

**ABC<sub>s</sub>**  
of Kidney  
**Stones**

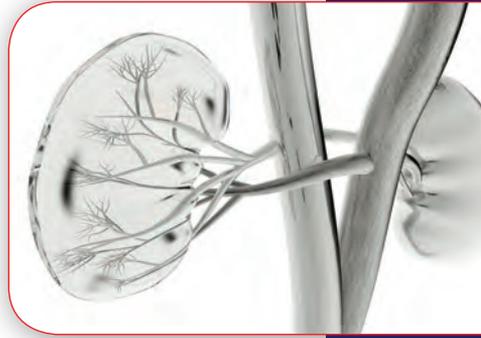
**A PATIENT'S GUIDE**

To Help Prevent  
Recurrent  
Kidney Stones





# Welcome



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## A practical, step-by-step approach to avoiding recurrent kidney stones

A group of medical experts in kidney stone disease has published a physician's version of *ABCs of Medical Management of Stones* for many years. Now, a new patient version is available just for people who have suffered from kidney stones. The objective of this brochure is to set forth simple and practical guidelines you can use in your daily life that will minimize your chances of developing another stone.

Following your doctor's advice is the most important thing you should do to manage your condition. The recommendations in this brochure are designed to augment, not replace, the advice of your doctor. If you have any questions about the content of this brochure, please ask your doctor.



## Q. Why do stones develop?

**A.** Different kinds of stones form in different people for different reasons. Some diseases like high blood pressure, diabetes, obesity, osteoporosis, or chronic diarrhea might increase the risk. Heredity also plays a role in the formation of some kinds of stones. Certain metabolic imbalances in your system, like too much (or too little) calcium or oxalate, a common component of foods, might be involved. Some medications and supplements, like guaifenesin (for coughs) and topiramate (for epilepsy or migraines), also increase the risk of stone formation.

But other important risk factors are directly related to diet and lifestyle. Obesity is a major risk factor. Dehydration that results from not drinking enough fluids is strongly linked to kidney stones, as are excessive salt intake and consuming too much animal protein (meat, poultry, and fish).

Not drinking  
enough water



High  
sodium intake



Animal  
protein



High  
temperatures



Certain  
medications



For stones to form, a person's urine needs to be supersaturated with stone-forming compounds. This means there are not enough fluids in your urine to dissolve the solid particles that can form stones. These compounds are also more likely to form crystals when the urine has low levels of substances called inhibitors. Inhibitors slow the formation and growth of stones. Citrate is one of the most important inhibitors.

## Q. Who gets stones?

**A.** A lot of people, even as far back as a 7,000-year-old Egyptian mummy discovered by scientists, have evidence of kidney stones!<sup>1</sup>

Every year, more than half a million people seek emergency treatment for kidney stone problems. Worldwide, 1 in 10 people might expect to have a kidney stone in their lifetimes. And over the past 30 years, they've become even more common, growing from less than 4% to more than 5% of the US population.<sup>1</sup>

If a person gets a stone, he or she has a 30% to 50% chance of getting another stone within 5 years.<sup>2</sup> The average rate of new stone formation in those who develop recurrent stones is 1 every 2 or 3 years.<sup>3</sup>

Although it was previously thought that men were 3 times more likely to form stones than women, recent evidence suggests that women are forming stones at an increased rate, and currently the male to female ratio of stone formation is only 1.3 to 1.<sup>4</sup>





## Q. How are stones treated?

**A.** There is no cure for kidney stones, but once the immediate pain of the passing stone or stone removal has been resolved, the key to therapy is simple: prevent recurrence. Fortunately, the most common types of stones (calcium and uric acid) can be effectively managed with a combination of medication and diet/lifestyle changes. Medicine includes thiazide diuretics, potassium citrate, and allopurinol in appropriate patients.

## Q. How can I avoid getting more stones?

**A.** Unless your stones are linked to a specific disease, the lifestyle and diet choices you make have a major impact on your likelihood of developing more stones. An overall strategy includes reaching and maintaining a healthy weight, and optimizing your diet. For most patients with stones, especially those due to calcium oxalate, dietary recommendations are neither complicated nor bland. The table at right provides a quick overview of dietary guidelines for preventing the recurrence of kidney stones. Following the table are a series of dietary guidelines that relate specifically to types of stones. The sheets are there for you to review with your doctor and learn which of the guidelines are appropriate for you.

A handy rule of thumb in eating to prevent stone disease is to avoid the *stone promoters* and focus on *stone-inhibiting strategies*. The following table shows a quick overview.

