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Alkaline and Plant Waters — What's Behind the Trend?

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Research suggests that while functional waters may contain some nutrients, they may not be any better than bottled or tap water for rehydration.

The Beverage Marketing Corporation recently released data that show bottled water has become the largest beverage category by volume in the United States, surpassing carbonated soft drinks for the first time.¹ The rise coincides with overall food and beverage trends—consumers are looking for healthier, more nutrient-dense products. It's no longer enough to sell plain water. Instead, clients are searching for functional waters with more perceived benefits, which include alkaline waters and plant, or botanical, waters.

"There are a lot of health-conscious people out there who are looking for the next big thing," says Sarah Ladden, MS, RD, director of nutrition, health, and wellness for Nestlé Waters North America in Stamford, Connecticut. "Plant water is coming on people's radars, and alkaline has been on the market for a while. You're always going to see the marketplace respond to consumer demand, and right now they're looking for their products to be more functional and provide more benefits."

Alkaline Waters

Pure water has a pH of 7, so alkaline water is any water that has a pH higher than 7. The pH scale, which runs from 0 to 14, measures how acidic or basic a substance is. Neutral is pH 7; anything below is acidic, and anything higher is basic or alkaline.² The average pH range for alkaline waters is around pH 8 and pH 9, though one brand claims to be the highest with pH 10. Each number on the scale represents a tenfold change in the acidity or alkalinity.

The most common minerals found in water include calcium, sodium, potassium, copper, manganese, magnesium, and iron.³ According to the World Health Organization, water contributes anywhere from 1% to 20% of the total dietary intake of some trace minerals, providing up to 20% of the total required daily intake of calcium and magnesium. Location impacts the concentration of minerals in water; hard water has significantly more calcium and magnesium compared with soft water.⁴ A higher mineral content in water means it has a higher pH level.

Alkaline waters are higher in alkalizing agents such as calcium, potassium, bicarbonate, silica, and magnesium. Some waters are naturally alkaline, while others undergo processing to become alkaline. A water ionizer creates alkaline water by running the water over positive and negative electrodes, separating it into acidic and alkaline.⁵ There also are water filters that add alkalizing minerals and water filters that reverse osmosis. For a simpler fix, adding baking soda to water can make it more alkaline.

Alkaline waters are marketed to a wide range of consumers, including athletes, acid reflux sufferers, and anyone looking to increase antioxidant intake and improve overall health, bone health, and muscle health. It isn't uncommon to see a celebrity or athlete endorsing major brands of alkaline water and their purported benefits.

One company says its water, "along with healthy life choices, can reduce acid in the body, leading to overall better bone and physical health." Another says that doctors and nutritionists recommend

drinking alkaline beverages to prevent "acid tide," which can lead to loss of strength and increased tiredness as well as decreased bone, kidney, and muscle health.⁶ "What you drink is more important than how much you drink," one company states, describing its product as "supercharged ionized alkaline water" and explaining that it's better at rehydrating after exercise compared with regular water.

The most shared health claim among alkaline water manufacturers is the promise to detoxify the body and fight against the acidity of the Western diet. Some claims go so far as to say that "bacteria, disease, and viruses thrive in acidic water but struggle to survive in alkaline," explaining that drinking their water increases the level of pH in the body.⁷ Others simply display a pH scale depicting a sad face, sickly figure, or the words "sickness" on the acidic side and a happy face or "health" on the alkaline side.

It's true that chronic acid retention can lead to bone loss; it promotes the increase of urine calcium excretion, and, without an increase in intestinal calcium absorption, the body takes calcium from the bones.⁸ The condition is also known as metabolic acidosis, and, though it can have many causes such as kidney disease, lactic acid buildup, ketoacidosis, and even severe diarrhea, it's an uncommon condition in healthy individuals.⁹ One study published in *Urolithiasis* found that patients with osteoporosis and abnormal distal renal tubular acidification showed improvements in bone density after alkali therapy.¹⁰ However, the alkali therapy consisted of three 400-mg capsules of ammonium chloride daily, which isn't obtainable through drinking alkaline water.

Claims to prevent acid tide may be misleading, as acid tide is a condition that occurs after fasting and results in a temporary increase of acidic urine—not a common occurrence as the claim suggests. The research on the benefits of alkaline water for human consumption is limited. A 2012 study published in *Annals of Otolaryngology, Rhinology & Laryngology* found that alkaline water with a pH of 8.8 inactivated human pepsin, which contributes to acid reflux, whereas water bottled/tap water with a pH of 7 didn't.¹¹ The tests were performed in vitro, and further clinical trials need to be conducted to support these findings.

