

*Traditional Chinese Medicine***From religious manual to herbal pharmacopoeia: a textual study of the formation and transformation of *Shennong's Classic of Materia Medica***Bi-Sheng Peng^{1*}, Min Lu²¹Institute of Taoism and Religious Culture, Sichuan University, Chengdu 610065, China; ²Center For Studies of Ethnic Minorities in Northwest China, Lanzhou University, Lanzhou 730020, China.***Corresponding to:** Bi-Sheng Peng. Institute of Taoism and Religious Culture, Sichuan University, No.24 South Section 1, Yihuan Road, Chengdu 610065, China. E-mail: Bishengpeng@hotmail.com.**Highlights**

This paper reviews the formation and transformation process of the earliest *Ben Cao* (i.e., materia medica) book: the *Shen Nong Ben Cao Jing* (*Shennong's Classic of Materia Medica*; 25 C.E.–220 C.E.), which appeared during the Han Dynasty period (202 B.C.E.–220 C.E.). A close relationship was found between traditional Chinese medicine and the local religions Fang Xian Dao and Daoism in ancient China.

Traditionality

Although the early records of pharmacology in traditional Chinese medicine can be traced back to the Pre-Qin period (–221 B.C.E.), the term “Ben Cao” first appeared in the book *Han Shu* (*History of the Han Dynasty*; 105 C.E.). The term of “Ben Cao” was used to refer to a group of religious people called Fang Xian Daoists who specialized in the study of alchemy and herbology in *Han Shu*. Since then, there appeared a series of *Ben Cao Jing* (*Classics of Materia Medica*; 25 C.E.–220 C.E.), which recorded a type of mixed knowledge involving medicine and religion. Tao Hongjing (456 C.E.–536 C.E.), a famous doctor and Daoist of the Liang Dynasty (502 C.E.–557 C.E.), compiled the *Ben Cao Jing Ji Zhu* (*Variorum of Classics of Materia Medica*; 456 C.E.–536 C.E.). In this book, he claimed that the *Shen Nong Ben Cao Jing* (*Shennong's Classic of Materia Medica*; 25 C.E.–220 C.E.) was the only orthodox *Ben Cao Jing* written by the legendary sage sovereign Shennong.



Abstract

The earliest *Ben Cao Jing* (*Classics of Materia Medica*; 25 C.E.–220 C.E.) appeared during the reign of the Han Dynasty (202 B.C.E.–220 C.E.); their origins are traceable to the religious group called Fang Xian Dao. In addition to their use as a medical reference, the *Ben Cao Jing* works were also used for religious purposes. Tao Hongjing (456 C.E.–536 C.E.), a famous doctor and Daoist (one member of the Chinese local religion, Daoism) of the Liang Dynasty (502 C.E.–557 C.E.), compiled the *Ben Cao Jing Ji Zhu* (*Variorum of Classics of Materia Medica*; 456 C.E.–536 C.E.) based on the *Shen Nong Ben Cao Jing* (*Shennong's Classic of Materia Medica*; 25 C.E.–220 C.E.). During the compilation of this book, Tao made a radical medical revision to the *Shen Nong Ben Cao Jing*, by reducing its religious contents while complementing its medical contents. After such revisions, the ancient *Ben Cao Jing* was transformed from a religious manual into an herbal pharmacopoeia.

Keywords: *Shen Nong Ben Cao Jing*, *Shennong's Classic of Materia Medica*, *Ben Cao Jing Ji Zhu*, *Variorum of Classics of Materia Medica*, Tao Hongjing

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.

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Background

The *Shen Nong Ben Cao Jing* (*Shennong's Classic of Materia Medica*; 25 C.E.–220 C.E.) is perceived as one of the most important books in traditional Chinese medicine. It is believed to have been written by the legendary sage sovereign Shennong after he had experimented with hundreds of herbs. This book is considered to represent the beginning of pharmacology in ancient China; therefore, it was given the name of “precursor of materia medica”. This book also had significant influence on the pharmacology of ancient Japan and ancient Korea, for example, Silla (ancient Korea) founded its first medical school in 693 C.E., the *Shen Nong Ben Cao Jing* was chosen as one of the fundamental teaching materials. Similarly, the *Ji Yi Ling* (Medical Statutes; 701 C.E.) of ancient Japan declared that a student of medicine must learn *Ben Cao* (i.e., materia medica) according to the research of Natsui Takato, based on *Ben Cao Jing Ji Zhu* (*Variorum of Classics of Materia Medica*; 456 C.E.–536 C.E.) [1], which is a variorum edition of the *Shen Nong Ben Cao Jing*. In the following years, all important medical writings such as the *Yi Fang Lei Ju* (*Categorized Collection of Medical Formulas*; 1443 C.E.), *Dong Yi Bao Jian* (*East Medical Treasures*; 1611 C.E.) of ancient Korea, and the *Yi Xin Fang* (*Ishinpo*; 984 C.E.) of ancient Japan have been influenced significantly by the *Shen Nong Ben Cao Jing*.

