Potassium & Heart Health

FACT SHEET

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INTERNATIONAL FOOD INFORMATION COUNCIL FOUNDATION

Potassium is a nutrient that is essential for health at the most basic level—it keeps the body's cells functioning properly. Along with sodium and other compounds, potassium is an electrolyte, working to regulate the balance of body fluids. These actions affect nerve signaling, muscle contraction, and the tone of blood vessels, with far-reaching impacts on the body, including the cardiovascular system.

How Potassium Protects The Cardiovascular System

There is strong evidence that potassium lowers blood pressure, whether consumed in foods primarily as potassium bicarbonate, or as a dietary supplement in the form of potassium chloride or other potassium salt (IOM 2005; He and MacGregor 2008). Specifically, potassium has been noted to reduce both systolic and diastolic blood pressure (Whelton et al 1997; INTERSALT 1986; Dyer et al 1994) in people with normal and high blood pressure. Potassium's blood pressure lowering effect is greatest in those that need it most: those with hypertension, those who are salt-sensitive, African American males (who are also more likely to have hypertension and to be salt-sensitive), and those who consume the most sodium. It is important for those with hypertension to know that blood pressure is lowered with increased potassium and with an increase in the ratio of potassium to sodium (He and MacGregor 2008; ADA Ev Analysis 2005).

Potassium also reduces salt sensitivity, an independent risk factor for heart disease. Even without diagnosed hypertension, salt-sensitive individuals may experiences spikes in blood pressure when they eat salty foods. Eating enough potassium-rich foods reduces or prevents the blood pressure response to dietary sodium, possibly by stimulating excretion of sodium chloride, or inhibiting sympathetic nerve response (Ando et al 2010).
One final note about potassium and the cardiovascular system is that it may improve more than blood pressure. Emerging research suggests it affects the structure and mechanical function of the heart, which can lead to improvements in many cardiovascular risk factors (He et al 2010).

Potassium Rich Foods The Context Of The Total Diet

Diets high in potassium-rich foods such as fruits, vegetables and low fat dairy foods have been shown to lower blood pressure. The best illustration of this is the DASH (Dietary Approaches to Stop Hypertension) diet. The original eight-week trial randomized 459 participants with normal to mild hypertension to one of three diets: 1) control (typical Western) diet; 2) a diet high in fruits and vegetables; or 3) a diet high in fruits, vegetables, and low-fat dairy foods, and reduced in saturated and total fats (subsequently known as the DASH diet). While the fruit and vegetable diet reduced blood pressure by 2.8/1.1 mm

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Hg (P < 0.001/P = 0.07), the DASH diet reduced blood pressure by 5.5/3.0 mm Hg (P < 0.001/P < 0.001).

Following the DASH trial, the DASH-Sodium trial demonstrated even greater blood pressure-lowering with decreasing levels of sodium intake. Both DASH alone and sodium reduction alone lowered blood pressure. But the lowest blood pressure was achieved with the two approaches combined. Many studies have replicated the results of the DASH trials, and other research has demonstrated that 4,700 mg potassium per day prevents the blood pressure raising effects of dietary sodium in both hypertensive (Morgan 1984) and nonhypertensive (Morris 1999; Schmidlin 1999) adults.

Emerging research is assessing the effects of the DASH eating pattern on other health outcomes associated with hypertension. For example, DASH has been shown to improve neurocognitive function among sedentary and overweight or obese individuals with prehypertension and hypertension (Smith et al 2010). Also, DASH plus exercise and weight loss improved not only blood pressure, but also insulin sensitivity and blood lipids (Blumenthal, Babyak, Sherwood, et al 2010), and cardiac functional measures (Blumenthal, Babyak, Hinderliter, et al 2010). Stay tuned as these interesting areas of research continue to develop.

Recommended Intakes

The Institute of Medicine Food and Nutrition Board set the Adequate Intake (AI) for potassium at 4,700 mg (120 mmol) per day for adults. The Dietary Reference Intakes (DRI) Committee noted the expectation that this level of intake should "maintain lower blood pressure levels, reduce the adverse effects of sodium chloride intake on blood pressure, reduce the risk of recurrent kidney stones, and possibly decrease bone loss." The body is quite efficient at getting rid of excess potassium in the urine. Therefore, the DRI Committee did not set a Tolerable Upper Intake Level (UL) for potassium. They noted certain conditions (e.g., impaired kidney function) and medications (e.g., ACE inhibitors, renin inhibitors, angiotensin receptor blockers, potassium-sparing diuretics, or aldosterone antagonists) that increase risk of potassium toxicity.

The IOM Committee on Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate determined that there were insufficient data from dose-response trials demonstrating the health effects of potassium, therefore neither an Estimated Average Requirement (EAR) nor a Recommended Dietary Allowance (RDA) could not be derived. The Adequate Intake (AI) is determined from observed usual intakes at which the adverse effects of insufficient potassium are absent.

