Mini Review

The history of ginseng in the management of erectile dysfunction in ancient China (3500-2600 BCE)

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ABSTRACT

Emperor Shen-Nung was the second of China's mythical emperors (3500-2600 BCE). Widely considered the father of Chinese medicine, he catalogued over 365 species of medicinal plants which he personally tasted. Through his treatise 'Shen Nung Benchau Jing', we relive Emperor Shen-Nung's contribution to urology with reference to his management of erectile dysfunction. Time-related sources in medical and historical literature were reviewed, including the 'Shen Nung Benchau Jing' (The medicine book of Emperor Shen-Nung), archives and manuscripts at the Wellcome History of Medicine Collection, the Royal Society of Medicine, London, The Hong Kong Museum of Medical Sciences, and The Museum of Medical History, Shanghai, China. Chinese traditional herbal medicine began approximately 5000 years ago. Agricultural clan leader, Emperor Shen-Nung, was said to have a 'crystal-like belly' to watch the reactions in his own stomach of the herbs he collected. Ginseng was among of Shen Nung's contributions to herbal medicine. He experienced a warm and sexually pleasurable feeling after chewing the root. He advocated this as a treatment for erectile dysfunction and used it to stimulate sexual appetite. The reputation of ginseng as an aphrodisiac is based on the doctrine of signatures, since the adult root has a phallic shape. Shen-Nung believed that ginseng's resemblance to the human form is proof of its rejuvenative and aphrodisiac properties. It was believed that the closer the similarity to the human figure, the more potent the root. The use of ginseng for erectile dysfunction by Emperor Shen-Nung was unique for its time. It continues to hold parallels as a modern-day herbal aphrodisiac 5000 years on.

Key words: Ancient China, erectile dysfunction, ginseng, history of urology

INTRODUCTION

Emperor Shen-Nung was the second of China's mythical emperors (3500-2600 BCE). Widely considered the father of Chinese medicine, he has catalogued over 365 species of medicinal plants. He is believed to have personally tasted many of them. Through his treatise 'Shen-Nung Benchau Jing', we relive the Emperor's contribution to urology with specific reference to his management of erectile dysfunction with the herbal root ginseng, which is used even today.

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Ancient China

Ancient China has been dated as far back as *circa* 3500 years BC. Evidence of its existence has been extensively studied from age-old literature and archaeological studies. They have demonstrated a thriving civilization in what is modern-day central China and the Yellow River Valley region of Northern China.[1] Four thousand years on, ancient China has brought to the modern world the development of literature and the arts through calligraphy and writing. Philosophical thinking was ahead of its time and through this, a unique and sophisticated political system was born.

Records which demonstrate such achievement were mostly written by members of the scholar-official class. These records were often used to provide rulers and their precedents reminders of social policies and teachings in the ancient Chinese courts. Historians described the ancient Chinese political pattern as a hierarchy of dynasties, emperors and rebirth under new families of political control.[1] Writings predominantly focused on these dynastic policies and many had stories of historical court proceedings. There was a strong sense of what was real and what was mythological, and voluminous records exist to this day depicting this.[1]

An interesting and consistent trait identified by historians is the ability for the ancient Chinese to assimilate people of the surrounding areas into their own civilization. This was conducted through conquest, war and colonization. This allowed the spread of knowledge, language, technology, and political influence beyond its borders. This was particularly seen in similarities with medicine and herbal remedies that have migrated to what is now modern-day Korea, Japan and Vietnam.[1]

We focus on an early Chinese civilization, which preceded the Xia Dynasty (*circa* 2070 BCE–1600 BCE).[2] This era was known as the *Three Sovereigns and Five Emperors Dynasty*. The emperors that ruled were an amalgamation of mythological rulers and cultural heroes from ancient China and lived between 3500 BCE to 2000 BCE.[3] Although this period of time was not a dynasty by its classical definition (which requires a single ruler or ruling family), this period in Chinese history is referenced as a separate entity in subsequent literature and art from dynasties that followed.[4]

The *Three Sovereigns or Five Emperors* were considered to be demi-gods. These were humans who used their magical and God-like power to improve the lives of the people that followed them. All emperors from this period were recognized to rule over a period of great peace and lived to an old age. These mythical emperors brought to the people of this era, fire, architecture, principles of farming and agriculture, the calendar, and medicine.[5]

The existence of the *Five Emperors* has been embellished and written into Chinese mythology. Legend has it that the universe was created by the first of the five emperors, Pangu. After his death, Pangu's left eye became the sun, and his right eye, the moon. Various parts of his body then became the various essences of the world. The remaining emperors, *Shen-Nung*, *You-Chao*, *Sui-Ren*, and *Fu-Xi* then shaped the world into what it is now.[6] We concentrate further on Emperor Shen-Nung and his role in medicine within ancient China.