Beyond the book associated with this legendary sage king, there are a series of books on herbology called *Ben Cao Jing* (*Classics of Materia Medica*; 25 C.E.–220 C.E.) in the early period of China. The *Ben Cao Jing* that bears the name of Shennong is only one of the texts within the series. These early materia medica books were not pure works of pharmacology: they contained a lot of religious elements such as shamanism and alchemy, including the use of spells, rites, and elixirs to treat illnesses. Their origin seems to be traceable to a religious group called Fang Xian Dao had been inactive for hundreds of years from the Warring States period (475 B.C.E.–221 B.C.E.) to the Han Dynasty period (25 C.E.–220 C.E.), which was a specialized religious group focusing on seeking and refining the elixirs. Some scholars believed that the Fang Xian Dao was the predecessor to the most important local religion known as Daoism. This subject has been discussed extensively in articles by scholars such as Shang Zhijun and Tohru Oghata [2, 3].

The *Ben Cao Jing* was passed down from one generation to the next since their appearance up until Tao Hongjing (456 C.E.–536 C.E.) in the Liang Dynasty period (502 C.E.–557 C.E.), who engaged in a pervasive reconsideration of the importance of the book. Tao was a famous doctor of his time and was a

Daoist. Based on the four-volume version of the *Shen Nong Ben Cao Jing* and other medical books, Tao completed the compilation of the *Ben Cao Jing Ji Zhu*. Tao's work was valued as the best and most comprehensive materia medica book at that time. In the Tang Dynasty (581 C.E.–907 C.E.), a new edition of the materia medica called *Xin Xiu Ben Cao* (*Newly Compiled Materia Medica*; 659 C.E.), which was the first official materia medica in the history of China, was compiled using the fundamentals of the *Ben Cao Jing Ji Zhu* under the supervision of the imperial court. In subsequent periods of history, editions of materia medica followed the editing rules of *Xin Xiu Ben Cao*, which required editors to take the previous edition of materia medica as the authoritative basis upon which to work and to retain a complete copy of the *Ben Cao Jing Ji Zhu*. In this way, the *Shen Nong Ben Cao Jing*, which was preserved in Tao Hongjing's *Ben Cao Jing Ji Zhu*, has become the foundation of all the extant materia medica books, and, as such, has come to be regarded as the “precursor of materia medica”.

In the process of its being passed down, the *Shen Nong Ben Cao Jing* underwent some medical revisions, such that its religious content (e.g., elements of shamanism, alchemy, and worship of the deities) were reduced, and medical theories and applications were continuously improved. This process can be seen by examining the textual differences between the remains of the ancient *Ben Cao Jing* and the extant *Shen Nong Ben Cao Jing*; this topic will be discussed more fully in the present article. After this extensive medical revision, the *Shen Nong Ben Cao Jing* has, in effect, been transformed into its current form as an herbal pharmacopoeia. The purpose of this paper is to review the formation and transformation process of the earliest *Ben Cao* book, the *Shen Nong Ben Cao Jing* that appeared during the rule of the Han Dynasty (25 C.E.–220 C.E.), with the aim of exploring the relationship between traditional Chinese medicine and the local religion Fang Xian Dao in ancient China.

Formation and passing down of the *Shen Nong Ben Cao Jing*

It is impossible to discover, with certainty, the exact formation process of the *Shen Nong Ben Cao Jing* or to ascertain its true origins because of the insufficiency of documentary evidence. Modern scholars can only reach consensus on a rough hypothesis based on the texts recorded in the book itself and by reference to other ancient historical records. Although controversy still exists, there is a general consensus that this book was probably written in the Han Dynasty period (25 C.E.–220 C.E.). There are several strong evidentiary reasons for this judgment.

