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Which Table Salt to Choose?

Cristina Carapeto*, Sílvia Brum and Maria João Rocha

Department of Science and Technology, Universidade Aberta, Portugal

Abstract

The link between salt consumption and hypertension has been the focus of many studies and clinical trials in the past few years. It is recommended that table salt intake does not exceed the maximum of 5 g per day and yet most people find almost impossible to comply with this recommendation. New types of salt have recently appeared in the market and they claim to be less harmful to health than current commercial salt. Besides being less salty to the taste these new types of salt contain less sodium and more trace minerals than commercial salt but there is a need of experiments and studies in order to establish their benefit to health.

Keywords: Salt flower; Sodium; Hypertension

Introduction

Is salt just NaCl or there is more to it that human organism can use to its benefit? And even if salt is just NaCl is it important to us? Is salt a friend or a foe? Why do we continue to worry about salt?

Salt, also commonly named table salt, is an ionic compound made of sodium and chloride ions with the chemical form of NaCl. Salt comes from two main sources: sea water and mines in land (also known as rock salt). From its underground beds salt may be extracted by mining.

In the last few years there has been a growing interest in gourmet salts not only because food industry has made them fashionable but also because people tend to believe that these types of salt are healthier. Salt occurs naturally around the world as mineral halides and in seawater and salt water lakes. The distinct chemical compositions of salts may contribute to some taste differences. Mineral content of salts differs depending on the harvesting location and it may be possible to substitute some salts for others to help lower the sodium content in the diet [1].

A Brief History of Salt

In antiquity salt was of very high value. Jews, Greeks, Chinese, Romans and other peoples used salt in different ways and the product always contributed to the development of their civilizations. So important was it that in the early days of the Roman Republic roads were built with the purpose to make salt to get to Rome faster. *Via Salaria* linked Rome to the Adriatic Sea which being shallower than the Tyrrhenian Sea was more productive although farther away. Even the wages of the roman soldiers were paid (part of it) with salt and the word salary, still in use, comes from those ancient days. Cities have become important owing to salt commerce (like Liverpool, U.K.) and wars were fought and won because of salt.

At present days salt commerce is still important and it just seems that people cannot live without this commodity. From the practice of salting the earth by the ancient Assyrians so that nothing would flourish on it until modern days' fast food, salt has accompanied humanity in every step of evolution.

To make a long story short one may say that the fascinating history of salt had its most impressive period between Antiquity and the end of the 19th century. The starting point being when man developed techniques to extract salt from nature using evaporation of salt water (India 7.000 BC; China 6.000 BC; Egypt 3.000 BC) [2] and the end point when we were able to have the technology to mine salt underground which gave access to sources until then unexploited and widening the access to salt putting an end to disputes over the product.

Salt and Health

Salt is essential for the majority of living organisms. Plants and animals all have salt in their body's composition. Sodium is an essential element.

Sodium chloride wasn't always a stealth killer. Despite the nowadays known link between sodium and high blood pressure, iodized table salt saved lives when U.S. manufacturers started producing it in 1924, adding a barrier against iodine-deficiency-related diseases like goitre [3]. Salt can be an important fluoride conductor and was considered in the plan for the prevention of dental caries created by the WHO in 2005. Also, Marthaler and Petersen [4] agree that especially in developing countries this may be an effective way to decrease the incidence of dental caries. It was decided that salt could also be enriched with fluoride to prevent tooth decay, especially in the case of school children. But the medical history of salt begins in ancient times and is closely related to different aspects of human history. In medicine the use of salt tended to emphasize its positive aspects such as in the prevention of putrefaction, reduction of tissue swelling and treatment of diarrhoea [5].

