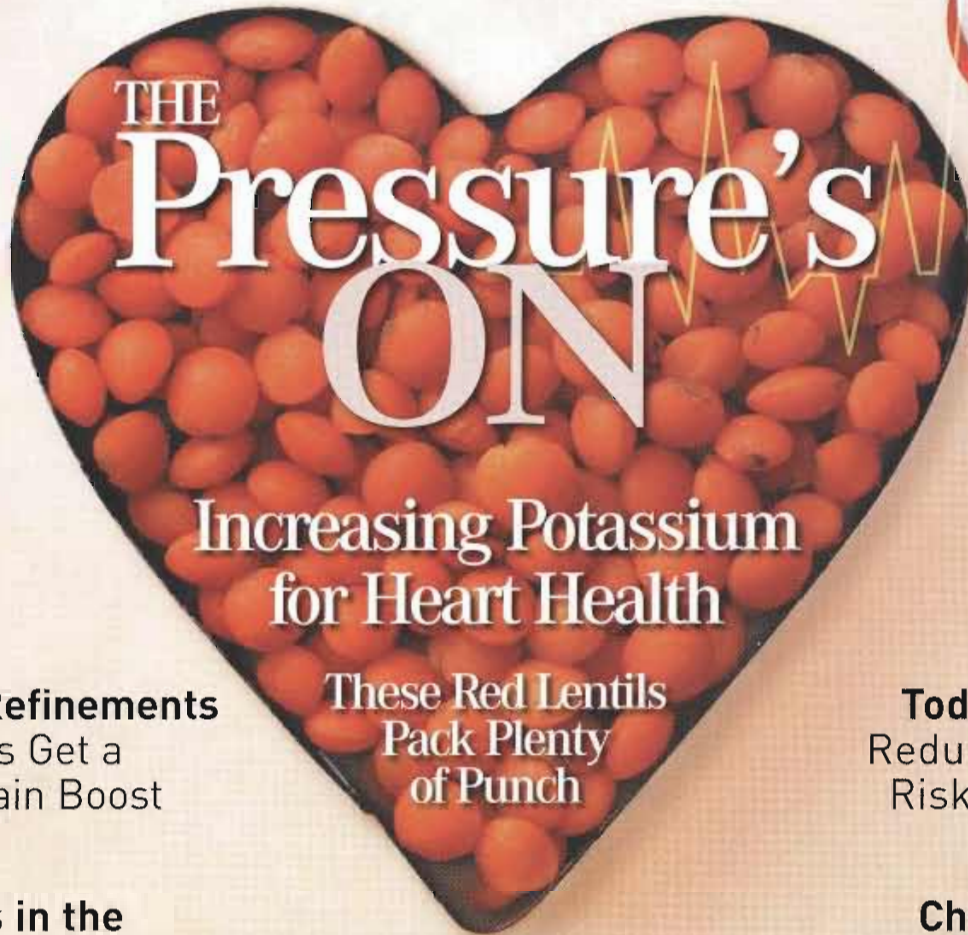


# today's dietitian

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## THE Pressure's ON

Increasing Potassium  
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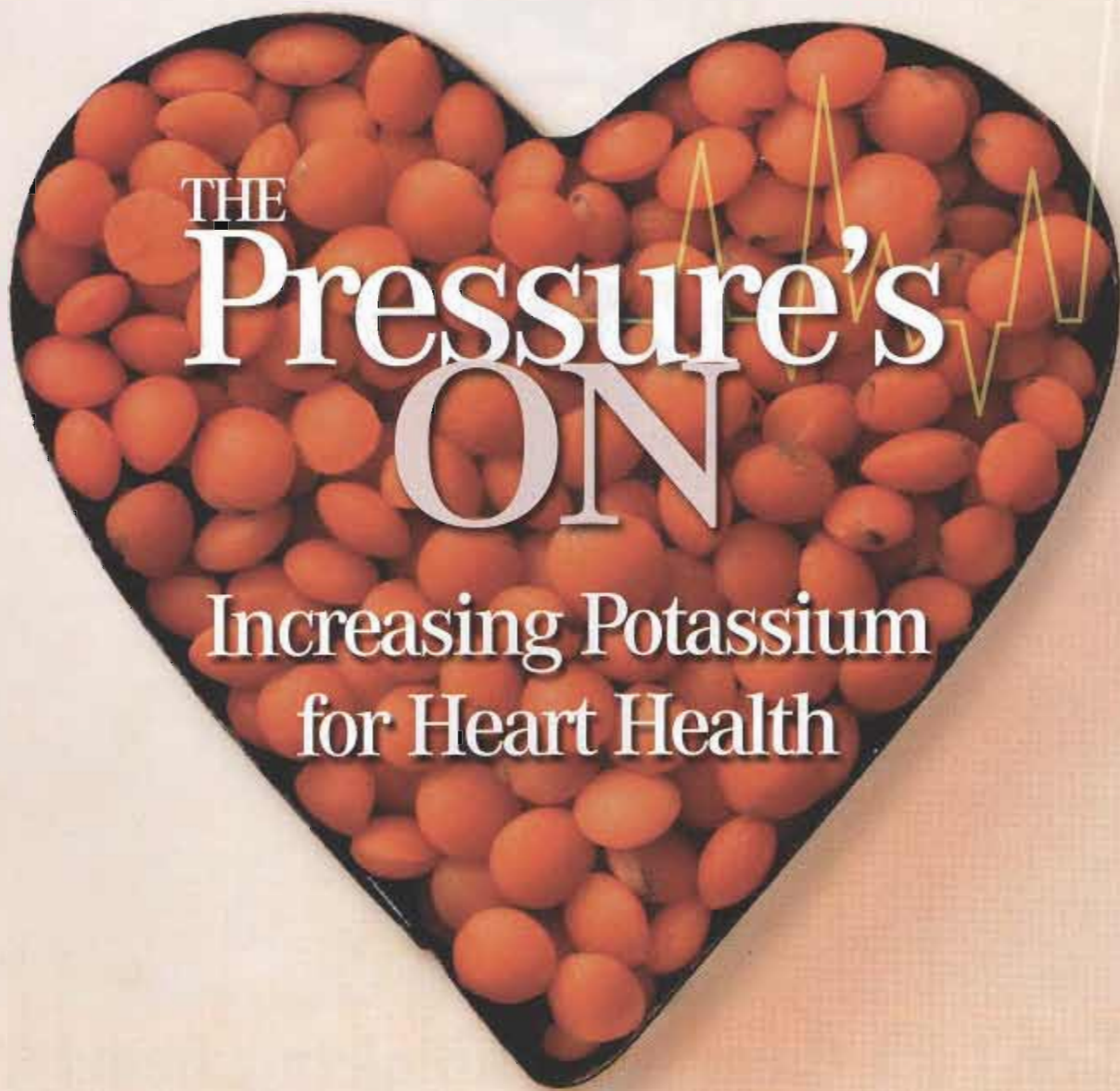
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**These red lentils  
pack plenty of punch**

