

Heart Headlines

A professional resource on nutrition and heart health brought to you by the Promise® Institute for Heart Health Nutrition

Spotlight on Blood Pressure & Potassium

THE FOCUS



Diets high in potassium have been clinically shown to reduce blood pressure. This issue highlights the beneficial role of a potassium-rich diet in managing high blood pressure, a major risk factor in cardiovascular disease. In addition to cholesterol, blood pressure is a modifiable risk factor that greatly contributes to stroke, coronary heart disease, other cardiovascular diseases and kidney disease. This article is full of tips and suggestions to assist you in helping your patients reach recommended intake goals for potassium.

If people with high blood pressure were nickels, we'd all be rich. High blood pressure affects about 72 million people in the U.S. – that's nearly one in three adults. Pre-hypertension affects another 69 million adults, and nine out of 10 people will develop high blood pressure by the time they reach their 60s.¹ By way of quick review, remember that high blood pressure (HBP) is defined as systolic blood pressure (SBP) of 140 mmHg or higher, diastolic blood pressure (DBP) of 90 mmHg or higher, or both; and that pre-hypertension is blood pressure ranging between normal and high, indicating an increased risk of developing high blood pressure. Table 1 provides more details. As a modifiable risk factor, dietary choices can make a big difference.

Table 1

Classification of Blood Pressure for Adults ²		
Category	Systolic (top number)	Diastolic (bottom number)
Normal	Less than 120	Less than 80
Pre-hypertension	120–139	80–89
High blood pressure		
Stage 1	140–159	90–99
Stage 2	160 or higher	100 or higher

For people with diabetes and chronic kidney disease, blood pressure of 130/80 mmHg or greater is considered high.

The Evidence is in: Potassium Wins

Whether clinical or epidemiological in nature, a growing body of research supports the claim that high potassium

diets may significantly lower blood pressure. Findings from a meta-analysis of over 30 randomized-controlled intervention studies showed that both systolic and diastolic blood pressure was reduced in groups with relatively high levels of potassium supplementation.³ The median level of added potassium (from food or supplements) was 2933 mg/day. Systolic blood pressure (SBP) decreased by 3.11 mmHg (95% CI: 1.91 to 4.31), and diastolic blood pressure (DBP) decreased by 1.97 mmHg (95% CI: 0.52 to 3.42).

Results from another study,⁴ which reviewed 19 clinical trials, showed that oral potassium supplementation (mean intake 3354 mg/day, range 1872- 5460 mg/d) lowered SBP 5.9 mmHg (95% CI: 6.6 to 5.2) and DBP 3.4 mmHg (95% CI: 4.0 to 2.8). These results were seen in patients with normal and high blood pressure, though greater blood pressure lowering effects for potassium were seen in hypertensives compared to normotensives. The effects were greater with longer exposure to supplementation ($p < 0.05$ for SBP; $p < 0.01$ for DBP).

Similarly, the Dietary Approaches to Stop Hypertension (DASH) trial has shown that a diet rich in potassium and other nutrients can lower blood pressure. The DASH study used foods (versus isolated nutrients) rich in potassium, calcium and magnesium such as fruits, vegetables, whole grains and low-fat dairy. The DASH diet plan is also high in fiber and low in saturated fat, total fat, sodium and cholesterol. Significant reductions in blood pressure were seen in just two weeks – those with hypertension saw an

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What are the Signs and Symptoms of Hypertension?

Though some people report headaches, dizzy spells, and abnormal nosebleeds, typically there are no overt clinical signs of hypertension. That's why it's nicknamed "The Silent Killer." It's quick and easy to check blood pressure, and with a 1-in-3 rate of prevalence of hypertension among adults, everyone should! A qualified health professional should check it at least once every two years – more often if it's high or for people with certain co-morbidities (e.g. obesity, diabetes, cardiovascular disease, kidney disease).