Emperor Shen-Nung

Emperor Shen-Nung was the second of China's mythical emperors and is widely considered the father of Chinese medicine. He ruled during the period of the Three Sovereigns and Five Emperors. Emperor Shen-Nung was also known as the 'Emperor of the Five Grains'. His name means '*the Divine Farmer*' having brought the ancient Chinese farmers and workers practices of agriculture. Such was his reverence, that to this day, an annual harvest festival (known as the Mid-autumn Festival) honors his contribution to ancient Chinese civilization [Figure 1].

Legend has it Emperor Shen-Nung was born with the head of a bull and the body of a man. The bull represents his power, and is a symbol of fertility and agriculture, a role he was highly revered for. He is also described with sharp horns, a bronze forehead or an iron skull.[4] Emperor Shen-Nung's role was paramount in teaching the people how to cultivate grains, plant roots and plow fields. This was to avoid the killing of animals, which was a precious and expensive commodity amongst the working class.

Emperor Shen-Nung is said to have tasted hundreds of herbs to test their medical value. Legend has it that he had a crystal-like belly to watch the reactions of these herbs in his own stomach! Through his treatise *'Shen Nung Benchau Jing'* (The Divine Farmer's Herb Root Classic)[7] he catalogued over 365 species of medicinal plants, many of which he personally tasted.

The *'Shen Nung Benchau Jing'* itself was not written during the time of Emperor Shen-Nung, and its true authorship remains unknown. Rather, the work was compiled during the end of the Western Han Dynasty, over 2000 years after the existence of the Emperor. It is considered to be the earliest Chinese pharmacopoeia. The '*Shen Nung Benchau Jing'* is composed of three volumes containing entries on medicaments and their description.[7] It contains the famous description pertaining to the discovery of tea when in approximately 2737 BCE, tea leaves were carried by the wind and landed in the Emperor's pot of boiling water resulting in the important brew.[8]

Although it is difficult to separate mythology and true historical reference when describing Emperor Shen-Nung, his clan, dynasty and existence is evident in the literature, and it is up to the reader to determine whether he was either a mythological creature, or a man with extraordinary ability and command.

Ginseng

Panax Ginseng was discovered in the mountains of Manchuria, China, over 5000 years ago. Taking up to six years to mature, this unique root has a plant which grows from eight to fifteen inches in height, and must be grown in cool moist soil which is frequently watered.[9]

It is likely that ginseng was originally used as a food amongst the farmers and field laborers; many ancient Chinese records show that it was used for medicinal purposes over 3000 years ago. It was revered for its strength-giving properties and rejuvenating powers. Ginseng was, and still remains a powerful symbol of divine harmony on earth. The old Chinese Canon of Medicine states that:

"Ginseng strengthens the soul, brightens the eyes, opens the heart, expels evil, benefits understanding and if taken for prolonged periods of time will invigorate the body and prolongs one's life."[10]

There was a strong belief that the strength behind the ginseng

Figure 1: An artist's impression of Emperor Shen-Nung. Note the horns on his head and how he tastes a herb or plant to identify its medicinal properties The Legendary Emperor Shen-Nung, Illustration from a "Pen Tsao," 18th-19th Century; http://www.allposters.com/-sp/The-Legendary-Emperor-Shen-Nung-Illustration-from-a-Pen-Tsao-18th-19th-Century-Posters_i1588381_.htm. Accessed 09/06/2011

Figure 3: To this day, modern herbal aphrodisiacs commonly contain the age-old herb ginseng Image obtained from: http://www.ecvv.com/product/2821449.html. Accessed 09/06/2011

root strongly stems from its resemblance to the human body. The word *ginseng* is derived from the Chinese term *rénshēn* which translates to "man root." The root has a characteristic forked shape, resembling the legs of a man. It was thought that the closer the resemblance of a root to the human form, the more potent the root when consumed [Figure 2].[7]

Although the discovery of ginseng as a medicinal herb is widely credited to Emperor Shen-Nung, an ancient Chinese legend tells of a village, Shantang, which was kept awake at night by howling and crying. The villagers investigated the source of the sound, and found it to lie under a bush in the center of the forest. They dug beneath the bush, and lying at its base, was a man-shaped root crying out for their help. The villagers named this root 'spirit of the earth.' The root was ginseng.[11]

