

## REVIEW ARTICLE

### BAMBOO SALT- A REVIEW

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#### ABSTRACT

Bamboo salt has been used in Korean medicine for centuries as a folk medicine for the prevention and treatment of various diseases. It is made by putting sea salt into cases made from bamboo trunks with 3 years of growth. Studies have shown bamboo salt to have anti-cancer, anti-oxidant, anti-inflammatory, anti-microbial effects etc. Recently, it has been used in dentistry for cure of various oral diseases.

**Key Words:** Bamboo Salt, Types, Preparation, Health Benefits, Uses.

#### INTRODUCTION

Bamboo Salt has recently been introduced to the North American market as a miracle salt that has anti-cancerous and anti-viral properties that can prevent and treat various types of cancer and illnesses. It has antiseptic power that can be used to treat mouth sores as well as various digestive system-related conditions. At the same time, it has been labeled as a wonder beauty product that can effectively treat acne and boost the youthful glow in skin when used as a facial and body scrub; the Bamboo Salt can also fortify hair when used as shampoo. While there are many benefits of Bamboo Salt, but little evidence supports them.

#### History of Bamboo Salt

Bamboo salt (also called as Jookyeom) is specially processed according to a traditional recipe using normal salt, bamboo, pine tree wood, pine resin, and yellow soil, combined at very high temperature<sup>(1)</sup>. It was originally developed by Korean doctors and monks almost 1,000 years ago as a folk medicinal remedy for various illnesses. The Bamboo Salt is made by putting sea salt into cases made from bamboo trunks with 3 years of growth. After the salt is inserted into the trunks, the ends are sealed with natural yellow clay that is rich in minerals. The trunks are then roasted in a furnace with pinewood being used as fuel. The process requires 10 hours of roasting at a temperature between 1,000 to 1,500°C. This procedure can be repeated from three to nine times. In the ancient times, the process was only repeated two or three times. However, through repeated experimentations doctors discovered that Bamboo Salt gained higher medical effectiveness if it was baked for more time.

This method enhanced the amalgamation of minerals from the bamboo and the yellow clay into the sea salt. Additionally, the numerous high-heat roasting process was more effective in ridding of impurities in the sea salt. It has been found that the salt reaches its highest medical efficacy when it is baked for 9 times. After 9 times, the medicinal benefits of the salt drastically decrease from over-roasting.

Because of the time and effort put into making the 9-times-baked Bamboo Salt, the 9-times-baked Bamboo Salt is specially named as Purple Bamboo Salt for the purple color hue resulted from the numerous repeated roasting processes. As a result, you can see various Bamboo Salt being labeled as 1x, 3x, 6x, 9x; these labels indicates the number of roasting processes the specific Bamboo Salt has received. Because the medical efficacy correlates with the amount of roasting procedures, the price range can differ significantly depending on the number of roasting processes (Xin *et al.*, 2013).

#### Preparation of Bamboo Salt

Bamboo salt is prepared by placing sea salt into bamboo joint cases (approximately 8 cm diameter, 30 cm long) from plants less than three years old. The cases are sealed with natural red clay at both ends and then baked several times at 1,000°C-1,500°C using pine as the combustible fuel (Hu *et al.*, 2000; Shin *et al.*, 2004). Approximately 1,000 years ago, Korean medical doctors and monks began to prepare this medicinal salt by inserting sea (solar) salt in a thick bamboo stub and baking such stubs together with pine tree firewood. The ancient bamboo salt was baked only two or three times and then used in special medical treatments. After empirical testing, the doctors found that bamboo salt was most effective when baked at least nine times. They also found that the toxic characteristics of bamboo salt were removed if the salt was completely melted.

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Bamboo salt has been adopted as one of the most well-known traditional medical treatments, not only in Korea but also in many other Asian countries (Lee *et al.*, 2003). From scientific research, it has been found that Bamboo Salt contains more than 70 kinds of minerals due to the leaching of minerals from the bamboo tree trunks, the pine tree resin, and the yellow clay. Amongst all the minerals, the main components of Bamboo Salt are calcium, phosphorus, magnesium, iron, manganese, copper, and potassium, zinc and high in sulfur, which makes Bamboo Salt a highly alkaline food in contrast to all the other salts which are acidic & makes Bamboo Salt a great neutralizer too.