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average decline in SBP and DBP of 11.4 mmHg and 5.5 mmHg, respectively ($p < 0.001$). Those with normal blood pressure also saw a significant decline in blood pressure: 3.5 mmHg ($p < 0.001$) and 2.1 mmHg ($p = 0.003$) for SBP and DBP.⁸ The initial study was done in four clinical centers with 459 participants with blood pressure $< 160/80-95$ mmHg, who ate one of three meal types: (1) a control diet which reflected a "typical" American diet (mineral intakes were 25% of recommendations for calcium, potassium, and magnesium); (2) a diet high in fruits and vegetables, but unchanged in macronutrients from the control; and (3) a diet high in fruits and vegetables and lower in saturated fat, total fat, and cholesterol. Sodium was kept at about 3 g/d across all three diets. This study found that the DASH eating plan lowered blood pressure in virtually all subgroups (e.g. race, sex, age, body mass index, education, income, physical activity level, alcohol intake, hypertension status).⁸

In a follow-up randomized trial, the DASH eating plan significantly lowered blood pressure beyond the effects of sodium restriction alone.¹⁰ The DASH trials provided the basis for the 2005 USDA Dietary Guidelines for Americans, which recommends 4700 mg/d potassium, especially for those with hypertension.

Population-based observational studies further support the positive role of potassium by showing that a high potassium diet is associated with a decreased

risk of stroke in people with normal and high blood pressure over the long term.^{5,6} The Intersalt study, a cross-sectional study of over ten thousand adult men and women from 52 diverse sites in 32 countries around the world, found that potassium excretion was independently associated with a reduction in blood pressure, even after adjusting for sodium excretion, body mass index and alcohol intake. This standardized, worldwide epidemiologic cross-sectional study showed that potassium intake as measured by 24 hour urinary potassium excretion is an important determinant of population blood pressure, independent of sodium. A 1173 – 1564 mg increase in potassium intake was associated with approximately a 2-3 mm Hg reduction of systolic blood pressure on a population level.⁷ Though there is still debate about the exact mechanism of action, most data points to potassium's ability to help the body eliminate sodium, the mineral most connected to high blood pressure.

The combined strength of clinical and observational data support that a high potassium diet helps control blood pressure. Recent reports from the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7),¹¹ and the 2006 American Heart Association (AHA) Scientific Statement: Dietary Approaches to Prevent and Treat Hypertension,²⁰ emphasize effective lifestyle modifications to lower blood pressure as initial or supplemental treatment for high blood pressure. The AHA statement specifically highlights how, over the past 10 years, increased potassium intake has emerged

Table 2

Lifestyle Modification to Prevent and Manage Hypertension*+		
Modification	Recommendation	Approximate Reduction in Systolic Blood Pressure (Range)
Increased potassium intake ²⁰	4700 mg/d	2-4 mmHg
Adopt DASH eating plan (Dietary Approaches to Stop Hypertension)**, ^{11,20}	Consume a diet rich in fruits, vegetables and low-fat dairy products and reduce intake of saturated fat and cholesterol.	8-14 mmHg
Dietary sodium reduction ^{11,20}	Reduce dietary sodium intake to no more than 2.4 grams sodium or 6 grams table salt	2-8 mmHg
Weight reduction (in those who are overweight or obese) ^{11,20}	Maintain normal body weight (body mass index 18.5- 24.9 kg/m ²)	5-20 mmHg/10 kg
Physical activity ¹¹	Engage in regular aerobic physical activity such as brisk walking (at least 20 minutes/day, most days of the week)	4-9 mmHg
Moderation of alcohol consumption ^{11,20}	Limit consumption to no more than 2 drinks (e.g. 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) per day in most men, and to no more than 1 drink per day in women and lighter weight persons.	2-4 mmHg

* For overall cardiovascular risk reduction, stop smoking

+ The effects of implementing these modifications are dose and time dependent, and could be greater for some individuals