By Christen C. Cooper, MS, RD



which are normally salt laden and often stripped of naturally occurring nutrients such as potassium.

Observational studies, including INTERSALT (International Study of Salt and Blood Pressure), which involved 10,079 subjects from 32 nations, found that the dietary sodium to potassium ratio had a stronger association with blood pressure than sodium or potassium alone. In countries such as Japan, where sodium intake is high yet people consume traditional diets of largely whole foods, rates of high blood pressure remain, on average, lower than those of Western nations.<sup>3,5,8</sup>

### Potassium: Sodium Proportions

Sodium and potassium can be at odds with each other. But they also continually work together at the cellular level to control cellular volume, pH, and membrane potential. The sodium-potassium exchange pump, or *sodium pump*, which provides energy for a number of critical cellular functions, triggers a cascade of events leading to the constriction or relaxation of blood vessels. It does this based on the concentrations of electrolytes in the intracellular and extracellular space.

In a potassium deficit scenario, sodium enters cells to maintain cellular volume. Then water follows sodium into the cells, increasing pressure on artery walls. Over time, this extra pressure leads to stiffness and, in some people, high blood pressure. As explained in a recent study, sodium depolarizes cellular membranes, leading to vasoconstriction, the kind characteristic of primary hypertension.<sup>5</sup> On the other hand, ample dietary potassium causes sodium pump stimulation and endothelial cell hyperpolarization. This ultimately relaxes blood vessels, allowing blood to flow freely and keeping blood pressure at normal levels.

### Potassium's Partners

The full extent of the process by which potassium may help control blood pressure has not been elucidated. Some studies suggest that the antipressor effects of dietary potassium may come from its natriuretic effects since potassium acts on the renal tubule to increase salt excretion.<sup>4</sup> Other studies suggest that it is

the conjugate anion occurring with potassium, whether citrate or chloride, that confers benefits.

The favored conjugate anion is potassium citrate, a bicarbonate-generating form of potassium found in fruits and vegetables. Studies suggest that this form promotes lower blood pressure because it produces a larger cellular entry when exchanged for sodium in cells.<sup>5,7</sup> Unlike potassium chloride, which is the form of potassium found in meats and selected grains, potassium citrate appears to have an alkalinizing effect on the body. Some researchers believe that the bicarbonate-generating citrate form may help prevent a low-grade metabolic acidosis resulting from a diet heavy in animal foods. Even a low-grade state of acidosis can be detrimental because in order to buffer the acidity, the body chips calcium away from bone. This leads to hypercalciuria and hypocalciuria, which can express themselves as bone demineralization and kidney stones.<sup>7</sup>

Of course, the benefits of a particular anion are hard to separate from plant foods' numerous other heart-healthy substances, including fiber, antioxidants, and phytochemicals. But again, in the Dietary Approaches to Stop Hypertension (DASH) diet, we see evidence that fruit and vegetable intake correlates with better heart health, including lower blood pressure. The DASH trial compared a "typical" American diet with a diet high in fruits and vegetables (eight to 10 servings) and also with a diet rich in plant foods and low-fat dairy. All three diets provided approximately 140 millimoles of sodium chloride per day. Both experimental diets led to reductions in blood pressure, with the greater drop observed in subjects assigned to the dairy-inclusive diet.<sup>5,7</sup>

In a second DASH study, researchers decided to test different sodium intake levels—and therefore the impact of sodium specifically—on each of the three diets. Again, there was a dose-dependent hypotensive effect, with the greatest blood pressure drop occurring in the DASH diet group with the greatest sodium chloride restriction.

