

# **LING ZHI, *Ganoderma ling zhi* (Curtis) P. Karst (1881), the Chinese Mushroom of Immortality**

By Dianna Smith

The history of classic medicine in pre-modern China is extremely rich and complex. It is intimately associated with long-standing beliefs and hygienic practices<sup>1</sup> of the political elite, scholars, powerful landowners, merchants and the many specialists that catered to the physical and psychological health of the privileged during their lives and afterward. Some were founded on quasi-religious or mystical ideas and superstitions, focused on living a balanced life that incorporated consumption of a wide-variety of health promoting foods in moderation and in accordance with their seasonal and regional availability. Others were based on interpretations of an integrated theory of cosmological change systematized during the Later Han Dynasty that tied the synchronization of political, social and health activities and ideals to the celestial movements and natural observable changes that occurred over the course of the seasons. During the Han Dynastic period (202 B.C. 9 A.D.; 25 AD-220AD), classical medical theory was developed in a hierarchically defined, authoritarian socio-political culture dependent upon the labor of a rural peasantry to feed many urban centers and maintain infrastructure to ensure the continued existence of the reigning dynastic family. It reflected the ideals of the entitled and the desire of at least some Han Dynasty political advisers to establish control over the whims of tyrannical rulers. It entailed sociopolitical ideals that would become manifest in a world united by compliance to rituals honoring Heaven, Earth and Man, moderation in all activities, and respectful obedience to the ruler, the ancestors, the family elders and particularly the laws of nature.<sup>2</sup> Deviations from the norm, whether from an emperor's or a commoner's misbehavior, resulted in social uprisings, political chaos, war, widespread illness and famine. Restoration to order and health required compliance to the laws of nature and the adoption of behavioral and dietary practices as recommended by sagely physicians. If unheeded, irregularities would transform into more virulent disorders from which one would perish before reaching one's predetermined life-span of one hundred years. (Most Chinese men, it was said, die by age 50. Most Chinese women died by 49).<sup>3</sup> Controlling one's fate, reputation and legacy required following recommended rituals throughout the year by the emperor and the people. These were designed to maintain order, appease ancestors, show respect for authority, and prolong one's natural life-span of one hundred years with continued physical and emotional vigor. Failure to do so in an exemplary manner, would invite Heaven's wrath causing earthquakes, invasions, epidemics, uprisings and famine which resulted in the ruler to losing the Mandate of Heaven.

There were others, especially ardent followers of numerous Taoist sects, who were less interested in being compliant with patterning their lives after behavioral norms proposed by dictates of Confucian-Legalist government authorities. Their numbers grew in times of war, famine and other catastrophes and they were often suspect in being associated with political rebellions.<sup>4</sup> Some sought to make the most of circumstances that

threatened survival. They found refuge in uninhabited mountainous regions south of the Yangtze River. There they searched for foods and medicines consisting of its unfamiliar plants, insects, colorful stones, minerals, metals and fungi to sustain and to cultivate themselves physically and spiritually. Cut off from access to grains and rice, the basic foods of the masses, they ate no starches, fish or pungently favored foods, and intentionally fasted for days at a time. They practiced purification rites, and sought to lengthen their lives or better yet, become spiritual beings by creating elixirs of immortality. Quite a few even envisioned sustaining themselves in perpetuity as etherealized god-like spirits. Many methods and recipes were developed over the centuries to achieve these lofty ambitions and they appealed to anyone willing to devote their entire lives to spiritual self-cultivation. Some of these men were at least partly responsible for fostering the adoption and use of many of the drugs employed in China's corpus of pharmaceuticals in the past and in the present. In fact, some attained reputations for living hundreds of years and knowing exactly where these secret immortality substances could be found. Emperors were especially desirous of locating and rewarding shamans, doctors, and other wizardly men and women to find and make the elixirs spoken of in legendary tales in hopes of becoming immortal.