### Health Benefits of Bamboo Salt

Bamboo Salt is a highly alkaline food (pH 10.5). It can counterbalance the acidosis in the human body. It is high in minerals and is the only food to contain more than 70 different kinds of organic minerals. Because of this unique property, it can fully and continuously re-supply the lost minerals to the human body & play crucial roles in many cell functions such as cell proliferation, energy metabolism, protein and DNA synthesis, and cytoskeleton activation (Jeong and Hyun-Ja, 2011). In addition, it has antioxidants that aid in cell renewal and encourages clearance of free radicals, slowing down the aging process. It contains powerful infrared which is helpful in breaking through the blockages in blood vessels. This process helps lower the chance of stroke.

Although we all know that high salt consumption is damaging to the body, a diet void of salt is equally damaging. That is because salt is essential to the homeostasis of the human body. It is the vehicle that allows nutrients to be carried through the cell wall and into our cells. It is also a crucial element needed to hydrate the human bodies. This is why after exercise, it is important to replace both water and salt lost through sweating during exercise. At the same time, it is also why we need to take an oral saline solution to restore our electrolyte imbalance when we have severe cases of diarrhea or vomiting. In addition, salt is essential to regulating nerve impulse firing, helping your brain send communication signals to your muscles so that you can move on demand, as well as helping the lining of the blood vessels to regulate blood pressure. To put it in simple terms, our body will eventually shut down if we completely remove all salt content in our diets. Salt has a strong sterilization effect (Segner *et al.*, 1966), this activity might help to alleviate bacterial infection and decrease the severity of liver injury. Following repeated baking cycles, bamboo salt contains more hydroxyl groups, which may also increase its protective effect in liver damage because of its enhanced antioxidant activity (Zhao *et al.*, 2012).

### To Cure

Bamboo salt has been added as an ingredient to make face cream as it is very good for skin; and bamboo salt is also used to make toothpaste because it will help to heal certain tooth diseases very quickly. It stops bleeding gums with just a few uses. You may just directly replace toothpaste with bamboo salt and apply it to toothbrush, that can bring better effects. Putting feet in the bamboo salt dissolved water recovers weariness.

### Cosmetics

Bamboo salt has mysterious beauty-skin effect, taking a bath or washing up with bamboo salt dissolved water; you will be

surprised by the skin-softening effect of bamboo salt. You may also wet your skin, and then apply bamboo salt onto your body. Slowly massage or rub the salt on your skin gently, it will give you extra cleaning effect. Applying the salt at your tummy may help you burn extra fat. Bamboo salt can help to increase your metabolism rate in the process. Acne is caused by bacteria on your face; using bamboo salt water to wash your face can effectively kill the bacteria. Remember to avoid water getting into your eyes, as you may feel the pain like you swim in the sea and let sea water get into your eyes.

### Add to food

Use it to replace your table salt for cooking your dish. Recently, it was found that excessive intake of salt causes fatness and other serious health problems. Thus, proper diet including salt ingestion is very important to keep healthy. Bamboo salt on the other hand do not cause these adult-diseases. This salt contains various kinds of minerals that is beneficial to our body. Ingesting bamboo salt instead of table salt can be excellent choice for your health.

### Cleaning power

Use bamboo salt to wash your hair. Firstly wet your hair with water, then pour some bamboo salt onto your hand, slowly apply onto your hair. Massage gently so that the salt can clean the scalp thoroughly. After few minutes, rinse your hair with water. You will find extra clean hair wash.

### Antibacterial activity

Research on anti-inflammatory activity of bamboo salt suggest that bamboo salt importantly contributes to the prevention or treatment of inflammatory diseases. Healthy organic bamboo salt contains more than 70 essential minerals and micro nutrients. High calcium, magnesium and zinc, high sulfur from bamboo tree trunk, may help purifying the blood thus lowering the risk of blood pressure ([http://EzineArticles.com/?expert=Steven Chai](http://EzineArticles.com/?expert=Steven+Chai)).