Before knowing how to extract salt for different uses early human hunters obtained their salt by eating animal meat. Carnivores still obtain salt in the same way and recycle it along the food-chain. Some plants also have salt in their composition although in much less quantities than animal and with less sodium (eg. **Salicornia ramosíssima**). So, from the view point of keeping ourselves in good health without missing the essential element Na all we have to do is to eat healthy food and we will get enough salt to our organism without having to add it as a condiment. However, when humans became sedentary and turn to agriculture they missed that salty flavour they were used to, and it may well have been at this point of evolution that we start actively seeking salt (may be in sea water). Archaeologists report that Chinese people used to boil sea water in clay vessels to get the salt but it is probable that the first techniques would just involve the power of the Sun. From that

***Corresponding author:** Cristina Carapeto, Associate Professor, Department of Science and Technology, University of Porto, Portugal, Tel: 351300007259; E-mail: carapeto@uab.pt

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point to the discovery of the power of salt to preserve food must have been a small step.

Several studies in humans have already proved the association between the amount of salt consumption and blood pressure [6,7]. In 1988 the INTERSALT study compared sodium ingestion (by measuring Na levels in urine) and blood pressure in a sample of 10.079 volunteers with ages ranging from 20 to 59 years old and from all over the world. The results left no doubt and clearly showed the link between Na ingestion and changes in blood pressure. With the study NHANES III it was concluded that a high ratio Na/K is linked to a significant increase in cardiovascular diseases and death and that in the USA the high sodium ingestion is closely related to an increase in population mortality [8,9]. These results had already been showed in the study NHANES II where an inverse association between Na ingestion and cardiovascular diseases had been proved.

More recently Graudal et al. [10] have studied the effect of the decrease of sodium ingestion from a medium high level (201 mmol/day) to a medium level ingestion of 66 mmol/day which is below the maximum recommended level of 100 mmol/day (5 gr of salt). With this study, the authors registered a decrease of systolic/diastolic pressure of 1/0 mmHg in Caucasians with normal blood pressure but a decrease of systolic/diastolic pressure of 5.5/2.9 mmHg in Caucasians with hypertension.

Many other studies have been done over the relation between salt ingestion and hypertension and Candeias [11] and the WHO [12] have stated that excessive salt consumption, besides hypertension, may be the cause of other cardiovascular diseases, stomach cancer, renal strain, osteoporosis and diabetes.

Sodium is naturally present in a variety of foods like milk, meat and shellfish and is present in high quantities in processed foods like bread, precooked meat and snacks as well as in seasonings like sodium glutamate [13]. In view of this one may say that there is no need to add salt to our meals since the amount of naturally present Na in foods is enough to cover our needs.

In Portugal the excessive salt consumption is one of the main public health concerns [14]. Around 26.9% of the Portuguese population suffers from hypertension and only 16% of those are medically controlled [15]. 34.7% of deaths in the country result from cardiovascular diseases [16]. In the U.K. the study of Ji and Cappuccio [17] showed that dietary sodium intake was higher in people with a low educational level and low levels of occupation. The same results had already been found by Leclercq and Ferro-Luzi [18] when studying domestic (discretionary) consumption of salt in three different regions of Italy. In 1999 Van der Veen et al. [19] concluded that "health aspects did not play a major role in salt intake, whereas taste attitude was an important predictor of added cooking salt". These findings lead us to the problem of health and nutrition educational programmes and perhaps to demystify that gourmet salts may be healthier than other common (and cheaper) types of salt.

Types of Salt

In Portugal the culture of salt is done in several parts of the country since it is a country facing the sea with excellent saltmarshes where ponds are shallow and allow the retention of salt water and its natural evaporation. In addition, in the south of the country there is a mine of rock salt but it's no longer in use. The main type of salt that can be found in the country is sea salt but there is a significant difference between what can be called artisanal sea salt and industrial sea salt. Some places, like Castro Marim, in the Algarve (south of Portugal) still maintain the traditional form of producing and collecting the sea salt which goes back to ancient times that cannot be dated. It is however known that during the iron Age Castro Marim had commercial activities with the Phoenicians where fish and fish products preserved in salt were exported [20]. The traditional salt of Castro Marim is collected manually (Figure 1) still following ancient techniques that have survived over the centuries. This results from the combination of work of men, tides, sun and wind and the salt is not subject to any treatment. It is only milled and commercialised when completely dried by the sun and wind. It is naturally white and shiny. The salt resulting from this process preserves the richness of sea water and its composition is not only NaCl but also a vast group of other minerals that are beneficial to health like Mg, Ca, K, Fe, Zn or Mn. It is less salty to the taste.