Shennong chewing a branch (1503). The short horns on his head are a consequence of his acquiring a feature of immortal tortoises. Painting by Guo Xu (1456-1529). Shennong is the mythological ancestor of Chinese medicine and is called the Divine Farmer and a Sage King. In addition to inventing the plow, the hoe, the axe and various other items of civilization, he is credited with teaching the people farming practices, irrigation techniques, how to dig wells, and how to preserve and store food. He is also said to have personally tested hundreds of herbal drugs for the benefit of the people. The legendary Yellow Emperor, Huang Di, believed to be his son, is known for inventing wheeled chariots, astronomy, the compass, the calendar and is known for promoting the secrets of dietetics, immortality and golden elixirs. He is believed to be an Immortal.

Given the esteem in which fungiphiles especially hold on 'medicinal fungi' longevity drugs like *Ganoderma ling zhi*, you may be thinking these immortality substances consisted mainly of fungi and certain herbs. Most popular books and articles – even those by Chinese medical researchers writing about the potential medicinal compounds found in *Ganoderma ling zhi* - are insistent on convincing us this is a fact. Belief in the antiquity of use is somehow supposed to make this polypore more acceptable as an empirically verified scientific medicine. This is unfortunate. Certainly, there are numerous fungi used in Chinese cooking, which are also recommended for maintaining health and even enhancing it if not in tip-top shape. However, it is impossible to find supporting

evidence that *Ganoderma ling zhi* has a two to seven-thousand-year history of use in China. Despite the often-repeated passages regarding its antiquity of use, it is not in fact mentioned in any original Chinese medical source prior to recent times, and it certainly was never recommended as a cure for heart disease or cancer!

There are just two references to which scholars and researchers of Chinese medicinals point when they declare that *Ganoderma ling zhi* had been used from early imperial times onward. The first was recorded during the Han dynasty (206 BC – 9 AD). In a prose poem about the mythical Islands of the Immortals called “Western Metropolis Rhapsody”, Zhang Heng (AD 78-139) wrote:

Raising huge breakers, lifting waves,  
That drenched the stone mushrooms on the high bank,  
And soaked the magic fungus on vermeil boughs.<sup>5</sup>

Precisely what the terms ‘stone mushrooms’ referred to is seriously open to question. Despite its possible later association with a species of *Ganoderma* from the late fifteenth century onward, no one can be certain that the characters referred to the polypore in its earliest documented reference.<sup>6</sup> According to Xue Zong, a scholar and high official of the state of Eastern Wu during between 220s to 243, the characters *dan zhi* referred to drugs of immortality.

Today the character for *zhi* means fungus or lichen or an iris. Two thousand years ago, however, it referred to a variety of super mundane substances often described as immortality substances. Depending on the historical period in which it was used, the term denoted different substances made from minerals, precious stones, petrified fossils, lichens and fungi. The following passage, however, is the one usually referred to when authors and researchers mention the long use of *Ganoderma lucidum* in China. It consists of this translated passage the from *Huang Di Nei Jing*, also known as *The Yellow Emperor’s Classic of Health*, which is believed to have been compiled during the second half of the Han Dynasty.

“*Tiny excrescences*. These grow deep in the mountains, at the base of large trees or beside springs. They may resemble buildings, palanquins and horses, dragon and tigers, human beings, or flying birds. They may be any of the five colors. .... **When** dried in the shade, powdered, and **taken by the inch-square spoonful, they produce spirithood**. Those of the intermediate class confer several thousands of years, and those of the lowest type a thousand years of life.”<sup>7</sup>

The ‘tiny excrescences’ or *zhi* referred to above refer to a variety of ‘auspicious’ spiritual substances in the earliest dictionaries. In medicine, they have the power to confer immortality. Generally, they refer to substances that have

charismatic powers of transcendence.<sup>8</sup> In other words, the square-spoonful of dried substances which conferred on the Taoist at least a thousand years of life, or even immortality definitely was not ground-up *Ganoderma*!

Might the author have been referring to hallucinogenic mushrooms, such as *Gymnopilus junonius*, or even hallucinogenic plants, which some groups of Taoist alchemists are known to have used?<sup>9</sup> Joseph Needham mentions an illustrated Liang dynasty (502-587) publication called “On the Planting and Cultivation of Magic Mushrooms”, which unfortunately is no longer extant.<sup>10</sup> So it is possible, but it is difficult to believe that even a hallucinogenic out of body experience would result in the proliferation of so many writings laying out the detailed ritual and material requirements of achieving everlasting immortality by standing over a continuously glowing crucible of metallic liquid.