Stone promoters	Stone-inhibiting strategies
Not enough fluid intake, low urine output, high urine supersaturation	Drink at least 3 liters (quarts) of water or other low-sugar, low-calorie beverages daily, distributed throughout the day as much as possible
Too much salt intake	Restrict salt to 2000-2400 mg/day by reducing intake of processed foods, cheese, luncheon meats, salty snacks, and added salt
Too much animal protein (meat, poultry, fish)	Limit meat, poultry, and fish intake as needed to reduce targeted risk factors* identified by your doctor (such as high urine calcium or high urine uric acid); limit of 6 ounces per day is a good starting goal
Too much oxalate absorbed in the digestive tract (oxalate is commonly found in many plant foods)	<p><i>If you normally eat a lot of high-oxalate foods (spinach, beets, chocolate, nuts, seeds, and potatoes), reduce portion sizes and eat them less often<sup>5</sup></i></p> <p><i>If your diet is already low in high-oxalate foods, follow normal recommendations for dairy intake; it is important not to restrict calcium-containing foods because calcium binds with oxalate in your digestive tract to reduce the amount of oxalate in the kidneys</i></p>

*\*You may have only one risk factor for kidney stones or a combination of factors. Discuss your specific risk factors with your medical management team.*



## Q. What do fluids have to do with kidney stones?

**A.** It's the job of your kidneys to remove waste products from your body. Every day they collect about 2 quarts of waste products and extra water. The kidneys then turn this into urine. Each time you urinate, you are getting rid of the waste products and extra water.

To do their job right, the kidneys need lots of fluids. This is because fluids help to keep urine diluted enough to prevent crystals containing substances such as calcium and uric acid from forming. When urine is too concentrated or not “watered down” enough, kidney stones may form.

That's why it is important to drink lots of fluids. It helps flush out the kidneys and dilute the urine. That, in turn, helps prevent stones and all the pain they can cause.

## Q. How much fluid should I drink every day?

**A.** This varies greatly from one individual to another due to differences in physical activity, climate/temperature, etc. For most people, it is sufficient to drink at least 100 ounces of fluids daily (10 glasses, 10 ounces each, distributed throughout the day). This may sound like a lot, but it's really not. And it's one of the most important things you can do for your kidneys.



## Q. What kind of fluids should I drink?

**A.** Water is best, but you may also drink fruit juices, milk, and low-sugar/low-calorie beverages (especially if weight is a concern). Excess fluid intake from high-sugar beverages should be avoided—too much sugar in the diet, including sugars from beverages, has been linked to excess calcium in the urine. Alcohol in excess is also not recommended because it has the potential to cause dehydration.

Whatever you choose to drink, just do it! The key to preventing kidney stones is fluids, fluids, and more fluids.

## Q. What if I just don't feel thirsty?

**A.** Don't wait until you feel thirsty to drink fluids. By that time, you have already been without them for too long. Get in the habit of always having fluids with you. And be sure to eat foods that are high in fluids. These can include fruits, vegetables, and low-salt soups.

## Q. What are some tips to help me drink more fluids?

**A.** Try to incorporate some of the suggestions below into your daily life:

- Carry a special water bottle with you at all times
- Set an alarm clock on your desk to remind you when to drink fluids
- Drink a glass of water before going to bed
- Keep a 24-hour diary to record when you drink fluids
- Set a goal for how many ounces you want to drink per hour and try to reach it
- Drink a glass of water before and after every meal
- Try flavoring your water with lemon or lime juice or other low-sugar alternatives to make it more appealing



## Keep oxalate levels low

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Oxalate is a common compound in many plant foods. High levels of oxalate in the urine may be caused by eating a lot of high-oxalate foods, but it may also result from certain digestive disorders or chronic low intake of calcium. If you have been advised to reduce your consumption of dietary oxalates, see the table on the right for a list of foods with the highest oxalate values.

*Be sure to talk to your medical management team for more information, as there are many common misconceptions about oxalate content of foods, and to learn about strategies for optimizing your diet.*

## OXALATE-RICH FOODS<sup>6</sup>

FOOD ITEM	SERVING SIZE	OXALATE CONTENT (mg/serving)
Spinach, cooked	½ cup	755
Spinach, raw	1 cup	656
Rhubarb	½ cup	541
Rice bran	1 cup	281
Almonds	1 ounce or 22 kernels	122
Miso soup	1 cup	111
Baked potato with skin	1 medium	97
Corn grits	1 cup	97
Bulgur, cooked	1 cup	86
Beets	½ cup	76
Navy beans	½ cup	76
Cocoa powder	4 teaspoons	67
Hot chocolate (homemade)	1 cup	65
Bran flakes with raisins	1 cup	57

# Maintain calcium intake



To help reduce oxalate levels in the body, calcium is best obtained from food sources (see the table below for a list of some high-calcium foods). This is because dietary calcium binds with oxalate in the digestive tract before it can reach the kidneys. If you need to supplement with calcium, it is typically advisable to first calculate your typical daily intake of calcium from food sources and then use calcium supplements only for the remainder you need to reach the established Dietary Reference Intake (DRI). For most adults, current DRI guidelines recommend between 1000 and 1200 mg of calcium daily.