** The DASH diet provides ~ 4700 mg/day based on the 2100 calorie meal plan.

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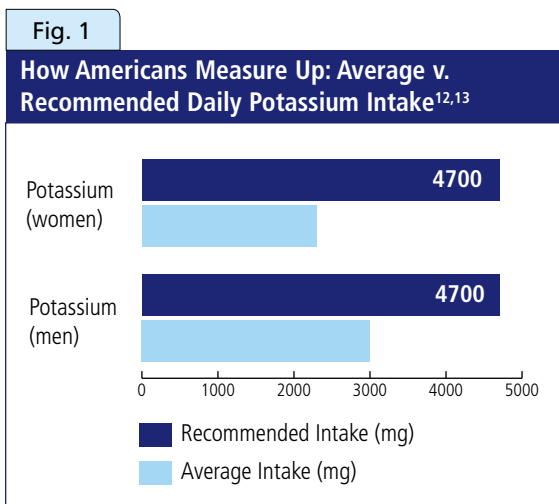
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as an effective strategy to lower blood pressure. Table 2 combines data from the JNC-7 and AHA reports to provide details on the blood pressure lowering effects of a high potassium intake, the DASH diet plan, dietary sodium reduction as well as other lifestyle changes such as: weight loss (in those who are overweight or obese); physical activity; and limiting alcohol consumption.

Dietary Changes for Reducing Blood Pressure: More Potassium Please!

Experts agree. Americans should be consuming more potassium, which abounds in the food groups that the 2005 US Dietary Guidelines encourage most Americans to eat more of, such as fruits, vegetables, whole grains, and fat-free or low-fat milk and milk products. The Guidelines recommend 4700 mg/d for most adults (table 3), but most Americans are only getting about half that (figure 1).

Sex	Age	Daily AI
M/F	1-3	3,000 mg
M/F	4-8	3,800 mg
M/F	9-13	4,500 mg
M/F	14-71+	4,700 mg
F	Pregnant	4,700 mg
F	Lactating	5,100 mg



Average intake for men (2800-3300 mg) and women (2200-2400 mg) approximated to 3050 mg and 2300 mg, respectively, in chart above.

In addition, when it comes to the American diet, the top 10 most common food sources of potassium may be less than ideal (table 4).

1. Milk
2. Potato products
3. Coffee
4. Beef
5. Tomato products
6. Orange/grapefruit juice
7. Bread
8. Poultry
9. Dried beans/lentils
10. Bananas

Ideally, the top food sources of potassium would include more fruits, vegetables, and low fat or fat-free dairy products. Unfortunately, while foods like milk, potatoes, coffee, beef, and tomatoes (the current top 5) may not seem especially unhealthy, it's important to keep in mind that Americans may very well be getting these foods in forms that are high in saturated fat, sodium, and calories such as french fries, whole fat milk, and/or coffee/coffee drinks. Not only do most people fall drastically short of daily intake goals, the little potassium they do get is more likely from coffee than fresh fruit. The difference between what we eat and what we should be eating reveals a major underlying challenge for health care professionals counseling their patients on dietary change: recommendations run counter to the typical American diet. For example, the DASH meal plan – a pattern of eating based on fruits, vegetables, whole grains, and low-fat dairy that has been proven to lower blood pressure – works much better in a controlled study environment than in everyday life. In real life, individuals may make poor dietary choices because of a number of influences including convenience, taste, habit, and more.

Mechanism for Potassium's Role in Controlling Blood Pressure

Recall that potassium is an essential dietary mineral, meaning that our bodies cannot produce it on its own and it must come from external sources (i.e. diet). It is the primary positively charged ion inside the cell, and

What Else Can Potassium Do For Me?¹⁷

- **Fluid Balance:** With sodium, potassium is involved in maintaining a normal water balance, osmotic equilibrium, and the acid-base balance.
- **Muscle:** In addition to calcium, potassium is important in the regulation of neuromuscular activity. Muscle formation and contraction requires potassium.
- **Cellular growth:** Potassium promotes cellular growth.
- **Bone Health:** Metabolic acids can weaken the integrity of the bone over time. Potassium-rich foods often contain potassium bound to bicarbonate anions, which can be utilized as buffers to neutralize metabolic acids. This process helps to spare the reserve of buffers that are part of bone structure. In this way, a potassium-rich diet may help maintain bone health.
- **Kidney health:** Potassium citrate attaches to calcium in the urine, preventing the urine from becoming too acidic. This helps prevent uric acid, which in turn, may help maintain kidney health.