### Anti-cancer Function

Scientific researchers have found that salt in general contains methanol extracts that have antimutagenic and anticlastogenic effects. However when comparing regular purified salt and solar salt with one-time roasted Bamboo Salt and nine-times roasted Bamboo Salt, the scientists have found that the Bamboo Salt have a much higher anticancer and anticlastogenic effect than the other salts (Hwang and Kyung-Mi, 2008; Park and Kun-Young, 2012).

### Anti-obesity Function

A very recent scientific study has found that Bamboo Salt reduces the overall body weight as well as lowers the serum lipid level. This study suggests that intake of Bamboo Salt may have preventive effect on obesity (Park and Kun-Young, 2013).

### Dental Treatment and Preventive Care

In another scientific research, researchers have found that dental patients who use a bamboo solution for gargling, have a significantly increase in the level of enamel hardness and a

decrease of mineral loss than patients who use plain water for gurgling (Choi, 2012). Another study found that toothpastes that contain Bamboo Salt contributes to the reducing effects on dental plaque formation and lessens the chance of gingivitis (Min *et al.*, 1995).

**Anti-inflammatory Function**

Although salts in general all have inflammatory properties, Bamboo Salt is found to have a much significant effect on treating inflammations. Therefore, it contributes significantly to the prevention and treatment of inflammatory diseases (Shin *et al.*, 2003).

**Reducer of Chemotherapy Side-Effects**

Cisplatin is a highly effective chemotherapeutic agent that rids the human body of cancerous cells. But it has a significant side effect of accelerating the death the auditory cochlear hair cells. However Bamboo Salt has a specific chemical effect that inhibits a specific protein channel that regulates the cell death of the auditory system. As a result, of the blockage, the cochlear hair cells stop dying, and hearing is preserved (Jeong and Hyun-Ja, 2011)

**Anti-gastric Ulcer Treatment**

Bamboo Salt generates hydrogen sulfide which acts as a gasotransmitter like NO and CO. These chemicals have physiological effects including anti-inflammation, anti-hypertension, as well as the improvement of the insulin sensitivity.

**Diabetes**

It has been shown that Bamboo Salt contributes to the improvement of glucose tolerance and high glucose uptake in skeletal muscles (Saoraya, 2011).

**Treatment for Arthritis**

When used with acupuncture, it alleviates arthritis (Xu and Kai-Sheng, 2009). With higher content of magnesium than Epsom salt and Dead Sea salt, it is evident that Bamboo Salt is effective for alleviating arthritis ache in joints and muscles.

**Treatment for Sore Throat**

As an inflammatory agent, Bamboo Salt can be used to lessen the inflammation in the throat and suppress the aching resulting from the inflammation (Choi, 2012).

**Bamboo salt- the use of bamboo and salt in oriental medicine ([http://EzineArticles.com/?expert=Steven Chai](http://EzineArticles.com/?expert=Steven+Chai))**

Bamboo salt is made of sea salt roasted in the bamboo. On top of that, yellow clay is used to cover the opening after the salt is filled in. The process of making bamboo salt by heating the combination of the 3 elements in 1000 to 1500 degree of Celsius, making the bamboo salt carry the benefit of all three. The poisonous mineral in the salt will be eliminated in this process. In the practice of traditional medicine in the Oriental, bamboo, salt and yellow clay are known to be effective to certain illness.

Our ancestors learn all this good knowledge through experience, even though they do not know how to conduct research like modern medicine. Parched salt has been used to help in digestive disorder. It also can help to neutralize certain poison in the body, reduce the effect of vomit, diarrhea and others. Bamboo is known to be effective for palsy, diabetes, various kinds of tumors, fever, parasite, vomiting, insomnia, fatigue, pain in an eyeball, brain trouble and many other symptoms. Yellow clay indirectly adding more mineral to the bamboo salt compound, this make the bamboo salt has more balance in mineral. Modern process has produced salt in a more purified form of sodium chloride. This is one reason why people are facing more health problems.