(1) There was no record of *Shen Nong Ben Cao Jing* in the historical catalog *Yi Wen Zhi* (*Literature and Art Records*; 105 C.E.) or from the *Han Shu* (*History of*

the Han Dynasty; 105 C.E.), which recorded all the important books known to have been in existence before the rule of the Han Dynasty period (25 C.E.–220 C.E.). Several medical or religious books were recorded in *Yi Wen Zhi*, of which some were named as “Shen Nong”. For example, there are medical books named *Shen Nong Huang Di Shi Jin* (*Shennong & Huangdi’s Food Taboos*; 105 C.E.) and *Sheng Nong Za Zhi Ji Dao* (*Shennong’s Fitness Skills*; 105 C.E.), but there is no record of the *Sheng Nong Ben Cao Jing* in *Yi Wen Zhi*, which means when the *Yi Wen Zhi* was compiled by Ban Gu (32 C.E.–92 C.E.), it is likely that the *Shen Nong Ben Cao Jing* had not yet been finalized or might only have been circulated among a small group in secret.

(2) A large number of place names were recorded in *Sheng Nong Ben Cao Jing* to locate the habitat of herbs in which the names of Yu Zhang, Chang Shan, and Zhu Ya were included, but in fact, the names of these places only appeared in the Han Dynasty (25 C.E.–220 C.E.), which indicates that it is possible that the *Sheng Nong Ben Cao Jing* was written before the rule of the Han Dynasty period (25 C.E.–220 C.E.) [4].

(3) The term “Ben Cao” first appeared during the time of the Han Dynasty (25 C.E.–220 C.E.); it can be found in the three chapters of *Han Shu*, namely *Lou Hu Zhuan* (*Biography of Louhu*; 105 C.E.), *Jiao Si Zhi* (*Records of Sacrifice*; 105 C.E.), and *Ping Di Li* (*Chronological Record of Ping Di*; 105 C.E.). In these three records, “Ben Cao” was a reference to herbology or to the people who were proficient in herbology; these people were regarded as alchemists or shamans and were valued by the emperors during the rule of the Han Dynasty (25 C.E.–220 C.E.) who had the desire and the will to pursue their quest for immortality through this route [5]. The *Shen Nong Ben Cao Jing* is one version of the ancient *Ben Cao Jing*. There is evidence that at the time of their first appearance there was no single specific name by which they were called; taken together, there was only *Ben Cao Jing*, which was used as a unified name or thematic reference for them. Many ancient books in the Han Dynasty (25 C.E.–220 C.E.), such as the *Chu Ci Zhang Ju* (*Chapters and Sentences of Chu’s Poems*; 114 C.E.) and the *Fan Si Er Ya Zhuan* (*Fan’s Note of Erya*; 180 C.E.–225 C.E.), have quoted from *Sheng Nong Ben Cao Jing* [6], which came to be known as the “*Classics of Materia Medica*”. In addition, there are about 250 citations of *Shen Nong Ben Cao Jing* in *Tai Ping Yu Lan* (*Taiping Imperial Encyclopedia*; 983 C.E.), which was an important source book compiled during the Song Dynasty (960 C.E.–1279 C.E.), including more than 220 drug entries under the titles of *Ben Cao Jing*, 17 drug entries under the titles of *Ben Cao*, and only 9, 6, and 3 drug entries under the titles of *Shen Nong Ben Cao* (*Shennong’s Materia Medica*; 25 C.E.–220 C.E.), *Shen Nong Jing* (*Classic of Shennong*; 25 C.E.–220 C.E.), and *Shen Nong Ben Cao Jing*, respectively [7].

Later, these medicine books, which were called the *Ben Cao Jing*, were distinguished from each other by means of the addition of different names as prefixes. For example, we may refer to a work by Wu Pu (149 C.E.–250 C.E.), a famous doctor in the Three Kingdoms period (220 C.E.–280 C.E.), who compiled the book *Wu Shi Ben Cao Jing* (*Wu’s Classic of Materia Medica*; 149 C.E.–250 C.E.). In this book, nine versions of the *Ben Cao Jing* were collected: Shen Nong, Huang Di, Qi Bo, Lei Gong, Tong Jun, Bian Que, Li Shi, Yi Jing, and Yi He; these are all names of ancient doctors or kings, Shen Nong being just one of them. Tao Hongjing (456 C.E.–536 C.E.) also mentioned that there were different versions of *Ben Cao Jing* that specified different numbers of drugs (some of them recorded 595 kinds of drugs, some dealt with 431 kinds, and some listed 319 kinds). The version chosen by Tao was one which contained 365 drugs, corresponding to the number of days in a year [8]. All these findings show that the *Shen Nong Ben Cao Jing* recorded in the *Ben Cao Jing Ji Zhu* by Tao Hongjing (456 C.E.–536 C.E.) was only one version from many of the ancient *Ben Cao Jing*.

