https://book.douban.com/subject/1281634/>
  23. Dong LJ. Review of the epidemic: (II) prevention of the epidemic. *Chin Med Pill Mon*. 1946;10(4):12. (Chinese)  
<https://www.cnbkys.com/search/detail/d997478ad68372cab5b847025287dc39/7/60fba09a84b849351db59bfb1>
  24. *Daoist Sutra · Health Theory of Peng Zhu*. Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
  25. Liu C (Song Dynasty). *Daoist Sutra · Hun Shu Yi Sheng Lu*. Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
  26. George M. *An embassy to China Travels in China*. Beijing: The Commercial Press;2010.  
<https://book.douban.com/subject/25804993/>
  27. Su DL. *Lectures on the General Theory of Infectious Disease Control*. Shanghai: Shanghai First Medical College;1961. (Chinese)  
[https://xueshu.baidu.com/usercenter/paper/show?paperid=ca9782353ad4c77a22ef4627c2f0292d&site=xueshu\\_se](https://xueshu.baidu.com/usercenter/paper/show?paperid=ca9782353ad4c77a22ef4627c2f0292d&site=xueshu_se)
  28. Arnaud T. Four thousand years of concepts relating to rabies in animals and humans, its prevention and its cure. *Trop Med Infect Dis*. 2017;2(2):4.  
<https://doi.org/10.3390/tropicalmed2020005>
  29. Wan XY. A study of Daoism's approach to plague prevention and control. *Relig Stud*. 2019;123(2):83. (Chinese)  
<https://mall.cnki.net/magazine/Article/ZYJZ201902012.htm>
  30. Voltaire. *Lettres Philosophiques Sur Les Anglais*. Shanghai: Shanghai People's Publishing House;2014. (Chinese)  
<https://book.douban.com/subject/25859279/>
  31. Li JW. Immunological ideas, techniques, and influences in ancient China. *J Chin Med*. 1993;39(3):169–175. (Chinese)  
<https://www.airitilibrary.com/Publication/alDetailedMesh?docid=10176446-199312-201003240053-201003240053-169-175>
  32. Gai JM, Peng BS. Exorcising the plague and redeeming the world: the historical contribution of Daoist medicine to the prevention and treatment of the plague. *China Relig*. 2020;244(3):78. (Chinese)  
<https://mall.cnki.net/magazine/Article/ZGZJ202003045.htm>
  33. Yang QS (Yuan Dynasty). *Daoist Sutra · The Immortal-given Secret Prescriptions of Surgeryshe*. Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
  34. Qinghaosu Antimalaria Coordinating Research Group. Antimalaria studies on Qinghaosu. *Chin Med J*. 1979;92(12):811–816.  
<http://rs.yiigle.com/CN11215419799212/1069236.htm>
  35. Zheng HQ, Christopher JC, Benjamin KJ, et al. Inhibitors of *Mycobacterium Tuberculosis* DosRST signaling and persistence. *Nat Chem Biol*. 2017;17(13):217–225.  
<https://doi.org/10.1038/nchembio.2259>
  36. Liu WS (Song Dynasty). The remaining texts of *Daoist Sutra · Yellow Emperor's Internal Canon*. Taipei: Shin Wen Feng Print Company;1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
  37. Sun PL, Zhou WS. Acupuncture in the treatment of COVID-19: an exploratory study. *J Chin Med*. 2020;123(6):1–7.  
<https://www.journalofchinesemedicine.com/acupuncture-in-the-treatment-of-covid-19-an-exploratory-study-23092.html>
  38. Zhai FL, Li Y, Chang LC, Li PN. Application of acupuncture therapy in the prevention and treatment of corona virus disease 2019. *China Natur*. 2020;28(8):10–12. (Chinese)  
<https://doi.org/10.19621/j.cnki.11-3555/r.2020.0804>
  39. Luo YH, Tang CZ, Yang JJ. Effects of acupuncture on monoamine neurotransmitters in hypothalamic and pituitary tissues of chronically fatigued rats. *Chin J Basic Med Tradit Chin Med*. 2008;14(9):713–714. (Chinese)  
<https://mall.cnki.net/magazine/Article/ZYJC200809031.htm>

40. Han ZZ, Zhang Y, Wang PQ, Tang QL, Zhang K. Is acupuncture effective in the treatment of COVID-19 related symptoms? Based on bioinformatics/network topology strategy. *Brief Bioinform.* 2021;4:1–11.  
<https://doi.org/10.1093/bib/bbab110>
41. Sun SM (Tang Dynasty). *Qian Jin Yi Fang*. Beijing: China Traditional Chinese Medicine Publishing House;2014. (Chinese)  
<https://book.douban.com/subject/1000795/>
42. Wang F, Yao ZY. A review of research on ritual therapy choices of rural residents. *Rural Econ Sci Technol.* 2013;24(1):132–135.  
<https://mall.cnki.net/magazine/Article/NCJ201301056.htm>
43. Zhang JF (Song Dynasty). *Daoist Sutra · Yun Ji Qi Qian*. Taipei: Shin Wen Feng Print Company; 1977. (Chinese)  
<https://book.douban.com/subject/5358199/>
44. Chen S (Jin Dynasty). *The History of the Three Kingdoms*. Beijing: Zhonghua Book Company;1959. (Chinese)  
<https://book.douban.com/subject/1014763/>
45. Xu Z, Bo L, Yuan Y, et al. Brain control of humoral immune responses amenable to behavioural modulation. *Nature.* 2020;7807(581): 204–208.  
<https://doi.org/10.1038/s41586-020-2235-7>
46. Shi SF, Liu QQ. Exploring the value of Chinese medicine in the treatment of novel coronavirus pneumonia from the “Jiang Xia Cabin Chinese Medicine Model”. *Jiangsu J Tradit Chin Med.* 2020;52(4):11–13. (Chinese)  
<https://doi.org/10.19844/j.cnki.1672-397x.2020.00.008>