A more mineral balanced bamboo salt would be a good substitute that has been long practiced by our ancestors. Bamboo Salts have many beneficial qualities; however, little is known about its side-effects. As a result, a group of researchers performed a three month study to determine the side-effects of Bamboo Salt. After three months of administrating Bamboo Salts to the test group, the results show that there was no significant toxicological findings. There was also no negative effect to the hematological, serum biochemical and histopathological components (Jun *et al.*, 2001). Of the 1,200 bamboo species, only 58 species produce timber, 18 are used for pulp and paper and 56 for edible shoots (Li and Kobayashi, 2004).

**Types of Salts (Kim and Young-Sick, 2013)**

The different kinds of commonly available salts are

Table Salts	It is the salt that is sold in all supermarkets. It is made by evaporating sea water or brine from brine wells or various salt lakes.
Kosher Salt	It is similar to table salt except the salt granules are larger and coarser. It is often used for pickling.
Sea Salt	Sea salt tends to be coarser than table salt. Unrefined sea salt is found to have many minerals that regular table salt lacks such as potassium, magnesium, calcium, and iodine. Because of this, a lot of people use sea salts instead of table salts.
Black Salt	This is a salt that is found mostly in Indian markets. It has a strong sulfuric flavor and is often used in Ayurvedic medicine.
Rock Salt	Also known as halite. It is used mainly to cure meat and fish. In the old times, it was essential for making ice-cream. It is also used to keep pavements from icing during winter times.
Himalayan Salt	It is actually rock salt from Pakistan. It is often used in bath products as an allergy reliever and a muscle relaxer. It is also used to make salt lamps as a natural allergy reliever as many people believe that the salt crystal emits negative ions that repel allergen particles from the environment.
Epsom Salt	Also known as Magnesium Sulfate. It is mainly used as a bath salt to soothe sore muscles on a regular basis. However, it is used extensively in the medical field as an ingredient in antacids and laxatives. It is also used as an antiarrhythmic agent in cardiac arrest, as well as a reliever for acute asthma attacks.
Dead Sea Salt	Sea salt extracted from the Dead Sea. It has a low content of sodium chloride unlike normal ocean sea salt. The salt is used mainly for bath and beauty regiment purposes. It is documented in scientific research to effectively treat acne and psoriasis because of its high magnesium concentration, a main ingredient for reducing inflammation. As a result, it is also effective in treating arthritis as well as relieving allergic reactions.

## Research

Unlike the other salts, Bamboo Salt does not induce hypertension (Kim and Young-Sick, 2013). Although the reason is still unclear, researchers suggest that it may be linked with Bamboo Salt's unique ability to improve glucose tolerance of the body and lowers the serum lipid level. Bamboo salt has been added to toothpaste and according to the manufacturer this toothpaste can prevent cavities, reduce plaque and gingivitis, soothe sensitive teeth, fight bad breath, whiten teeth, strengthen tooth enamel, prevent receding gum line and decrease mineral loss. Numerous bamboo salt toothpastes are available in Japan, Hong Kong, Korea and worldwide through the Internet (Preena Sidhu *et al.*, 2014). Choi *et al.* conducted a study to evaluate the laboratory remineralisation effects of a dentifrice with bamboo salt and NaF on artificial caries-like enamel lesions, at both the surface and deep areas. The authors concluded that there was a significant increase in the level of the surface hardness and decreased mineral loss of the artificial caries-like enamel lesions. The test dentifrice also significantly decreased the lesion depth (Choi, 2012).