Tao Hongjing (456 C.E.–536 C.E.) distinguished different source of texts with different colors in the process of compiling the *Ben Cao Jing Ji Zhu*. That is to say, the original texts of *Shen Nong Ben Cao Jing* were written with red characters [8], and the texts that came from *Ming Yi Bie Lu* (*Notes of Famous Doctors*; 492 C.E.–500 C.E.), complementing *Shen Nong Ben Cao Jing*, with black characters. This method of distinguishing between and among the various texts was inherited by the *Xin Xiu Ben Cao* compiled during the Tang Dynasty (581 C.E.–907 C.E.). The remnant of the *Xin Xiu Ben Cao* numbered as p.3714, which is kept at the Library of France in Paris, still retains this compilation style that distinguished the various texts by means of different colors. It should be noted here that some scholars question whether even the red characters had been revised by Tao Hongjing (456 C.E.–536 C.E.) during his compilation of the *Ben Cao Jing Ji Zhu* [2].

In the *Zhen Lei Ben Cao* (*Zhenlei Materia Medica*; 1097 C.E.–1100 C.E.), which was compiled in the Song Dynasty (960 C.E. – 1279 C.E.), a different method for distinguishing the different texts was used. The original texts of *Shen Nong Ben Cao Jing* were printed with white characters on a black background [9], and the texts that came from *Ming Yi Bie Lu* were printed with large black characters while other texts were printed with small black characters. Because the *Ben Cao Jing Ji Zhu* was well preserved and taken as the basis for the subsequent materia medica books, it can be claimed that there is actually a single common source of the extant *Shen Nong Ben Cao Jing*, which is the *Shen Nong Ben Cao Jing* recorded in the *Ben Cao Jing Ji Zhu*, compiled by Tao Hongjing (456 C.E.–536 C.E.).

Textual differences between ancient *Ben Cao Jing* and the extant *Shen Nong Ben Cao Jing*

There are many lost texts of *Ben Cao Jing* preserved in other ancient historical books of China. Many of them are quite different from the texts found in the present-day version of *Shen Nong Ben Cao Jing*. These differences reveal modifications that were made to the text as it was being passed down through the ages. These differences include the differences in the theory of drug classification, which can be seen from the lost texts recorded in the *Bo Wu Zhi* (Natural History; 232 C.E.–300 C.E.), written by Zhang Hua (232 C.E.–300 C.E.) at the time of the Xijin Dynasty (265 C.E.–316 C.E.). and *Bao Pu Zi Nei Pian* (Secret Classic of Ge Hong; 306 C.E.–317 C.E.), a Daoist classic written by the famous Daoist Ge Hong (284 C.E.–364 C.E.) at the time of the DongJin Dynasty (326 C.E.–420 C.E.). There are also differences in the content of drug entries, which can be seen from the medicine entries of the *Ben Cao Jing* quoted in *Tai Ping Yu Lan*. In addition, there are lost texts that were preserved only in other ancient books that cannot be found in the extant *Shen Nong Ben Cao Jing*. There are several examples of these textual differences; only a number of them will be selected for consideration within the scope of this article.

Regarding the differences in theory pertaining to the classification of drugs, it is best to compare the passages taken from *Bo Wu Zhi* and *Bao Pu Zhi Nei Pian*, which are quite different from the corresponding texts in Tao Hongjing's *Ben Cao Jing Ji Zhu*.