### **What were immortality elixirs made of?**

The earliest Immortality elixirs were not made with herbs or fungi. Herbs could only provide longevity. After all, they turned to ash when cooked or rotted when allowed to naturally decompose. The ingredients employed for forging a physical compound through metallurgical processes to fashion Pills of Immortality were durable, long-lasting substances not subject to decay. They were a class of supernatural drugs made from metals, minerals, stones and pearls. These could be ground up and melted down and transformed in the caldrons of seekers of immortality. According to Ge Hong (284-363), who wrote a book on emergency medicine, *Zhou hou beiji fang* (*Handbook of Prescriptions for Emergency*), the superior medicine is cinnabar, followed by yellow gold, white silver, the various excrescences, the five jades, followed by mica, pearls, realgar, Limonite, Burnet, quartz, and softer metals.....<sup>11</sup>

Taoist adherents engaged in ritualized alchemical practices involving the manufacture of a golden elixir out of cinnabar, mercury, realgar (disulphide of arsenic), salts, orpiment and sulphur in crucibles kept going over fires for many years at a time. Some elixirs were said to be so potent that lost teeth would regrow, and white hair would become black again. Immortals could also walk on water, ice or snow, become invisible at will, change form and travel the heavens and earth without being hampered. These powers were known through ancient stories to have been achieved by the mythical adepts who lived in the depths of legendary time. Devotees aimed to become so light that they would dematerialize.<sup>12</sup> They ate so little that they occasionally wrote about seeing ghosts and gods. The metallic compounds and particularly arsenic breathed in while cooking their preparations may have been accompanied by hallucinations. Drinking the elixir over time probably also prevented their bodies from decomposing as they would if they died naturally.<sup>13</sup>

The practice of consuming mineral elixirs was mainly carried out by rulers and the well-to-do, who had the ability to procure expensive substances employed to make golden elixirs of immortality. Emperors, like many of the rest

of us, were concerned, especially toward the end of their lives with prolonging their existence forever. Like most human beings, emperors preferred to take short-cuts in hopes of getting instant results. Theoretically, all that was required was that while living, the ruler perform the prescribed annual rituals and govern in accordance with the Tao and Confucian principles.<sup>14</sup> After all, why give up all the pleasures of exotic foods, wines and an unlimited number of beautiful concubines too before one reached old age to take magical substances that promised eternal life?

The first emperor of a unified empire was the Qin Dynasty (221 B.C.– 206 B.C.) Emperor Shi Huang (259-210 B.C.), the first of numerous subsequent rulers obsessed with finding and taking an elixir of immortality. According to legend, well before Shi Huang Di declared himself emperor of China's first unified empire, he allegedly met a thousand-year-old wizard who invited him to come to the mythical Penglai mountain, a mystical island to imbibe on its immortality substances. The Taoist spirits were said to be living there in gold and platinum palaces surrounded by magical fauna, flora and stone-shaped mushrooms as well as ancient trees with branches that dripped with colorful jewels. After trying three times to find it, in 219 B.C. he sent Xu Fu and an armada of ships out to sea filled with hundreds of young boys and girls to collect the treasured antidote to death. They never returned.

At the virtual end of his life, he was in eastern China on another search for the elixir. He is supposed to have drunk the golden alchemical elixir and died of mercury poisoning.<sup>15</sup> He was buried with a life-sized terracotta army of 2,000 individual soldiers, stone and bronze horses, chariots, weapons, incense burners and mirrors. His tomb also held the sacrificed bodies of his concubines who never bore him a son, so he would have their companionship and heirs in the afterlife.<sup>16</sup> Bodies were often buried with a large amount of mercury in the form of rivers and lakes, a key ingredient of immortality drugs. Mercury served to prevent decomposition. The body of a 2100-year old wife of a Han Dynasty leader represents the best-preserved mummy ever found anywhere in the world.<sup>17</sup>

Although there are no historical records in existence of any Chinese emperor managing to actually attain a life of either a hundred years - or - immortality, as we have seen several are infamous for going to extraordinary lengths to procure and create magical substances that promised to protract and even perpetuate their lives forever. Immortality drugs were consumed in preparation for ascending to the celestial firmament as a winged immortal. An ultimate and 'ideal' goal of emperors, theoretically at least, was to rule at the center of an orderly celestial government centered at the pole star.<sup>18</sup> It would be managed by loyal, righteous and ethical spirit-bureaucrats and protected by strong defending celestial armies.

