

Should Iodized Salt Also Contain Potassium?

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STORY AT-A-GLANCE

- › Recent data show salt substitutes with 75% sodium and 25% potassium could help reduce the rate of stroke, major cardiovascular disease and death
- › Low-salt recommendations parallel the rise in high blood pressure, obesity, diabetes and heart disease, which may be related to the vilification of salt while the food industry liberally added sugar to processed foods
- › James DiNicolantonio, PharmD., believes you can't overdose on salt if you have healthy kidneys. However, there are conditions that require greater attention, including Cushing's syndrome, Liddle's syndrome, bowel diseases, adrenal insufficiency, hypothyroidism and sleep apnea
- › Low sodium levels also impact athletic performance and may be related to overtraining syndrome. Take care with your salt source, since sea salt from modern oceans is contaminated with plastics and heavy metal

A recent study published in the *New England Journal of Medicine*¹ discovered that the rate of cardiovascular events and death were lower in the group of individuals who used a salt substitute with potassium than in those who used regular salt. The salt substitute was 75% sodium chloride and 25% potassium chloride.

In the interview above with James DiNicolantonio, PharmD., we discuss how salt has been vilified in the past several decades and the possible impact this had on the development of chronic diseases, including high blood pressure and obesity. The

interview was in 2017, just after the publication of his book “The Salt Fix: Why the Experts Got It All Wrong – and How Eating More Might Save Your Life.”

In today's culture, most people think of salt as seasoning for their food. But historically, salt was necessary for the preservation of food and was inextricably intertwined with trade.² Salt was highly valued, and the word salary is actually derived from the word salt.

It was used as a method of currency and was crucially important economically to many cultures. According to historians, salt played a prominent role in the exploration of the Pacific Northwest in America, was used by the British as a leverage tool in the American Revolution and played a key role in defeating civilian and military morale in the South in the Civil War.

DiNicolantonio first became interested in salt when he was working as a community pharmacist.³ His patients were complaining of new symptoms after their physician put them on a low-salt diet for their high blood pressure. The symptoms included muscle fatigue, heart palpitations, muscle spasms and cramps.

He advised his patients to talk with their doctors and ask more questions about the necessity for using a low-salt diet. He also encouraged them to request a serum sodium blood test to determine if they had low salt levels.

His patients found that after adding salt back into their diet the symptoms disappeared. DiNicolantonio believed this was a real indication that low salt diets were not “panning out in the real world.”⁴

Potassium Salt Substitute Lowered Cardiovascular Events

The original “Dietary Approaches to Stop Hypertension” (DASH), was published in 1997 in the New England Journal of Medicine.⁵ The researchers enrolled 459 adults who had blood pressure of less than 160/95. After eating a control diet low in fruits and vegetables and dairy products for three weeks, they were randomly assigned to one of three diets.

One group of participants ate a diet rich in fruits and vegetables, the second ate the control diet and the third ate a combination of the two. The researchers concluded, “A diet rich in fruits, vegetables and low-fat dairy foods and with reduced saturated and total fat can substantially lower blood pressure.”⁶ At the time of publication, national guidelines also recommended a low-salt diet.

The intervention diet had a salt content of approximately 3 grams per day, with higher levels of potassium, magnesium and calcium. The researchers wrote, “Nonetheless, known diet-related determinants of blood pressure (sodium chloride, body weight and alcohol) could not have accounted for the reductions in blood pressure, because changes in these potential confounders were small and similar for all the diets.”⁷

In other words, they found that low-salt diets we're likely not responsible for the reductions in blood pressure that were found in those eating a whole-food diet. But later they wrote it was “noteworthy” that reductions happened with a “sodium intake of approximately 3 grams per day and consumption of two or fewer alcoholic drinks per day.”⁸ Twenty years later the diet is still considered an important advance in nutritional science. According to one paper:⁹

“It emphasizes foods rich in protein, fiber, potassium, magnesium, and calcium, such as fruits and vegetables, beans, nuts, whole grains, and low-fat dairy. It also limits foods high in saturated fat and sugar. DASH is not a reduced-sodium diet, but its effect is enhanced by also lowering sodium intake.”

Yet it has been the salt consumption in the DASH diet that has received the greatest attention. The recent data are from the Salt Substitute and Stroke Study¹⁰ which sought to determine if using a salt substitute that contained 75% sodium and 25% potassium could have an effect on the rate of major cardiovascular events, stroke and death.