On comparing the three paragraphs in Table 1, the following differences regarding the classification of the three grades of drugs are clear. In the *Bo Wu Zhi* of Zhang Hua, the quoted texts mainly talked about the classification of three grades of drugs, which were relatively simple. The texts quoted by the *Bao Pu Zi Nei Pian* of Ge Hong (284 C.E.–364 C.E.) mostly focused on the description of the different effects of the three grades of drugs, in which many Daoist terms are used, it was particularly different from the other texts. The texts recorded in the *Ben Cao Jing Ji Zhu* of Tao Hongjing (456 C.E.–536 C.E.) focused on the differentiation of drugs for use in the treatment of different diseases, including a statement of medical theories such as the specific number of the three grades of drugs, the combinations of drugs, the toxicity of drugs, and so on.

Regarding the differences pertaining to the drug entries, comparisons may be made between the drug entries quoted by *Tai Ping Yu Lan* and the drug entries recorded in the *Ben Cao Jing Ji Zhu*. There are more than 200 drug entries with the names specified in *Ben Cao* or *Ben Cao Jing* that have been quoted in the *Tai Ping Yu Lan*. Most of these entries are the same or similar to those recorded in the *Ben Cao Jing Ji Zhu*,

but there are also a few entries that are quite different from those found in Tao's version. For example, these three drugs specified below in Table 2 show a great difference between them.

It can be seen that there are some significant differences between the texts recorded in *Ben Cao Jing Ji Zhu* and those quoted in *Tai Ping Yu Lan*. The medical content, including such aspects as flavor, property, indication, and efficacy were described in detail in *Ben Cao Jing Ji Zhu* while only the shapes and habitats were recorded in the lost articles of *Ben Cao Jing*. Furthermore, it can be seen there are two texts that were quoted from *Shen Nong Ben Cao* and *Ben Cao Jing* simultaneously in *Tai Ping Yu Lan* for the He Huan (*Albizia julibrissin* Durazz), the text quoted from *Ben Cao Jing* is almost the same as the text recorded in the *Ben Cao Jing Ji Zhu*, while the text quoted from the *Shen Nong Ben Cao* is quite different. This is a clear point of evidence showing that there were substantive differences in the textual wording of the different versions of the ancient *Ben Cao Jing*.

In addition to the differences in the theory of medicine and drug entries, there are also some texts about the worship of the gods or the theory of immortality that can only be found in the ancient *Ben Cao Jing* which are not in the present-day version of *Shen Nong Ben Cao Jing*. For example, in *Tai Ping Yu Lan*, there are the following quotations from the book of *Ben Cao Jing*. The book of *Shen Nong Ben Cao Jing* says, Shennong bowed to the Tai Yizhi, who is a very important god in Daoism, again and asked: "I heard that in ancient times, the people could live longer than a hundred years without illness and pain; what reasons account for their longevity?" The deity Tai Yizhi said, "There are nine ways to reach longevity, and the middle way (taking medication) is the best." So Shennong followed the guidance of deity Tai Yizhi by testing herbs in order to save the people from having to suffer so greatly [12]. This paragraph is the only record found among the *Ben Cao Jing* that mentioned the formation process of the *Shen Nong Ben Cao Jing* and the legendary story of Shennong's testing of herbs, which connected this book to the worship of the deity Tai Yizhi.

From a careful comparison between the texts of the *Shen Nong Ben Cao Jing* preserved in the *Ben Cao Jing Ji Zhu* and the *Ben Cao Jing* preserved in other ancient books, it can be seen that there are wide differences between them. The most obvious of these is that there were more medical contents in the *Shen Nong Ben Cao Jing*, while in the ancient version of the *Ben Cao Jing*, there are a lot of religious terms, which have disappeared and are not to be found in extant versions.

Medical transformation of the *Shen Nong Ben Cao Jing*

It is now clear that the *Shen Nong Ben Cao Jing* had undergone a series of medical modifications in the process of its being passed down from generation to generation, which is the cause for the differences between the ancient *Ben Cao Jing* texts and the extant texts of the *Shen Nong Ben Cao Jing*. Before Tao Hongjing's compilation of the *Ben Cao Jing Ji Zhu*, the *Shen Nong Ben Cao Jing* had undergone some medical modifications, which can be seen in research conducted by Mr. Ma Jixing [6]. After that, when Tao Hongjing (456 C.E.–536 C.E.) compiled the *Ben Cao Jing Ji Zhu*, the *Shen Nong Ben Cao Jing* experienced

another radical medical revision.