Legendary tales of miraculous elixirs suggested this was a goal that could be attained. Imperial chroniclers reasoned that emperors who consumed these substances were too worldly, too immoderate, too acquisitive, too

connected to the here and now to become immortals. They all failed to become spirits and were poisoned instead, presumably because they were unworthy. In fact, of the 66% who were not murdered or who died by suicide, 82 out of 88 emperors who died early in life had a history of overindulgence in drinking or/and sex and died between 31.4 and 38.6 years of age depending on the mode of extravagance. This contrasts with the mere six out of 240 emperors who managed to live an average of 81 years (range: 69-89).

By the ninth and tenth century, many Taoist alchemists started to look for antidotes to elixir poisoning resulting from consuming toxic metals. Others abandoned the attempt to attain physical and/or immaterial immortality altogether and focused instead on internal 'alchemy'. It supposedly led to longevity, if not immortality. It involved less expense as no materials were required. There were many different 'schools', but most involved complex embryonic breathing exercises, gymnastic calisthenics, and sexual techniques requiring retention of semen (primal-quintessential life). The visual and temporal terminology used to describe the processes necessary to achieve longevity through controlled breathing practices were borrowed from that of the metallurgical alchemists. This method also required many years of diligent practice for those who hoped to achieve a long life. There nevertheless continued to be others who persisted in the attempt to live forever by taking dangerous immortality drugs in the Sung Dynasty period (960-1279) and even up through the eighteenth century. Kuo Zongshi, who worked as a minor official as Drug Inspector for the Imperial Medical Service during the Sung, wrote *Dilatations on Materia Medica (Bencao yanyi)* in which he discussed the functions and traits of what he considered were the most important drugs. He criticized the continued practice of popular healers' promotion of longevity drugs:

"I do not know from which generation of the Daoist practice of longevity drugs began. [However,] the number of people this practice killed is legion. In spite of that, generations have admired and valued these practices. This is bewildering...[they] pray [hoping the patient] will not die but actually he dies quickly. They call this wisdom. How can that be?"<sup>19</sup>

His conservative - more Confucian – and practical philosophy of medicine follows that expressed in earlier classical canonical literature in reminding physicians that they should not treat those already ill, but instead treat them with education on maintaining health before they are sick. "Dispensing drugs in a perfect way is not as good as maintaining health."<sup>20</sup>

The (1444) Ming Dynasty edition of the Taoist Canon mentions 127 varieties of immortality drugs in the chapter entitled "Classifications of the Most High Divine Treasure Mushroom Plant". A Ming reprint from 1598 includes woodblock pictures of them. Most are herbs that are also employed in many commonly used prescriptions for a variety of diseases. Some of them could elicit hallucinations – including *Cannabis sativa*, *Datura stramonium*, *Phytolacca acinosa* (poke weed) and *Gymnopus junonius* (The latter may be a different species, but it

was known as the 'laughing mushroom'). I find it interesting that the book illustrates several cap and stem mushrooms - possibly hallucinogenic, as well as edible fungi still widely used and revered in Chinese cooking (*Tremella fuciformis*, *Auricularia* sp., and *Polyporus umbellatus*). However, there is no representation of a strain of any species of *Ganoderma*, life-extending or not.<sup>21</sup>

Li Shizhen's *Ben cao Gang mu* (*Compendium of Materia Medica*) from 1596 discusses the six differently colored immortality excrescences or *zhi* (green, red, yellow, white, black, and purple) written about in the no longer extant Han medical classic, *Shennong ben cao*. Again, the term *Ling zhi* is not listed, but he relates the effects of *Chi zhi*, the "red mushroom."<sup>22</sup> Li Shizhen reports that early sources say it "affects the life-energy (*ch'i*) of the heart region, repairing and benefiting those with a knotted and tight chest. Taken over a long period of time, agility of the body will not cease, and the years are lengthened to those of the Immortals."<sup>23</sup> Interestingly, the *chi zhi* 赤芝 or "red mushroom" is also associated in his mind with *dan zhi*, the Cinnabar immortality substance, which is also called the "stone mushroom".<sup>24</sup>