While the endpoint of the DASH diet was to measure blood pressure reduction in a small number of participants, the Salt Substitute study involved people in 600 villages across rural China and used endpoint measurements that clearly had an impact on health.

The researchers chose participants who were 60 years old and older and had high blood pressure. Others were chosen because they had a history of stroke. The researchers

randomly assigned villages to use a salt substitute or regular salt¹¹ and followed up for a mean of 4.74 years.¹²

Those consuming the salt substitute had a lower rate of stroke, major cardiovascular events and death. The rate of hyperkalemia, or high levels of potassium in the blood, was only slightly higher in those using a salt substitute.¹³ While these results are encouraging, the researchers did not measure whether the participants were first deficient in potassium, also crucial for cardiovascular health.

Low-Salt Recommendations Likely Does More Harm

The original studies linking a low salt diet to high blood pressure began in the 1940s with Dr. Lewis Dahl. At the time of his death, he was chief of staff at the Hospital of Medical Research Center, Brookhaven National Laboratory, New York. In 1956 he concluded that a high-salt diet was an important factor in high blood pressure.¹⁴

In my interview with DiNicolantonio, he referred to Dahl as “the Ancel Keys of salt,”¹⁵ in reference to the way Keys’ and Dahl’s studies were structured.^{16,17} The method behind Keys’ study was seriously flawed, with the biggest flaw being that Keys cherry-picked the countries he used to support his hypothesis.

According to DiNicolantonio, Dahl did virtually the same thing as he chose five populations from which he would draw a linear line from high blood pressure to salt intake. DiNicolantonio commented:¹⁸

"I don't know what was in the water in the 1950s, but these doctors seemed to pick just five or six populations that fit their hypothesis, plot it out and show the association basically finding what they wanted to find."

DiNicolantonio continued by describing the 1988 Intersalt study¹⁹ in which 52 populations were evaluated for the relationship between urinary electrolyte excretion and blood pressure measurements. Included in the 52 populations were four primitive cultures that did not consume salt.

An analysis of the data showed that when the four tribal populations are included in the total, the overall results show that salt reduction can help lower blood pressure. However, it is important to note that while those populations did not eat salt, they had a diet with high levels of potassium and magnesium. The people group also exercised more, drank no alcohol and ate no foods with processed sugar.

When that group was removed from the data, it demonstrated that the lower levels of salt did not have a positive effect on blood pressure. One of the reasons this may happen is because when salt is cut from the body, insulin resistance rises.

The combination of Dahl's study and the DASH study lay the blame for high blood pressure, diabetes and kidney disease on salt. DiNicolantonio commented on the relationship between the study funding sources and the results:²⁰

"When you look at the data and look at studies that didn't have any conflicts with the food industry ... There was one systematic review published a few years ago and it literally showed the opposite results.

The studies that didn't have any conflicts, basically 80% showed that sugar is associated with obesity and gaining weight. And of course 80% of the studies that had conflicts with the industry showed exactly the opposite, which literally goes to show you that absolutely conflicts with the sugar industry and food industry can affect scientific results. That's what was going on here."

Conditions That Require Greater Attention to Sodium Levels

One of the best ways I have found to affect my mitochondrial health is through a cyclical ketogenic diet. When some people first begin this switch to ketosis, they can develop something called "keto flu." This is often a transitory combination of symptoms that include nausea, fatigue and headaches.²¹

DiNicolantonio describes the process of how going into ketosis can deplete your body of salt, and thus result in some of these symptoms. He explains that your salt levels directly control levels of magnesium and calcium.²²

As carbohydrates are cut from the diet, it reduces the amount of insulin in the body, raises glucagon and produces negatively charged ketone bodies. Each of these processes play a role in lowering sodium levels. DiNicolantonio also points out that there are certain subpopulations of people who are more salt sensitive, such as those with:

- **High aldosterone levels** – This hormone helps the body retain salt by reducing the amount excreted in the kidneys.²³ At the same time it causes the body to remove more magnesium.²⁴ This can happen with a benign tumor-secreting aldosterone.
- **Cushing's syndrome** – In this disorder, your body makes too much cortisol. This can mimic the actions of aldosterone and cause the body to keep too much sodium and excrete more potassium.²⁵
- **Liddle's Syndrome** – In this rare condition people retain too much salt.²⁶