In the preface of the *Ben Cao Jing Ji Zhu*, Tao Hongjing (456 C.E.–536 C.E.) described the compilation process in detail: “My compilation will be based on the *Ben Cao Jing Ji Zhu*, which recorded 365 kinds of drugs, and I will use the *Ming Yi Bie Lu* as supplemental materials, which also recorded 365 kinds of drugs, then refer to other medical books. I will choose all the materials, both fine and rough, I will distinguish the drugs by category, I will make note of their picking season and habitat, and I will record their application in religious use [8].”

Table 1 Comparison of drug theories in the ancient *Ben Cao Jing* (Classics of Materia Medica; 25 C.E.–220 C.E.) and the extant *Shen Nong Ben Cao Jing* (Shennong's Classic of Materia Medica; 25 C.E.–220 C.E.)

Books	Different quotations of the same paragraph
<i>Bo Wu Zhi</i> (Natural History; 232 C.E.–300 C.E.)	The <i>Shen Nong Jing</i> (Classic of Shennong; 25 C.E.–220 C.E.) said: “The upper grade drugs can nourish the life of a human being, of which the five kinds of mineral drugs (usually refer to Zhu Sha (Cinnabar), Xiong Huang (Realgar), Ci Huang (Orpiment), Bai Fan (Alumen) and Ci Shi (Magnetitum)) can make one's body strong and the six colors of Ling Zhi (<i>Ganoderma lucidum</i> ; white, red, yellow, blue, black and purple) can extend one's life. The middle-grade drugs can nourish the spirit of a human being, of which the He Huan (<i>Albizia julibrissin</i> Durazz) can calm down one's anger and the Xuan Cao (<i>Hemerocallis</i>) can make one forget one's sorrow. The lower-grade drugs can be used to treat illness, of which the Da Huang (<i>Rhei Radix et Rhizoma</i>) can help to relieve constipation and the Dang Gui (<i>Angelica sinensis</i>) can be used to relieve pain.” [10]
<i>Bao Pu Zi Nei Pian</i> (Secret Classic of Ge Hong; 306 C.E.–317 C.E.)	The <i>Shen Nong Jing</i> said: “The upper grade drugs can keep people healthy and extend their lifespan, can transform a human into a god, can enable a human to have the ability to fly, can give a human the power to have command over animals, can let a human grow wings, and can let a human have the ability of teleportation.” It was also said that the five colors of Ling Zhi (<i>Ganoderma lucidum</i> ; white, red, yellow, blue and black), Zhu Sha (Cinnabar), Yu Zha (<i>Sanguisorba officinalis</i> L.), Zeng Qing (Azuritum), Xiong Huang (Realgar), Chi Huang (Orpiment), Yun Mu (Muscovite, Muscovitum) and Yu Yu Liang (Limonitum), all these drugs can be taken separately; they can give humans the ability to fly and can extend a human's life. It was also said that middle-grade drugs can nourish the spirit of a human being and lower-grade drugs can be used to treat illness; they also can be used to remedy the bites of poisonous insects and the injuries caused by ferocious beasts; and they can even be used to protect a person from evil spirits [11]. Fantastic claims such as these have led certain modern scholars to regard the early materia medica texts as (in some parts) products of superstitious thought and therefore to characterize them as “religious” manuals.
<i>Ben Cao Jing Ji Zhu</i> (Variorum of Classics of Materia Medica; 456 C.E.–536 C.E.)	There are 120 kinds of upper grade drugs that are metaphorically referred to as the king of medicine, corresponding to the sky. These drugs are non-toxic, your health will not be impaired even with long-term and large-scale use of them. If you want to keep healthy and prolong your life, you should follow the instruction of the first volume of <i>Shen Nong Ben Cao Jing</i> . There are 120 kinds of middle-grade drugs, which are likened to the ministers of medicine, corresponding to the human being. Some of them are toxic and some are non-toxic, if you want to control the state of the illness and improve your fitness, you should follow the instruction in the second volume of <i>Shen Nong Ben Cao Jing</i> . There are 120 kinds of lower-grade drugs that are characterized as assistants and envoys of medicine, corresponding to the earth. Most of them are toxic, if you want to use them to treat illnesses, you should follow the third volume of <i>Shen Nong Ben Cao Jing</i> . [8]

Table 2 Comparison of drug entries in the ancient *Ben Cao Jing* (Classics of Materia Medica; 25 C.E.–220 C.E.) and the extant *Shen Nong Ben Cao Jing* (Shennong's Classic of Materia Medica; 25 C.E.–220 C.E.)