Claiming that viruses, disease, and bacteria thrive in acidic water is misleading. Bacteria typically thrive in more neutral pH conditions, though some can live in either basic or acidic conditions.¹² Typical cleaning agents developed to kill bacteria usually are either highly acidic or basic. For instance, cleaners such as vinegar or lemon have a pH near 2, which is acidic and doesn't promote bacterial growth.

The company that calls its water "supercharged" and "ionized" cites a research study published in the *Journal of the International Society of Sports Nutrition* that compared its water (pH 8.5) with tap water (pH 7) and tested biomarkers of rehydration after exercise. The randomized, double-blinded study included 100 adults who were mildly dehydrated after aerobic exercise; dehydration was measured as a loss of 2% body weight during aerobic activity. The four biomarkers for rehydration included blood viscosity, plasma osmolality, bioimpedance, and body mass. Results showed a statistically significant increase in blood viscosity after exercise in those who drank alkaline water compared with those who drank tap water. There were no statistically significant differences in plasma osmolality, bioimpedance, or body mass.¹³ A statistically significant increase in one of four biomarkers of hydration from one single study shouldn't be considered substantial evidence to advertise a product as a better hydrator for athletes.

"From an athletic environment when you're exercising a lot, you're producing more acid, free radicals, and hydrogen ions; that's the thought process," says Amy Goodson, MS, RD, CSSD, LD, owner of a private practice in Dallas. Goodson has 11 years of experience as a sports dietitian at Ben Hogan Sports Medicine and has worked with Texas Christian University Athletics, the Dallas Cowboys, Texas Rangers, FC Dallas, Jim McLean Golf School, and many PGA Tour players. "There's really not a lot of great research that says that drinking alkaline water is any better than [drinking] regular water."

Leslie Bonci, MPH, RD, CSSD, LDN, owner of Active Eating Advice in Pittsburgh, says she's gotten questions about alkaline water from her athletes as well. Bonci spent 24 years as the dietitian for the Pittsburgh Steelers. She now runs her own practice and serves clients such as the Pittsburgh Pirates, Carnegie Mellon University athletics, the Toronto Blue Jays, Kansas City Chiefs, Pittsburgh Ballet Theatre, and the Women's National Basketball Association. Bonci and Goodson agree that alkaline water does provide the benefit of extra minerals when compared with tap water or lower pH waters.

Sonya Angelone, MS, RD, CLT, who runs a private practice in San Francisco, gets questions about alkaline water from her nonathlete clients, often with goals of lowering their pH. "I think there's misinformation on what pH balance is and how your body maintains your pH," Angelone says. "If alkaline water goes into your stomach, that stomach acid is going to neutralize the water. Your blood has an optimal, healthy pH of somewhere around 7.36, and your body does a really good job of maintaining that. If someone is looking to lessen the acidity in their diet, start by adding more fruits and vegetables and water in general."

Coconut Water

The trend in functional waters has expanded to plant, or botanical, waters, the most notable being coconut water, which is the clear liquid inside of coconuts. According to the USDA nutrition database, an 8-oz serving of unsweetened, ready-to-drink coconut water provides 44 kcal, 64 mg sodium, 11 g carbohydrate, 9 g sugar, and 0 g protein.¹⁴ One cup provides 14% DV of potassium. The drink has long been popular in tropical countries, where coconuts are cracked open and sold by street vendors.¹⁵

Coconut water comes with its share of athlete and celebrity endorsements. If clients visit the most popular brands' websites, they'll more than likely see a model, singer, or athlete holding a bottle. Currently, the product is most widely marketed to athletes, professional and nonprofessional alike, as a "natural sports drink."¹⁵ One Thrillist reviewer wrote, "Coconut water provides electrolytes and replenishes lost fluids at a rate equal to that of a sports drink, making it an all-natural alternative to those bottles filled with processed sugar."¹⁶

Research on coconut water for hydration and exercise is mixed and somewhat scarce. Studies that do exist typically involve a small number of participants. One research study compared the rehydration ability of coconut water with bottled water and sports drinks after exercise and found no significant differences. The study included 12 men who exercised on a treadmill for 60 minutes; researchers measured dehydration as a 2% body mass loss. While the study reported no differences in fluid retention and exercise performance, subjects who drank coconut water reported a higher incidence of upset stomach and bloating.¹⁷