Such was the liking for and belief in the powers of ginseng by

Figure 2: Ginseng: Note the human-like form of the root indicative of its potency as a herbal aphrodisiac during ancient China Image obtained from: http://www.asia.ru/en/ProductInfo/520354.html

the ancient Chinese emperors that it was often sold for more than its weight in gold and reserved only for themselves. With this demand, an industry in ginseng production and export was born, a business that dates back to the 3rd century AD. Currently, over 99% of the world's ginseng supply is farmed [Figure 3].[12]

Diggers, illegal traders and robbers would raid live ginseng stock to sell on the produce in a black market trade. Demand for ginseng outstripped its supply, and in the 16th century Korea experimented and cultivated the first farmed root, creating a lucrative trade in the root to China and beyond. This was conducted along the silk-road, a route which shipped commodities from China and India through to Western Europe and Turkey .

Emperor Shen-Nung and Erectile Dysfunction

Ginseng was among Emperor Shen-Nung's notable contributions to herbal medicine. He advocated this as a treatment for erectile dysfunction and used it to stimulate sexual appetite. He particularly described a warm and sexually pleasurable feeling after chewing the root. Part of ginseng's reputation as an aphrodisiac is based on the doctrine of signatures as the adult root has a phallic shape.[10]

Emperor Shen-Nung believed that ginseng's resemblance to the human form is proof of its rejuvenative and aphrodisiac properties. It was made clear by Emperor Shen-Nung that the closer the similarity to the human figure, the more potent the root. He recommended its use to men to boost their performance in the fields and to enhance their potency.[7] Ginseng was also noted in the ancient Indian Vedic texts as through ancient ayurvedic practice, ginseng 'bestowed on men, both young and the old, the power of a bull'.[13]

The Science and Uses of Ginseng

Panax or Asian ginseng is one of three main types of ginseng.

The others are American and Siberian ginseng. Panax ginseng is grown both in China and Korea, and consists of Red Panax and White Panax. White comes from the naturally dried root grown in Korea that has been peeled. Red is the most popular type of ginseng in the East and is made by steaming the white root for 8 to 10 h, then allowing it to dry giving it its characteristic red color.[14]

Red ginseng is considered more potent than its white counterpart and is thought to promote 'a greater degree of yang' energy. As a result, red ginseng has been used in circumstances where vigor, stamina and energy are required and hence has been associated with being an ideal supplement to enhance the libido. It is from these properties that its role in treating erectile dysfunction and enhancing sexual function has developed.[12]

The efficacy of many herbal supplements throughout the ages has been exaggerated and a critical review of their performance through scientific literature and experiment is rare. Modern-day studies have shown that the root of these two most commercially obtainable Panax ginseng species have been found to contain more than 30 'ginsenosides' or active compounds.[15] It is these compounds which are thought to contribute to ginseng's pharmacological activity.

Treatment claims with ginseng are numerous and an overriding principle exists where ginseng supports one's overall health and boosts the immune system by channeling the body's energy to areas that require it for healing. It has been used as an 'adaptogen'. This term is used by herbalists to describe herbs which increase the body's resistance to stress.

The use of ginseng in both ancient Chinese and modern-day practice extends beyond the management of erectile dysfunction. Ginseng has been prescribed to patients recovering from illness and operation, due to its ability to stimulate the immune system and increase a sense of wellbeing and stamina. It has been recommended to reduce both physiological and emotional stresses and regular ingestion has been shown to improve both mental and physical performance. Specific conditions ginseng has been advocated for include depression,[16] anxiety, chronic fatigue syndrome,[17] the treatment of hepatitis C, diabetes mellitus[18] and hypertension. It has been prescribed to control symptoms of menopause in women.[19] A traditional use for ginseng in Korea is to slow the aging process.

The short-term use of ginseng at standard recommended doses does not appear to have a significant side-effect profile, and is safe for consumption in most people. Prolonged use of the herb, however, is known to cause a variety of mild side-effects. These include headaches, sleep dysfunction and gastrointestinal symptoms which include diarrhea, nausea and vomiting. Specific to Panax ginseng, allergic reactions have been reported but not proven. Reported symptoms may be due to ginseng itself, or another herb or drug within the final product. These include breast tenderness, menstrual cycle changes, dizziness and fainting, and hypoglycemia is a particular phenomenon seen in diabetics.[20]

Ginseng overdose is a rare phenomenon, and data is limited regarding the possible outcomes of excessive consumption. Overdose is likely to be dose-dependent, and in addition to the drug's side-effect profile, tachycardia,[21] arrhythmias, and psychiatric disturbances including manic behavior have been suggested.[22] Clotting may be impaired in significant overdose[23] due to the postulated mechanism of action via inhibition of the CYP 2D6 liver enzyme resulting in liver impairment and early signs of clotting dysfunction may include bruising, epistaxis and unexplained gastrointestinal bleeding. Treatment for overdose is currently symptomatic as a true antagonist to the active ingredient remains unidentified.