But the hypotensive effects attributable to the sodium level were most pronounced in the control group. In other words, in the group for which potassium intake was lowest (50 millimoles per day), the salt restriction had the greatest impact. One review states: "It seems likely that the hypotensive effect of the DASH diet is to a considerable extent determined by its relatively high potassium intake, and possibly to some extent by a greater renal calcium retention thereby induced."<sup>7</sup>

### Potassium in a Pill

Additional benefits may come from further supplementing a potassium-rich diet, as shown in a handful of studies on potassium supplementation. These works show that supplementing the DASH diet with potassium citrate can further decrease blood pressure and the excretion of calcium in the urine.<sup>7</sup> Supplemental potassium bicarbonate blunted the effects of salt on salt-sensitive hypertensive and nonhypertensive individuals in a number of studies. Salt sensitivity refers to the pressor effect of salt on blood pressure. In one trial, increasing potassium intake to 4.7 grams per day had a



particularly notable positive effect on salt sensitivity in nonhypertensive African Americans.<sup>27</sup> This is important because suppression of salt sensitivity is thought to delay or prevent hypertension. It is also important because African Americans tend to consume less potassium and are more likely to have salt sensitivity.<sup>4</sup>

### Recommendations

The Institute of Medicine (IOM) set the adequate intake for potassium at 4.7 grams per day for healthy adults, a level that nine or 10 servings of fruits and vegetables provide.<sup>1</sup> The IOM recommendation is supported by evidence that 4.7 grams of potassium per day should lower blood pressure, help counter the effects of

**soups and stews** for a warm, savory, and potassium-rich accent. (Roasted veggies can add so much natural flavor that the dishes they join need less salt, another heart-healthy benefit.)

- **International** cuisines can offer potassium-rich inspirations. Toss chickpeas into salads; add lentils to soups or as a side. With a few spices, these legumes lend themselves to a number of Indian and Middle Eastern dishes.
- There are numerous fish, including tuna, halibut, salmon, and flounder, that are potassium rich. Beef, chicken, and pork also contain ample potassium.
- Suggest adding fruits such as oranges (since citrus is generally available and tastes good in winter) and dried fruits such as raisins into salads for variety in taste and color.
- What better classic potassium-rich food can one find than a banana? Suggest a smoothie made with a banana, a cup of frozen berries, a teaspoon of honey, and a tablespoon of wheat germ in the morning for breakfast, or a banana split made with low-fat or nonfat frozen yogurt with a sprinkling of peanuts or almonds and raisins for dessert.

Advise clients who may want to try potassium supplements to proceed with caution and seek a physician's advice before taking it or any supplement: Although potassium is readily excreted by the body, some forms of potassium in excess can cause disruption of heart rhythms and other heart problems. As always, clients with

sodium chloride on blood pressure, and reduce the risk of kidney stones and bone loss.<sup>4</sup>

The 2005 Dietary Guidelines Advisory Committee followed suit when it set the new, controversial fruit and vegetable goal at 4½ cups per day. (This, by the way, is roughly equal to the IOM's nine to 10 servings.) Like the IOM report, the Dietary Guidelines Advisory Committee Report clearly states that a diet rich in potassium can help fight high blood pressure, lessen the effects of salt on blood pressure, and help prevent kidney stones and bone loss.<sup>2</sup>

### Tips for Advising Clients

For many people, increasing potassium may be a more useful heart health strategy than simply trying to reduce sodium. After all, it's generally easier to get Americans to eat more, not less. So try to suggest some gastronomic experimentation to add not only potassium but also interesting elements to winter foods and brighten up the season.

- Who says meat and potatoes people can't be heart healthy? There's nothing that matches a potato when it comes to potassium. So roast it, bake it, mash it—just don't deep fry it—and you'll have a heart-healthy dish. By the way, beef's also a good source, but keep it lean.
- Starchy winter foods such as sweet potatoes and acorn squash are bursting with potassium and can be roasted or tossed into

renal problems should limit potassium and have serum potassium carefully monitored by their physician. For most people, unless their doctors advise otherwise, it's better to increase potassium through potassium-rich foods.

Cultural awareness can also be a boon for advising people on how to boost potassium. For many newcomers to the United States, the diet eaten prior to arrival was richer in fruits and vegetables than the diet consumed here. We know the challenges of finding affordable fruits and vegetables in many places across the country. Encourage visits to farmers' markets and farm stands, where quality produce can usually be found at affordable prices and where human interaction and an exchange of information with sellers can make for a unique, informative, and enjoyable experience.

— Christen C. Cooper, MS, RD, is a Pleasantville, N.Y.-based freelance health and nutrition writer. She has worked in healthcare consulting in Latin America and the United States and holds a master's degree in nutrition education from Teachers College, Columbia University.

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