Industrial salt comes basically from the crystallization of dissolved salts in sea water making use of industrial dryers. The common process involves the concentration of sea water, crystallization of sodium chloride, its collection and washing to remove impurities. It is during the washing up of salt that the product becomes almost only NaCl losing the other minerals naturally present in sea water. No chemical addition is made since the salt is washed up with water saturated with NaCl to avoid its dissolution. After having been washed the salt is centrifuged and follows the process of milling [21]. However, in order to remain dry and loose for a very long-time industry usually adds some legal additives like anti-caking agents (sodium ferrocyanide, aluminium ferrocyanide, sodium silicates) (Figure 2) [22].

Only from the artisanal production of salt can we collect the salt flower (Figure 3). Salt flower is made of tiny white pyramid-shaped crystals formed on the surface of the brine. These are the first crystals to be formed and they are harvested by the salt makers making use of a special webbed spatula to remove them gently from the surface of

Figure 1: The traditional way to collect salt.

the salt ponds, where they form a thin layer. These crystals dry under the sun but still carry a certain amount of humidity and it's the sea impurities they also carry that give them the special taste so much appreciated by cooks [21].

There are other types of salt like the pink salt from the Himalayas (Figure 4). This is a rock salt that is mined in areas close to the Himalaya Mountains, often in Pakistan. Its pink coloration comes from the presence of several minerals like Mg, K, and Ca. People claim that this salt is healthier given its amount in trace elements and that in lamp form it eases symptoms from seasonal affective disorder (SAD), increases energy and improves sleeping by cleaning air pollutants like dust and pollen [23]. However, according to Sifferlin [23] and from the nutritional point of view this salt is very similar to regular salt.

The black salt, also known as *kala namak*, (Figure 5) comes from India and it is of volcanic origin. Besides having an attractive color (pinkish grey) it has sulphur compounds in its composition which gives it a strong sulphur taste. Besides the sulphur compounds this salt also has in its composition iron and potassium chloride. It is very soluble and it is used for cooking or just to add a special color to some dishes [24].

The red Hawaiian salt is terracotta in color (Figure 6), rich in minerals from its high content of red volcanic clay (*alaea*) [25].

Figure 2: Industrial production of salt in Brazil.

Figure 3: Collecting salt flower.

Finally, the pink Peruvian salt (Figure 7) comes from the Andes Mountains and is collected from shallow terraced ponds with water rich in mineral content. Its red color comes from the carotenoid pigments in the water [25].

Conclusion

It is also well known that hypertension is a risk factor for cardiovascular disease which affects over 970 million people worldwide and is the cause of death for more than nine million people every year [26,27].

Although David Brownstein [28] states that "When people use unrefined salt that contains minerals, there is no increase in blood pressure" Reddy et al. [29] published a literature review on the link that exists between sodium intake and hypertension both in animals and humans.

If artisanal sea salt and other rock salts do contain less sodium in their composition since they carry other minerals one should use all types of salt with parsimony until further studies prove this really makes a difference in health namely on the onset of hypertension. However, some people, like athletes, owing to their increased sweating do not benefit from a reduction in their salt intake. On the contrary, salt is recommended to recover basic minerals and avoid dehydration. Also, according to the Instituto de la Sal [30] elderly is a special group

Figure 4: Himalaya salt.

Figure 5: Black salt.

Figure 6: Red hawaiian salt.

Figure 7: Pink peruvian salt.

and it is difficult to state that they should reduce their salt intake. In fact, low-salt diets may lead to dehydration and as it is well known the elderly tend to reject of forget about water. As for pregnant women the same Instituto de la Sal [30] does not recommend the decrease of their salt ingestion and states that that could even be counterproductive.

Lourenço and Macedo [31] state that 75% of the salt human organism may need comes from the food we eat and that the addition of salt to our meals should be one of the main aspects to target in health campaigns and education since table salt contains 30% of sodium. In view of this and since we already consume so many additives in our daily food maybe it is not a bad idea to prefer artisanal salt (or salt flower) to commercial salt, which is not the same as to say that the former is harmless to health.

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