An interesting phenomenon called the 'ginseng syndrome' was reported in the 1970s. This collection of symptoms which includes a heightened sexual drive, anxiety, diarrhea and insomnia has since been revoked from the literature.

Ginseng being actively metabolized and under the direct influence of liver enzymes, has the potential to interact with a host of medications. Anti-platelet agents and anticoagulants must be cautiously when taking the ginseng at high doses. There is a potential decrease in platelet function and patients on warfarin may require higher doses to achieve adequate anticoagulation. These patients should have their dosage monitored closely. Due to their potential to cause bleeding, patients should avoid taking non-steroidal anti-inflammatory agents and cyclo-oxygenase inhibitors in combination with ginseng.[24]

The potential for hypoglycemic episodes in diabetic patients taking ginseng should prompt caution when using this herb in conjunction with oral or injected hypoglycemic agents. Patients are to closely monitor their blood sugar when ginseng is used in combination. Medication which is metabolized by the liver may also interact with ginseng and therefore toxic levels may be propagated by its use. These, which include morphine-based drugs, antidepressants, antipsychotics and anti-emetics should be moderated according to response.[24]

The Molecular Basis of Ginseng as a Herbal Aphrodisiac

Stemming from the ancient practices of using ginseng as a herbal aphrodisiac, there have been many modern-day studies to investigate the role of ginseng in sexual desire and function. They aim to identify its effect on sexual function, libido and erectile function.

Ginseng has been studied at a molecular level and has been

found to contain significant levels of phytoestrogens, which are known to have a role in promoting sexual desire.[25] One particular investigation found that in laboratory animals, both Asian and American forms of ginseng enhanced libido and copulatory performance as ginseng altered the effect of phytoestrogens (also known as ginsenoside components) on the central nervous system and this in turn directly stimulates gonadal tissue.[26] There is further evidence to suggest that phytoestrogens facilitate penile erection by inducing vasodilatation and relaxation of the penile corpus cavernosum by mediating nitrous oxide (NO) release from the tissue.[27]

Ginsenoside Rg1 is one such example of a purified ingredient from ginseng which has been shown to have a direct effect on male copulatory behavior. In *in-vivo* and *in-vitro* male mouse models, Rg1 increased mouse mounting, intromission frequency and pelvic thrusts. Serum testosterone concentration, nitrous oxide release, and cyclic GMP accumulation in the penile corpus cavernosum were all increased in these models. Ginsenoside Rg1 appeared to play a key role in male sexual function by acting on the NO/cGMP pathway in the corpus cavernosum. It paves the way for further research in developing a new drug for erectile dysfunction using distillated ginseng compounds.[28]

One particular study conducted by the University of Ulsan and the Korean Ginseng and Tobacco Research Institute revealed that men given ginseng compared to a placebo showed improved erectile dysfunction, sexual desire and sexual satisfaction scores. These men were able to achieve and maintain a better erection on ginseng compared to placebo. Interestingly, the root did not affect underlying baseline testosterone levels, nor did Doppler study evaluation demonstrate enhanced penile blood flow in these patients. There was also no statistical difference between frequency of ejaculation or quality of orgasm whilst on the herbal adjunct. This evidence has been used to recommend ginseng as a potential herbal alternative to more invasive treatment strategies when treating male erectile dysfunction.[29]

CONCLUSIONS

The exact timing of Emperor Shen-Nung's existence is a matter of scholarly debate; indeed his very existence as a single man with demi-god like properties may have been embellished. His name, however, remains attached to ginseng, and this unusual root has captured the imagination not only of the Far East, but also of the Western world. The use of ginseng in managing patients with erectile dysfunction by Emperor Shen-Nung was unique for that time. It has influenced urological practice to date in many countries and continues to maintain its presence as a modern-day herbal aphrodisiac 5000 years on.

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Wellcome History of Medicine Collection, 183 Euston Road, London, NW1 2BE, United Kingdom

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The Museum of Medical History and The Shanghai University of Traditional Chinese Medicine, 530 Lingling Road , Shanghai 200032 , China

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