Sohn *et al.* showed that when bamboo salt is used in dentifrices, it had an anti-plaque and anti-inflammatory effect (Kim *et al.*, 1991). So the main ingredient of bamboo salt is sodium chloride salt. And it is believed that the trace elements in the mud and bamboo are thought to make this form of salt healthier (Ju *et al.*, 2013). However, Yoo *et al.* reported that bamboo salt had no effects on the general pharmacology of central nervous systems and cardiovascular system (Yoo *et al.*, 2000). HJ Ju *et al.* reported a case of a healthy young woman with acute severe hypernatremia caused by excessive bamboo salt intakes as folk remedies (Ju *et al.*, 2013). The mortality of hypernatremia is very high. In general, doses greater than 1 g sodium chloride per kg body weight can lead to raised blood sodium concentration by 30mmol/L (Turk *et al.*, 2005; Ofran *et al.*, 2004; Ward, 1963). Serum sodium levels above 160mEq/L have been associated with a high mortality rate (9-35%) and neurological damage (Snyder *et al.*, 1987; Meadow *et al.*, 1993; Dine and McGovern, 1982). Moreover, extreme hypernatremia (>190mEq/L) has a high mortality rate up to 62% for children (Moder and Hurley, 1990). Takashi *et al.* examined the relationship between the carbonizing temperature of bamboo carbide made from Moso bamboo & the removal effect of harmful gases & odorants & concluded from their study that the effective carbonizing temperature is different for each chemical & a specific charcoal must be selected for each specific use as an adsorbent or deodorant & it is expected that charcoal can be effectively used as a countermeasure against "Sick Building Syndrome" or as a deodorant (Takashi *et al.*, 2002).

## REFERENCES

- Choi, C.H. 2012. Effect of bamboo salt-NaF dentifrice on enamel remineralization. *American Journal of Dentistry*, 25: 9-12.
- Dine, M.S. and McGovern, M.E. 1982. Intentional poisoning of children an overlooked category of child abuse: report of seven cases and review of the literature. *Pediatrics*; 70(1):32-35.
- [http://EzineArticles.com/?expert=Steven Chai](http://EzineArticles.com/?expert=Steven+Chai)
- Hu, C., Zhang, Y. and Kitts, D.D. 2000. Evaluation of antioxidant and prooxidant activities of bamboo *Phyllostachys nigra* var. Henonis leaf extract in vitro. *J Agric Food Chem.*, 48:3170-3176.
- Hwang, Kyung-Mi. 2008. Increased Antimutagenic and anticlastogenic effects of Doenjang (Korean Fermented Soybean Paste) Prepared with Bamboo Salt. *Journal of Medicinal Food*. December, 11(4): 717-722.
- Jeong, Hyun-Ja. 2011. Specific blockage of caspase-1 activation by purple bamboo-salt prevents apoptosis of auditory cell line, HEI-OC1. *Journal of Medicinal Food*, 14(1-2): 53-61.
- Ju, H.J., Bae, H.J., Choi, D.E. Na, K.R. 2013. Case Report on Severe Hypernatremia by Excessive Bamboo Salt Ingestion in healthy young woman. *Electrolyte Blood Press* 11:53-55.
- Jun, G.K., Bong, H.L., Kyung, W.S., Mi, K.P., Chang, W.P., Jin, H.A., Choong, M.H. and Dae, H.C. 2001. Single dose toxicity studies of the Bamboo salt(Jukyum) in rats. *Toxicological Research*, 17(4): 273-277.
- Kim, C. Y., Chung, S.C. and Sohn, W.S. 1991. Comparison of the antiplaque and anti-inflammatory effect of the dentifrices containing NaCl and bamboo salt. *J Korean Acad Dent Health* 15: 269-280.
- Kim, Young-Sick. 2013. Surprisingly, traditional purple bamboo salt, unlike other salts does not induce hypertension in rats. *TANG3*(2): 30-34.
- Lee, E.H., Kim, C.Y., Shin, T.Y., Kim, S.D., Song, Y.S., Lee, K.N., Hong, S.H. and Kim, H.M. 2003. Anti-inflammatory activity of Korean folk medicine purple bamboo salt. *Immunopharmacol Immunotoxicol*. 25:377-384.
- Li, Z.H., Kobayashi, M. 2004. Plantation future of bamboo in China. *J. For. Res.*, 15:233-242.
- Meadow, R. 1993. Non-accidental salt poisoning. *Arch Dis Child*, 68(4):448-452.
- Min, B. S., Choi, H. Y., Choi, Y. J., Hong, J. P., Chun, Y. H. and Kang, N. H. 1995. The reducing effects on dental plaque formation and gingivitis of toothpastes containing bamboo salt and several herb medicines. *J Kor Dental Assessment*. 1995;33:65-71.
- Moder, K.G. and Hurley, D.L. 1990. Fatal hypernatremia from exogenous salt intake: report of a case and review of the literature. *Mayo Clin Proc.*, 65(12):1587-1594.
- Moon, J. H., Shin, H.A., Rha, Y. A. and Om, A. S. 2009. The intrinsic antimicrobial activity of bamboo salt against *Salmonella enteritidis*. *Mol Cell Toxicol*; 5: 323-327.
- Ofran, Y., Lavi, D., Opher, D., Weiss, T.A., Elinav, E. 2004. Fatal voluntary salt intake resulting in the highest ever documented sodium plasma level in adults (255mmol L<sup>-1</sup>): a disorder linked to female gender and psychiatric disorders. *J Intern Med.*, 256(6):525-528.
- Park, Kun-Young, 2012. Anticancer and antimetastatic effects of bamboo salt. *The Journal of the Federation of American Societies for Experimental Biology*. 26:1025-19
- Park, Kun-Young. 2013. Anti-obesity effect of bamboo salt in Vivo. *The Journal of the Federation of American Societies for Experimental Biology*. 27:630-19.
- Preena Sidhu, Sathya Kannansenthilkumar Muthusamy, Kavitha Muthu. 2014. Letters to the Editor-Oral Health. *British Dental Journal* 217(2):54.
- Saoraya, Chanmuang. 2011. Effects of purple bamboo salt on insulin sensitivity and oxidative stress in Sprague-Dawley rats. *한국식품영양과학회 산업심포지움발표집*.;10:422-422.
- Segner, W.P., Schmidt, C.F. and Boltz, J.K. Effect of sodium chloride and pH on the outgrowth of spores of type E