The term *zhi*, interestingly, is often also used with plant names where it means 'seed'. By the late sixteenth century, the term *zhi* referred mainly to a variety of plants, fungi, lichens and excrescences. At this point in time, the red fungus currently called *Ganoderma ling zhi* seems to be suddenly and fairly reliably associated with the polypore in question. But, like most 21<sup>st</sup> century authors, Li Shizhen of the late sixteenth and early seventeenth century believed that the red immortality substance that was mentioned in the 2,000-year-old classic is the same as the one the Ming Dynasty emperors accepted as symbolic of their reign.

In any case, the polypore retained all the associations previously assigned to things that are red: the emperor in politics; the heart in medicine; cinnabar (the # 1 supernatural medicine), the red ore that releases silvery blobs of toxic mercury upon heating and which was still used in royal immortality recipes; fire; the sun; summer; noon; heat; growth; expansive energy; circulation; the planet Mars; happiness; joy; laughter; long life; vitality; money; prosperity; good luck; the south; marriage; the bridal color; cherry blossoms; red carnations; peaches; a musical note; mythical flying birds; fertility; bitter taste and scorching odors among a plethora of similar correspondences.<sup>24</sup>

In an effort to convince us of its medicinal efficacy, modern authors are fond of discussing its symbolism as a feature of Chinese imperial art and architecture over many thousands of years:

As a symbol of good health and long life, it is represented throughout ancient Chinese and Japanese art. It was woven into the silk robes and carved into the official scepter of Chinese emperors. At the Forbidden

City of Beijing and at the Emperor's Summer Palace, reishi is symbolized across the doors and door lintels, archways and railings. Reishi has been called the king of herbal medicines and was ranked in the Chinese Herbal Classic as the superior adaptogen, placed at the top of the list above ginseng." Reishi is regarded by *Ganoderma lucidum* advocates as the most revered medicine in the Chinese materia medica.<sup>25</sup>

To be perfectly clear, the decorative art referred to in the preceding passage was **not** a feature of any imperial period until the Ming Dynasty (1368-1644). Contrary to the impression given by writers of the popular book and movement called *Radical Mycology*, Beijing was not the capital city of China throughout its imperial history. It first became the capital of the empire after the Mongol ruler Kublai Khan installed himself in the northeastern corner as emperor of the Yuan Dynasty (1279-1368). Following the overthrow of the Yuan, the third Ming dynasty ruler, Zhu Di, moved his capital from Nanking to Beijing in 1420 with the goal of deterring renewed threats of invasion from his foreign predecessors. It was built from 1406-1420 on the ruins of the former Yuan Forbidden City with the aid of Chinese architects, engineers, stone masons, brick-layers and at least a million workers ordered to take down the *Phoebe zhennon* forests in the southwest to build the capital city from scratch. Incidentally, the first Ming ruler was reported to have sent out envoys into various mountains to find Zhang Sanfeng, a renowned Taoist immortal, to offer him a post in the royal court. It was said he went into hiding until their departure. The third emperor Cheng Zu also tried to find him, but it was rumored he escaped by pretending to be a beggar. Others claimed he ascended to the sky. The emperor honored him by building a Taoist monastery on Wu Dang Mountain in 1420. All the Ming rulers admired him.<sup>26</sup>

Exactly when the image of a *Ganoderma* appeared on buildings and palace furniture during the Ming isn't clear. But there was a renewed interest in pursuing some of the Daoist longevity practices once the political situation settled. The painting by Chen Hongshou (1598–1652) of a fully realized Taoist adept sitting on a cloud holding a *Ganoderma* in hand is among the most famous.

This, coincidentally, is also about the time we first see the polypore represented in Japanese art. As in China, it is treated as a symbol of good luck, health and longevity. The art of 400-500 hundred years ago in China or Japan is not contemporary, but it also isn't exactly 'ancient' either.