Herbs sources	<i>Ben Cao Jing</i> recorded in <i>Tai Ping Yu Lan</i> (Taiping Imperial Encyclopedia; 983 C.E.) [12]	<i>Shen Nong Ben Cao Jing</i> [8]
He Huan (<i>Albizia julibrissin Durazz</i>)	It is stated in the <i>Shen Nong Ben Cao</i> (Shennong's <i>Materia Medica</i>; 25 C.E.–220 C.E.) that the He Huan (<i>Albizia julibrissin Durazz</i>) grew around the valley of Yuzhou, the trees of He Huan (<i>Albizia julibrissin Durazz</i>) look like the trees of Gougu (<i>Tamarindus indica</i>). The <i>Ben Cao Jing</i> said that the He Huan (<i>Albizia julibrissin Durazz</i>) grew in the valleys, can be used to regulate the function of the five organs (heart, liver, spleen, lungs and kidneys), can contribute to the mental health of a human being, and can give men relief from depression; it is also said that the He Huan (<i>Albizia julibrissin Durazz</i>) can improve the bodily flexibility and eyesight of a human being.	Flavor: sweet. Property: neutral in nature; can be used to regulate the function of the five organs (heart, liver, spleen, lungs and kidneys), can contribute to the mental health of a human being, and can give men relief from depression; if you take this drug long enough, it can make your body strong and improve your eyesight.
Zhi Zi (<i>Fructus Gardeniae</i>)	The <i>Ben Cao Jing</i> said about the Zhi Zi (<i>Fructus Gardeniae</i>), also known as “Mu Dan”, which has pointed leaves at both ends: the kernels of this plant are reddish and look like silkworm cocoons.	Flavor: bitter. Property: cold in its nature; can be used to treat the pathogenic facts of the five organs (heart, liver, spleen, lungs and kidneys), pyrogenic facts of stomach, flushed complexion, acne rosacea, and impetigo; this plant is also known as “Mu Dan”.
Xin Yi (<i>Flos Magnoliae</i>)	It is stated in <i>Shen Nong Ben Cao</i> that the Xin Yi (<i>Flos Magnoliae</i>) grew around the valley of Hanzhong, Weixin, and Liangzhou. The trees of Xin Yi (<i>Flos Magnoliae</i>) look like the trees of Du Zhong (<i>Eucommia ulmoides</i>), about 2.5 meters tall, the fruits of Xin Yi (<i>Flos Magnoliae</i>) are small and look like winter peach. The <i>Ben Cao Jing</i> said the Xin Yi (<i>Flos Magnoliae</i>) is also known as “Xin Yin”, “Hou Tao”, or “Fang Mu”.	Flavor: pungent. Property: warm in its nature; can be used to adjust the function of the five organs (heart, liver, spleen, lungs, and kidneys), bodily chills, and fever; can be used to treat headaches. The Xin Yi (<i>Flos Magnoliae</i>) can be used to treat the diseases cause by Wind (a pathogenic factor), can improve the bodily flexibility and eyesight, and have the effect of anti-aging. The Xin Yi (<i>Flos Magnoliae</i>) is also known as “Xin Yin”, “Hou Tao”, or “Fang Mu”.

According to this statement, the systematic revision process of *Ben Cao Jing Ji Zhu* by Tao Hongjing (456 C.E.–536 C.E.) was accomplished in two steps. First was the selection of the appropriate version of the *Shen Nong Ben Cao Jing*. As stated above, there were a series of *Ben Cao Jing* in the early days. What Tao Hongjing (456 C.E.–536 C.E.) used is the *Shen Nong Ben Cao Jing*, which recorded 365 kinds of drugs. He believed this version of the *Ben Cao Jing* was left by Shennong himself. The second step was the revision of medical information after referring to other medical books. For example, according to his statement, one

guiding principle of his compilation was “to synthesize all kinds of medical classics, supplement the deficiencies, and delete the redundant content of the *Shen Nong Ben Cao Jing*” [8].

According to Tao Hongjing's statement of the compilation process and the textual difference between existing *Shen Nong Ben Cao Jing* and the lost articles of the ancient *Ben Cao Jing*, it can be inferred that Tao Hongjing (456 C.E.–536 C.E.) has made at least the following medical modifications.