- Clostridium botulinum* at optimal and suboptimal temperatures. *Appl Microbiol.* 1966;14:49–54.
- Shin, H.Y., Lee, E.H., Kim, C.Y., Shin, T.Y., Kim, S.D., Song, Y.S., Lee, K.N., Hong, S.H. and Kim, H.M. 2003. Anti-inflammatory activity of Korean folk medicine purple bamboo salt. *Immunopharmacol Immunotoxicol.*;25:377–384.
- Shin, H.Y., Na, H.J., Moon, P.D., Seo, S.W., Shin, T.Y., Hong, S.H., Lee, K.N., Park, R.K. and Kim, H.M. 2004. Biological activity of bamboo salt. *Food Ind Nutr.*, 9:36–45.
- Snyder, N.A., Feigal, D.W. 1987. Arieff AI: Hypernatremia in elderly patients. A heterogeneous, morbid, and iatrogenic entity. *Ann Intern Med.*,107(3):309-319.
- Takashi, A., Ishihara, S., Yamane, T., Toba, A., Yamada, A. and Oikawa, K. 2002. Science of bamboo charcoal: Study on carbonizing temperature of bamboo charcoal and removal capability of harmful gases. *Journal of Health Science*, 48:473–479.
- Turk, E.E., Schulz, F., Koops, E., Gehl, A. and Tsokos, M. Fatal hypernatremia after using salt as an emetic - - report of three autopsy cases. *Leg Med (Tokyo)* 2005;7(1):47-50.
- Ward, D.J. 1963. Fatal hypernatremia after a saline emetic. *Br Med J.*, 2(5354):432.
- Xin, Zhao. 2013. Purple bamboo salt has anticancer activity in TCA8113 cells in vitro and preventive effects on buccal mucosa cancer in mice in vivo. *Experimental and Therapeutic Medicine*;5(2): 549-554.
- Xu, Kai-Sheng. 2009. Clinical randomized controlled trials of moxibustion with salt in bamboo circle for treatment of periathritis of shoulder. *Chinese acupuncture & Moxibustion*;29(1): 77-80.
- Yoo ,T.M., Kim, S.S., Roh, Y.N., Yi, S.Y., Kim, O.K., Rheu, H.M. and Yang, J.S. 2000. General pharmacology of bamboo salt. *J Appl Pharmacol*, 8:93-98.
- Zhao, X., Jung, O.S. and Park, K.Y. 2012. Alkaline and antioxidant effects of bamboo salt. *J Korean Soc Food Sci Nutr.*;41:1301–1304.

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