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sodium is its counterpart outside the cell. Potassium concentrations are much higher inside the cell than out, and vice versa for sodium. The difference in concentrations creates an electrochemical gradient (aka, membrane potential), that keeps sodium and potassium where they're needed for optimal bodily function via a sodium-potassium pump. It uses ATP (energy) to pump sodium out of the cell in exchange for potassium – this process accounts for 20-40% of resting energy expenditure.

Clinical research has shown that diets high in potassium can significantly lower blood pressure, however, there is still debate about the exact mechanism of action. Most of the data points to potassium's ability to help the body eliminate sodium. Other potential mechanisms look at potassium's contributions to vasodilation resulting in greater blood flow volume in the absence of increased pressure. Potassium may also play a role in suppressing rennin and angiotensin secretion, decreasing adrenergic tone, and by stimulating sodium-potassium pump activity.¹⁶

For the general healthy population with normal kidney function, a relatively high potassium diet does not pose any health concern. However, individuals with impaired kidney function and those taking certain types of medication need to carefully control and/or limit their potassium intake. Patients should speak to their health care team if they have any concerns, especially those with diabetes, chronic kidney disease, advanced renal disease, severe heart failure, adrenal insufficiency, or those who are on medications such as angiotensin converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARB), or potassium-sparing diuretics.

Barriers to Change

It's hard to change any kind of habit! One study found that to eat according to the DASH eating plan, the typical diet would need to include: two times as many servings of fruits, vegetables, and dairy; half as much fat, oils, and salad dressing; a third less beef, pork, and ham; and a quarter less of sweets.¹⁹

Barriers are Meant to be Broken

Before a patient is ready to make therapeutic lifestyle changes, they will need ample motivation and confidence. And sometimes it takes more than knowing

what's good for you, so it can be helpful to focus on the "how," once your patients are convinced of the "why."

Barrier Busters to Share with Patients

- Increase motivation by encouraging patients to make a list of personal reasons to change, e.g., "for my health", "to reduce my risk of heart attack", or "because I love my grandkids, and want to see them grow up!" – encourage them to keep it in a wallet, on the fridge, or on a bulletin board.
- Eat more! More high-potassium foods, that is. Try bananas or raisins in your cereal, baby carrots with lunch, or a side of steamed broccoli with dinner. Snack time is a perfect opportunity to try something new – try opening up a pomegranate and snacking on the seeds, or try a handful of litchi berries (squeeze the rough outer skin until the sweet flesh pops into your mouth – kind of like what you might do with concord grapes or edemame). Check out table 5 and the 1-day sample meal plan for more high potassium food ideas.
- Keep an eye out for new food products that are healthy and provide another source of potassium; they can help make it easier to take control and increase potassium in the diet. Promise® SuperShots® for blood pressure is an essential fruit blend functional shot that is a good source of potassium and offers a convenient, great tasting way to increase daily intake of potassium. It is low in sodium, a good source of vitamin C and contains no saturated fat, trans fat, or cholesterol per serving. One 3 oz bottle contains 350 mg of potassium. Plus, they're 45-60 calories per serving. Diets containing foods that are good sources of potassium and low in sodium may reduce the risk of high blood pressure and stroke.
- Do some healthy housecleaning and restocking. Go through your pantry, refrigerator, car, desk, and anywhere else you keep food – get rid of common high-sodium culprits (processed and prepared foods) like canned soups, deli meats, microwave popcorn, soy sauce, frozen dinners, chips, and salted pretzels, and replace them with fruits, vegetables, and reduced or low-sodium versions of your favorite foods.
- Spice up your meals with herbs, spices, and citrus. A squeeze of lemon or lime at the end of cooking or at the table adds freshness and flavor to many dishes. Pestos can be prepared with healthy oils such as olive or canola oil and pureed fresh basil or cilantro.