First, the inclusion or introduction of the principle of drug formulation. The following principle of drug

formulation was described by Tao in the *Ben Cao Jing Ji Zhu*. The drugs of the upper, middle and lower grades are divided into four categories [8]. However, according to the *Bao Pu Zi Nei Pian* of Ge Hong (284 C.E.–364 C.E.) and the *Bo Wu Zhi* of Zhang Hua, no one had ever previously mentioned this formulation. When Tao Hongjing (456 C.E.–536 C.E.) compiled the *Ben Cao Jing Ji Zhu*, he claimed to have referred to the book of *Yao Dui* (*Drug Formulation*; 25 C.E.–220 C.E.), which specially discusses the principle of drug formulation. Therefore, it can be speculated that the formulation theory may be a unique portion of the content of the version of the *Shen Nong Ben Cao Jing* chosen by Tao Hongjing (456 C.E.–536 C.E.), or it might possibly have been added by Tao Hongjing (456 C.E.–536 C.E.) from his study of other medical books.

Secondly, the ancient method for the classification of drugs was adjusted and improved. According to Tao Hongjing (456 C.E.–536 C.E.), there was a great deal of confusion in the classification of drugs in the original *Sheng Nong Ben Cao Jing*: “Upper grade and lower-grade drugs were mixed, febrile drugs and cool nature drugs were also mixed, no distinction being made between the drugs made from animals and those derived from plants [8].” So, Tao made adjustments to the classification of drugs. First, adjusting the classification of the three grades of drugs according to their toxicity and efficacy. For example, realgar and orpiment were specified as belonging to the upper grade drugs in the *Bao Pu Zi Nei Pian* of Ge Hong (284 C.E.–364 C.E.), but Tao adjusted the list and assigned them to the lower-grade of drugs due to their toxicity. Second, considering that the ancient *Shen Nong Ben Cao Jing* only provided a rough classification to upper, middle, and lower grades but did not distinguish the categories of these drugs; in the *Ben Cao Jing Ji Zhu*, drugs were classified into several categories such as “Grass”, “Wood”, “Stone”, “Mineral”, “Insect”, “Grain”, according to their natural sources. This is the first time that Chinese herbal medicines were classified according to their natural sources, which became a principle of classification followed in all the later materia medica books [13].

Thirdly, many medical contents such as the efficacy and major functions of a drug were added to the *Sheng Nong Ben Cao Jing*. As we can see, most of the drug entries from the *Ben Cao Jing* quoted in the *Tai Ping Yu Lan* and other ancient books are relatively simple, some of them only included the shapes, picking season and habitat of the plants, while Tao’s version included more content pertaining to medical applications, including the flavor, property, indication, and efficacy of certain drugs. These technical differences in the texts make it clearly evident that Tao engaged in revision of the medical content of the *Shen Nong Ben Cao Jing* when he was compiling the *Ben Cao Jing Ji Zhu*.

Conclusion

Based this comparative study of the lost articles of the ancient *Ben Cao Jing* and the extant *Shen Nong Ben Cao Jing* compiled by Tao Hongjing (456 C.E.–536 C.E.), it is now clear that the formation and the revision process of *Shennong’s Classic of Materia Medica* may be described as follows.

During the Han Dynasty period (25 C.E.–220 C.E.), there was a religious group of Fang Xian Daoists who specialized in the study of alchemy and herbology, and the earliest *Ben Cao Jing* may be traceable to their works. The purpose of these Fang Xian Daoists was to use these texts as a guide in their pursuit of the emperor’s quest for immortality and also for general medical purposes. The contents of these books are relatively simple, mainly describing the shape, habitat, picking methods, and efficacies of various drugs prescribed during those times for medicinal and religious use. Tao Hongjing (456 C.E.–536 C.E.) compiled the *Ben Cao Jing Ji Zhu* in the Liang Dynasty period (502 C.E.–557 C.E.). This article shows that during the compilation of this book, Tao made a radical revision of the ancient *Ben Cao Jing*, by reducing the religious contents and augmenting the medical contents. This compilation, including the revisions made to the *Shen Nong Ben Cao Jing*, was retained in the subsequent materia medica books as basic reference material. After this textual revision by Tao Hongjing (456 C.E.–536 C.E.), the ancient *Ben Cao Jing* was, in effect, transformed from a religious manual of herbology into an herbal pharmacopoeia, which is the form in which it appears today.

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