A healthy body has a “salt thermostat”²⁷ that helps control how much salt you should be eating. It basically is about listening to your own salt cravings. However, as DiNicolantonio describes, there are health conditions that contribute to poor sodium absorption or sodium loss. Those include:

- **Bowel diseases** – People with ulcerative colitis, celiac disease and irritable bowel syndrome do not absorb salt well. Individuals who have had surgical intervention in their gut may also have poor salt absorption. This could include those who have had bariatric surgery or had part of their intestines removed from cancer.
- **Adrenal insufficiency** – This is also called Addison's disease and happens when the adrenal glands do not make enough cortisol.²⁸ DiNicolantonio spoke of a paper published in JAMA in the 1940s describing a child who was eating a lot of salt to the point where the parents hospitalized the child. The child ended up dying a few days later from salt loss. People with adrenal insufficiency do not absorb sodium well.
- **Hypothyroidism** – Thyroid hormones help control metabolism and the kidneys' ability to resorb salt.²⁹ People with some type of thyroid dysfunction may need more salt.

- **Sleep apnea** – People with sleep apnea may be losing twice the amount of salt at night, which is why they're often up during the night to urinate. The interruption in breathing can cause blood to enter the thorax, which increases central blood pressure. This tricks the body into thinking there is an overload of salt and causes the kidneys to excrete more salt and thus more urine during the night.
- **Kidney diseases** – Individuals with polycystic kidney disease, glomerulonephritis and interstitial damage to the tubules can negatively affect salt loss, leaving higher levels of sodium in the body.

Low Sodium Level Impacts Exercise Performance

DiNicolantonio calls salt “the sixth factor in fitness.”³⁰ He described how Ancel Keys discovered the benefits of salt for individuals who exercise. In the 1940s Keys demonstrated that individuals who work out in the heat without adequate amounts of salt have a 10-fold increase in the potential risk of heat stroke.

As people are looking for ways to improve blood circulation, DiNicolantonio believes that taking a bit of salt before exercise is one of the best ways to improve performance and reduce the risk of dehydration. Before working out he takes a half-teaspoon of salt with enough lemon juice to cover the taste of the salt and 2 ounces of water. He uses this approximately 20 minutes before working out.

The benefits are that you immediately begin increasing blood volume, circulation and reducing heart rate. People who have adequate sodium levels also release more heat because salt is a good vasodilator and allows heat to escape the body. As the heat dissipates during exercise it reduces your core body temperature.

Overtraining syndrome is a challenge faced by many athletes. The literature describes it as a “maladapted response to excessive exercise without adequate rest, resulting in perturbations of multiple body systems coupled with mood changes.”³¹ DiNicolantonio describes the effect salt has on overtraining syndrome:³²

“Overtraining syndrome is literally salt deficiency in the tissues. When your muscles are just losing salt it's why you get muscle spasms, and twitches and if you just add salt back to the diet you can completely eliminate overtraining syndrome.”

Consider Your Salt Intake

As DiNicolantonio points out, our ancestors ate much more salt than we do, potentially up to 10 times more than we consume today.³³ From a historical perspective it's important to note that society did not suffer from the chronic diseases that are also common today. He believes that the rise in high blood pressure, diabetes and obesity parallels lower salt diets and may have been a contributor to the development of these diseases.

In his research DiNicolantonio finds that the average American consumes about 3,400 milligrams of sodium each day. He does not believe that a person with healthy kidneys can consume too much salt, since the kidneys will flush out the excess amount.

It's crucial to consider the source of your sodium since sea salt from the modern oceans contains modern-day pollutants,³⁴ like plastics and traces of heavy metals when compared to Himalayan Sea salt or Redmond salt from ancient oceans.

DiNicolantonio also points out that it's important to get enough salt each day because a sodium deficiency can reduce vitamin C absorption, which indirectly affects bone health and strength due to the resultant vitamin C deficiency.³⁵ The chloride in salt is also a necessary part of hydrochloric acid, which is a component of how food is broken down in the stomach.

One factor in lower amounts of hydrochloric acid in the gut, which contributes to acid reflux and gastroesophageal reflux disease, is there may not be enough salt to produce enough hydrochloric acid. Simply normalizing your salt intake is a classic example of how simple strategies have a considerable impact on health and wellness.

Sources and References

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