In any case, in the fifteenth century the fungus was considered rare and only the emperor was permitted to possess it. It is revealing that Ming emperor, Jia-Jing, who ruled from 1521 to 1567, looking to prolong his life forever, did not take the so-called 'King of Herbs' or 'Immortality Drug', the *Ganoderma* mentioned in the Ming *Compendium of Materia Medica*. Rather, at the recommendation of his physician, he ate and drank from vessels made from alchemical gold and silver and like rulers before him suddenly died of poisoning.<sup>27</sup> The last known

emperor to have taken immortality drugs was Yong-cheng of the Ching Dynasty (1636-1912). He ruled from 1722 until his sudden death also from metallic-mineral elixir poisoning in 1735.<sup>28</sup> In other words, *Ganoderma lucidum*, was not employed as a medicine, or as a longevity drug even for emperors.

Basically, there is a lack of recorded evidence that *Ganoderma ling-zhi* (or any of the several other species of *Ganoderma* known to exist in the Chinese empire) was ever employed as a longevity or immortality substance prior to the late twentieth century. By then, the wealthy paid a fortune to procure *Ganoderma* from all parts of the world. The fact that it had previously been forbidden to commoners, made it especially valuable and a sign of one's exalted economic and socio-political station in life. Attempts to cultivate *Ling-zhi* to be used medicinally by the Chinese began in the late 1960's, but its first successful cultivation in China was in 1992. Thereafter techniques of cultivating the polypore were transmitted all across China and its use has rapidly spread throughout Asia and elsewhere. Thanks to the continued desire to 'self-medicate' with ancient supplements associated with happiness, wealth and longevity and to the proficient marketing techniques of Chinese pharmacists, nearly everyone today knows of its alleged energizing, health promoting, preventative and curative powers.<sup>29</sup>

Despite the frequently mentioned use of *Ganoderma lucidum* (*G. ling-zhi*) in 'ancient China' to cure cancer,<sup>30</sup> there is absolutely no evidence to back up this assertion. No pharmaceutical prescription was ever created specifically for cancers! There was not even a *word* for cancer in the Chinese literature until the late twentieth century. Its absence doesn't mean cancer didn't exist. It just was not recognized as a distinct disease. In fact, none of our modern disease concepts match those described in pre-modern Chinese books on medicine, theory or drugs. But had there been a recognized disease condition representing life-threatening cancers or any other debilitating pathogenic process, *Ganoderma ling zhi* would definitely not have been the drug of choice prescribed to treat or cure it. As a so-called 'superior' drug, it would not even have been considered robust enough to fight the effects of a growth that made it difficult for the patient to breathe. A patient diagnosed with potentially terminal illnesses would have been prescribed a combination of militant – even toxic ingredients to fight his condition – or nothing at all.<sup>31</sup>

The point is, *Ling zhi*, the spirit-excrescence, or spirit seed of a sublime substance was highly regarded for its super-mundane mystical powers, and not for its ability to boost the immune system, to cure cancer or to act as "the superior adaptogen,"<sup>32</sup> It was not used as a medicine or longevity drug even by emperors! The aura and mythology surrounding *Ling zhi* as an immortality substance has nevertheless inspired Asian researchers to find evidence for its ability to serve as a modern medicine capable of curing us of diseases biomedicine continues to find daunting. In any case, assertions that *Ganoderma ling-zhi* has a 7,000 to 2,2000+ years-long history of successful use is misleading and does little or nothing to buttress arguments regarding its medicinal efficacy.

Saying this, does not, however, mean that it should be ignored by researchers looking to discover medicinal compounds that may prove useful in helping us live healthier and longer lives.