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- If you're a fan of the salt shaker, try a potassium salt instead (check with your doctor first). If you can't part with regular table salt, try cutting down gradually. Your taste preferences for salt can adjust over time (give it a few weeks). If you're used to three shakes at the dinner table, try cutting down to two for a week, and then down to one shake at dinner the week after that.

Food, Standard Amount	Potassium (mg)	Calories
Sweetpotato, baked, 1 potato (146 g)	694	131
Tomato paste, ¼ cup	664	54
Beet greens, cooked, ½ cup	655	19
Potato, baked, flesh, 1 potato (156 g)	610	145
White beans, canned, ½ cup	595	153
Yogurt, plain, non-fat, 8-oz container	579	127
Tomato puree, ½ cup	549	48
Clams, canned, 3 oz	534	126
Yogurt, plain, low-fat, 8-oz container	531	143
Prune juice, ¾ cup	530	136
Carrot juice, ¾ cup	517	71
Blackstrap molasses, 1 Tbsp	498	47
Halibut, cooked, 3 oz	490	119
Soybeans, green, cooked, ½ cup	485	127
Tuna, yellowfin, cooked, 3 oz	484	118
Lima beans, cooked, ½ cup	484	104
Winter squash, cooked, ½ cup	448	40
Soybeans, mature, cooked, ½ cup	443	149
Rockfish, Pacific, cooked, 3 oz	442	103
Cod, Pacific, cooked, 3 oz	439	89
Bananas, 1 medium	422	105
Spinach, cooked, ½ cup	419	21
Tomato juice, ¾ cup	417	31
Tomato sauce, ½ cup	405	39
Peaches, dried, uncooked, ¼ cup	398	96

1-Day Meal Plan

Based on the DASH diet plan at the 2000-calorie level

BREAKFAST

Morning Goodness Smoothie

Blend together 2 oz. 100% orange juice, 1 bottle of Promise® SuperShots®, 1 cup low-fat plain yogurt, ½ cup mixed frozen fruit

Daily Bread

1 medium toasted whole wheat bagel with 1 tsp Promise® Light Spread

Tea Time

1 cup of tea with lemon

LUNCH

Stuffed Pita Delight

½ large whole wheat pita bread, stuffed with: ½ cup low-fat plain yogurt, 2 oz. broiled skinless chicken breast, 1 cup baby arugula, ½ cup shredded carrot, ¼ cup sliced red onion, ½ medium apple thinly sliced

Sticks & Bones

½ cup celery sticks with ½ cup low-fat plain yogurt mixed with favorite herbs
Sparkling water with lemon

DINNER

The Main Event

A bed of 1 cup brown rice, under 4 oz. herb-rubbed baked cod filet, topped with ½ cup lightly steamed asparagus tips. At the table, spritz lemon wedge over dish, as desired.

Sweet Somethings

Mix together 4 crumbled vanilla wafers, ½ cup non-fat vanilla yogurt, 1 bottle of Promise® SuperShots®, and top with 1 sliced medium banana, and sprinkle with cinnamon or nutmeg

SNACKS

Apples & Special Sauce

½ cup apple slices with dip: ½ cup non-fat vanilla yogurt mixed with 1 Tablespoon peanut butter

On the Go

¼ cup dried, unsweetened apricots with ¾ cup unsalted pretzels

Calories: 1930

Sodium: 2287 mg

Potassium: 5367 mg

DASH diet servings

Grains: 7, Vegetables: 4.5, Fruit: 6, Non-fat/Low-fat dairy: 3, Lean protein: 2, Nuts: 1, Fats: 1

New Promise® SuperShots® for Blood Pressure

An essential fruit blend functional shot to help achieve a diet rich in potassium.

- Diets containing foods that are good sources of potassium and low in sodium may reduce the risk of high blood pressure and stroke.
- Good source of potassium, contains 350 mg of potassium per serving, which is 10% of the Daily Value.
- Low in sodium.
- Consistent with the DASH eating plan.
- 45-60 calories per serving.



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