Another study compared plain water with coconut water to determine athletic performance and rehydration during exercise. The study involved 10 men who completed 60 minutes of cycling and drank either coconut water or water at will during the activity. There were no significant differences between the two regarding performance or hydration, but participants drank less coconut water, suggesting it was less palatable than plain water. This contrasts with other studies that reported coconut water as being more palatable during exercise.¹⁸

Bonci and Goodson agree that it's OK for the average person exercising in a gym for 45 minutes to rehydrate with coconut water. But they explain that the research can be misleading, as coconut water isn't a suitable substitute for a sports drink when considering professional athletes or those engaging in high-level training.

"Sports drinks were designed for what they are; they were designed for people playing sports," Goodson says. "Coconut water is often marketed as a low-sodium sports drink, which to me is an oxymoron because the point of a sports drink is partly to replace sodium. When we sweat, the average

person loses about three times the amount of sodium as they would potassium, so you simply don't need as much potassium for replacing what's lost in sweat and helping with cramping."

For comparison: an 8-oz serving of Gatorade Thirst Quencher, Frost Glacier Freeze flavor, provides 57 kcal, 109 mg sodium, 31 mg potassium, 14 g carbohydrate, and 14 g sugar—almost double the sodium and an additional 3 g carbohydrate and 5 g sugar compared with coconut water.¹⁹ An 8-oz serving of Powerade, Lemon-Lime flavor, provides 78 kcal, 102 mg sodium, 44 mg potassium, 19 g carbohydrate, and 15 g sugar—also nearly double the sodium and carbohydrates and an additional 6 g sugar compared with coconut water.²⁰ The sports drinks provide more carbohydrate and sodium that high-level or endurance athletes need to properly replenish what's lost during exercise.

Bonci also hears and experiences the same with her athletes. "I think that the allure is that it says 'natural.' It comes from a coconut, so therefore it must be better than something that comes from a bottle that's a beautiful shade of teal," Bonci says. "It's perception vs reality. The sugar is natural, therefore it's better for me."

It may not be best for serious athletes during or after exercise, but Goodson, Bonci, and Angelone agree that coconut water can be good to drink throughout the day since it's a good source of potassium.

Cactus Water

Another growing trend is cactus water, which is a mixture of prickly pear cactus extract, prickly pear cactus purée, and water. An 8-oz serving of the leading brand provides 26 kcal, 7 g carbohydrate, 7 g sugar, 12 mg sodium, and 5 mg potassium.²¹

A top-selling cactus water brand advertises its water as a good way to detoxify the body and maintain good skin. It also touts its ability to enhance athletic performance because it contains the amino acid taurine, which helps regulate water and minerals in the blood and assists with neurological development.²²

Research on cactus water is limited. There's no research stating that it specifically contributes to skin health, and there's little known on the impact of taurine supplementation over the long haul. Some studies have shown cactus water can improve athletic performance short term, although more research is needed. The claim of cactus water's benefits due to taurine may be unjustified. Some analyses have shown that the prickly pear plant does contain taurine (up to 572.1 mg/L),²² but it's unclear whether the juice or water contains any taurine after processing.²³ One study analyzed commercially available prickly pear juices and didn't detect any free taurine.²⁴

Bonci explains that all the amino acids must work in conjunction with one another to provide the most benefit. "It's a stretch to say taurine in and of itself is the reason someone may be able to optimize their performance," Bonci says.

Aloe Vera Water

Aloe vera water, often referred to as aloe vera juice, contains a mixture of aloe vera pulp, aloe vera juice, and water. An 8-oz serving of the leading brand provides 60 kcal, 15 g carbohydrate, 15 g sugar (including added sugars), and 29 g sodium.²⁵ As with cactus water, it's advertised as a detoxifying drink with skin health benefits.

There's research that shows aloe vera improves certain skin conditions when used topically, but studies on the effects of ingesting the water are scarce. Bonci knows many athletes who drink aloe vera juice to help with digestion problems. There's some research that suggests aloe vera may have a laxative effect, but the safety of regularly ingesting the gel of the plant is still in question.²⁶

Jury's Still Out

As the bottled water industry continues to expand and grow, it's unknown what the next trend may be. Functional waters such as alkaline and plant waters are getting more time in the spotlight, but until further research is conducted, there isn't enough evidence to say alkaline water or plant waters are significantly better than drinking bottled water or tap water.

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