Usual Intakes

Throughout life, Americans of all backgrounds, both male and female, consume less potassium than is recommended to maintain normal blood pressure. According to the 2007-2008 National Health and Nutrition Examination Survey (NHANES), people 2 years of age and older consume an average of only 2,509 mg potassium per day. Adult men who are 20 years and older eat and drink an average of 3,026 mg potassium per day, while women of the same age consume an average of 2,290 mg potassium daily. That is only 64 percent and 49 percent of the AI for men and women, respectively (NHANES). In fact, less than 2% of the U.S. adult population meets the AI of 4,700 mg potassium per day.

Potassium rich foods include fruits, vegetables, and food products made from them

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(juices, pastes, etc.). Based on usual serving sizes, baked potatoes (with skin), prune juice, carrot juice, tomato paste, cooked beet greens, white beans, tomato juice, plain nonfat yogurt, tomato puree, and baked sweet potatoes (with skin), are the 10 highest food sources of potassium. See Table 1. (DGAC table 2.14 or ARS Single Nutrient Report). Many dairy products and seafood products are also good sources of potassium.

The major sources of potassium in the American diet, however, are reduced fat milk, coffee, chicken/mixed chicken dishes, beef/mixed beef dishes, and orange/grapefruit juice (DGAC 2010; NCI 2010; McGill 2008). In total, these foods account for approximately 23 percent of potassium intake in the U.S. (NCI 2010). Because potassium is relatively ubiquitous throughout the food supply in small amounts, the remaining 77 percent is contributed by foods such as fried potatoes, potato chips, whole milk, other potato or pasta dishes, and dairy desserts, among other foods (NCI 2010). Bananas, for example, providing 422 mg/medium banana, contribute only two percent of the potassium in the U.S. diet. (USDA DB)

TABLE 1: GOOD SOURCES OF POTASSIUM ADAPTED FROM DGAC 2010, TABLE D2.14)

FOOD	Standard portion size	Calories in standard portion	Potassium (mg) in standard portion	Calories per 100 grams	Potassium (mg) per 100 grams
Potato, baked, flesh and skin	1 sm. potato	128	738	93	535
Prune juice, canned	1 cup	182	707	71	276
Carrot juice, canned	1 cup	94	689	40	292
Tomato paste	¼ cup	54	664	82	1014
Beet greens, cooked from fresh	½ cup	19	654	27	909
White beans, canned	½ cup	149	595	114	454
Tomato juice, canned	1 cup	41	556	17	229
Plain yogurt, nonfat	8 ounces	127	579	56	255
Tomato puree	½ cup	48	549	38	439
Sweet potato, baked in skin	1 medium	103	542	90	475
Plain yogurt, low-fat	8 ounces	143	531	63	234
Orange juice, fresh	1 cup	112	496	45	200
Halibut, cooked	3 ounces	119	490	140	576
Soybeans, green, cooked	½ cup	127	485	141	539
Lima beans, cooked	½ cup	108	478	115	508
Bananas	1 medium	105	422	89	358

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Getting More Potassium

Since potassium intake is highly correlated with energy intake, individuals who consume more calories generally have higher potassium intakes. However, increasing calorie consumption as a means to increase potassium consumption is unlikely to be a useful population-wide recommendation. It is well known that most Americans already consume more calories than they need.

Therefore, to meet a wide range of micronutrient needs, including potassium, individuals should aim to consume not only enough fruits (2 to 2 ½ cups), vegetables (2 to 2 ½ cups), and fat-free or low-fat dairy products (2 to 3 cups), but also the foods within those groups that are richest in potassium (Lin 2007; DGA 2005). Certain varieties of fish (sole, salmon, flounder, and sardines) can also provide a significant amount of potassium.

Choosing potassium-rich foods throughout the day is necessary to meet recommendations. For instance, standard portions of nonfat plain yogurt and bananas at breakfast, dates for a snack, white beans tossed into a salad at lunch, and halibut for dinner with tomato sauce, lentils, and beet greens on the side could provide over 4,000 mg potassium. With two cups of nonfat milk at meals, the daily potassium total could reach approximately 4,700 mg. It is also important to note that potassium leaches from vegetables into boiling water, particularly when the vegetables have been cut. Therefore, using dry heat methods improves the bioavailability of potassium and other nutrients while preventing losses in cooking water.

Bottom Line

Potassium is an essential mineral for normal cell function. Together with sodium, potassium plays a critical role in fluid homeostasis, with broad health effects. Potassium's role in lowering elevated blood pressure is increasingly well-documented. Foods that are rich in potassium (especially fruits, vegetables, dairy products, and seafood) include many other nutrients that may be beneficial for cardiovascular and general health. Most Americans do not consume enough potassium and consume too much sodium. Consequently, increased intake of potassium-rich fruits, vegetables, dairy products, and seafood is necessary to consume the recommended 4,700 mg per day.

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