## FOOTNOTES

1. Joseph Needham, "Comparative Macrobiotics" in *Science in Traditional China. A Comparative Perspective*, Harvard University Press, 1981, 57-84.
2. Holmes Welsh, *Taoism: The Parting of the Way*, Beacon Press, Boston MA, 1966, 99-100.
3. Paris Franz "Shamanism and the Pursuit of Power in Ancient China" [www.decodeedpast.com](http://www.decodeedpast.com).
4. Guohui Liu, *Foundations of Chinese Medicine: Shang Han Lun and Contemporary Medical Texts*, 2015, p.34.
5. David Knechtges, *Wen Xuan or Selections of Refined Literature*, Volume III, 1996, 211.
6. John Lagerwey, et al., *Modern Chinese Religion 1 (2 vols.): Song-Liao-Jin-Yuan (960-1368 AD)*, Brill Publishing, 2015. p. 1109.
7. James R. Ware, trans., *Alchemy, Medicine, Religion in the China of A.D. 320: The Nei P'ien of Ko Hung*, M.I.T. Press, 1966, 68-96.
8. "Zhi 芝 numinous mushrooms; excrescences", Fabrizio Pregadio, ed., *The Encyclopedia of Taoism*, Routledge, p. 1271.
9. Li Hui-Lin, "Hallucinogenic Plants in Chinese Herbals", *Botanica Museum Leaflets*, Harvard University, 25.6: 1977, 161-181.
10. Joseph Needham, *Science and Civilization in China*, Volume 5:2, Cambridge University Press, 1974, 115-116, 121-123.
11. Michael Stanely-Baker., *Daoists and Doctors: The Role of Medicine in the Six Dynasties Shangqing Daoism*, Dissertation, University College London, 2013, 1-324.
12. Joseph Needham, *Science and Civilization in China*, Volume 5:2 19; 1974, 298.
13. Michael Stanely-Baker., *Daoists and Doctors: The Role of Medicine in the Six Dynasties Shangqing Daoism*, Dissertation, University College London, 2013, 1-324.
14. Holmes Welsh, *Taoism: The Parting of the Way*, 1966, 99-100.
15. George M. Halpern, *Healing Mushrooms*, Square One, 2007, p. 59.
16. "The Secret Tomb of the First Chinese Emperor Remains an Unopened Treasure" *Ancient Origins*, January 14, 2015.  
<http://www.ancient-origins.net/ancient-places-asia/secret-tomb-first-chinese-emperor-remains-unopened-treasure-002568?nopaging=1>  
<http://www.csus.edu/indiv/d/duboisj/aia1s/ppts/ancientchinesetombs.pdf>.
17. *American Journal of Geriatrics Society*, August 2006.
18. Paul U. Unschuld, *Medicine in China: A History of Pharmaceuticals*, 1986, 225.
19. Asaf Goldschmidt, *The Evolution of Chinese Medicine: Song Dynasty (960-1200)*, Routledge Taylor and Francis Group, 2009, 122.
20. Asaf Goldschmidt *The Evolution of Chinese Medicine: Song Dynasty (960-1200)*, 2009, 122-123.
21. <https://wenku.baidu.com/view/e822be020740be1e650e9a21.html>.
22. Ilza Veith, translator, *The Yellow Emperor's Classic of Internal Medicine*, 53-55.
23. Paul U. Unschuld, *Medicine in China: A History of Ideas*, University of California Press, 1988, 115.
24. Ilza Veith, translator, *The Yellow Emperor's Classic of Internal Medicine*, University of California Press, 1975, 21-23.
25. Peter McCoy, et al., *Radical Mycology*, 2016, p.177.
26. Stuart Alve Olsen, *Refining the Elixir: The Internal Alchemy Teachings of Taoist Immortal Zhang Sanfeng*, Valley Spirit Arts, Phoenix, 2016, 298-302.
27. Joseph Needham, *Science and Civilization in China*, Vol. 5.3, Cambridge University Press, 1976, 212.

28. Madeleine Zelin, Willard Peterson ed., *The Cambridge History of China, in Volume 9, Part One: The Ch'ing Empire to 1800*, 2002, 183-229.
29. Li Saifei, et al. "Development of *Ling-zhi* industry in China – emanated from the artificial cultivation in the Institute of Microbiology, Chinese Academy of Sciences (IMCAS)", *Mycology: An International Journal on Fungal Biology*, Volume 7, Issue 2, 2016.  
<http://www.tandfonline.com/doi/full/10.1080/21501203.2016.1171805>.
30. Martin Powel, *Medical Mushrooms: A Clinical Guide* (sec. edition 2014), p. 61.
31. Tr. by George M. Halpern, *Healing Mushrooms: A Practical and Culinary Guide to Using Mushrooms for Whole Body Health*, Four Sigma Foods, 2007, p. 59.
32. Peter McCoy, et al., *Radical Mycology* 2016, p.177.