*Some individuals, such as those with certain digestive disorders, may need significantly more calcium. Please discuss your specific calcium needs with your medical management team.*

## CALCIUM-RICH FOODS<sup>7</sup>

FOOD ITEM	SERVING SIZE	CALCIUM CONTENT (mg/serving)
Low-fat yogurt	1 cup (8 oz)	415 <sup>†</sup>
Milkshake	1 cup (8 oz)	362
Pizza, cheese*	1/2 of 10-inch pizza	355
Eggnog, nonalcoholic	1 cup (8 oz)	330
Low-fat yogurt with fruit	1 cup (8 oz)	314 <sup>†</sup>

## CALCIUM-RICH FOODS (cont.)

FOOD ITEM	SERVING SIZE	CALCIUM CONTENT (mg/serving)
Sardines, canned	1/2 cup (3-1/2 oz)	303
Calcium-fortified beverages including orange juice, soy milk, and rice milk	1 cup (8 oz)	300
Milk (whole, low-fat, skim, or chocolate)	1 cup (8 oz)	300
Soups made with milk*	1 cup	150-290
Swiss cheese*	1 slice (1 oz)	272
Red salmon	1/2 cup (3-1/2 oz)	259
Ricotta*	1 ounce	257
Soft-serve ice milk	1 cup	236
Provolone*	1 ounce	214
Cheddar cheese*	1 slice (1 oz)	204
Pink salmon	1/2 cup (3-1/2 oz)	196
Cheese sauce, homemade*	1/4 cup	178
Ice cream or ice milk	1 cup	176
American cheese*	1 slice (1 oz)	174
Mozzarella*	1 ounce	147
Custard or pudding	1/2 cup	145
Mustard greens, cooked	1/2 cup	138
Cream pie	1 piece (1/8 pie)	137
Cottage cheese, creamed*	1 cup (8 oz)	136

\*These foods have higher sodium content and may not be the best sources of daily calcium.

†Calcium content varies widely by brand.

# Avoid excess sodium



High levels of dietary sodium (“salts”) may increase the amount of calcium excreted into the urine, which can increase the risk of stone formation. The Dietary Reference Intakes (DRIs) recommend no more than 1500 mg sodium per day for most adults. The real keys to reducing sodium intake are monitoring the nutrient labels of the foods you eat and limiting your intake of processed, convenience, and restaurant/takeout foods—as well as cheeses, lunch meats, salty snacks, canned soups and vegetables, and creamy dressings and sauces. Although some people use it more than others, the salt shaker typically provides only 10% to 15% of our total sodium intake.

The table below includes some common high-sodium foods. You can find the sodium content of specific foods and brands by searching the USDA Nutrient Data Laboratory Web site: <http://www.nal.usda.gov/fnic/foodcomp/search/>. Additional information is available at [http://www.ars.usda.gov/main/site\\_main.htm?modecode=12-35-45-00](http://www.ars.usda.gov/main/site_main.htm?modecode=12-35-45-00).

## SODIUM-RICH FOODS<sup>7</sup>

FOOD ITEM	SERVING SIZE	SODIUM CONTENT (mg/serving)
Teriyaki barbecue marinade	1 fluid ounce	4554
Table salt	1 teaspoon	2300
Salt, onion	1 teaspoon	1587

## SODIUM-RICH FOODS (cont.)

FOOD ITEM	SERVING SIZE	SODIUM CONTENT (mg/serving)
Salt, celery	1 teaspoon	1495
Meats and fish, canned	3-1/2 ounces	1357 avg (621-4393)
Salt, seasoning	1 teaspoon	1288
Pizza, cheese	1/2 of 10-inch pizza	1127
Soups, canned	1 cup	1081 avg (644-3864)
Soy sauce	1 tablespoon	1035
Smoked link sausage, pork	1 link (2-1/2 oz)	1012
Pickles (all varieties)	1 large (3-1/2 oz)	920 avg (506-1426)
Cottage cheese, creamed	1 cup	851
Vegetable juices, canned	1 cup (8 oz)	736
Ham, cured, cooked	3-1/2 ounces	713
Frankfurter (all varieties)	1 frank (1-1/2 oz)	506 average
Cheese, processed	1 ounce	414 avg (391-437)
Vegetables, canned with salt	1/2 cup	368 avg (115-667)
Sausage, pork, cooked	1 patty (1 oz)	345
Bacon, cured, cooked	3 slices	345
Cheese food, processed	1 ounce	322 avg (253-437)
Chips and snacks	1 ounce	322 avg (138-851)
Salami (all varieties)	1 slice (1 oz)	299 average
Bologna (all varieties)	1 slice (1 oz)	276 average
Cheeses, natural	1 ounce	207 avg (46-460)

# Maintain high magnesium intake



Higher dietary magnesium intake is associated with reduced stone risk. Magnesium helps to reduce the excretion of oxalate in the urine, and may also help to keep oxalate from binding to calcium in urine and forming calcium oxalate or calcium phosphate stones.

The Dietary Reference Intake (DRI) for magnesium is 320 to 360 mg/day for most adult women and 400 to 420 mg/day for most adult men. To learn the specific magnesium values for the foods you eat, search the USDA Nutrient Data Laboratory Web site: <http://www.nal.usda.gov/fnic/foodcomp/search/>.

## MAGNESIUM-RICH FOODS<sup>7</sup>

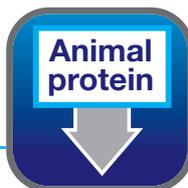
FOOD ITEM	SERVING SIZE	MAGNESIUM CONTENT (mg/serving)
Peanuts, all types, roasted	1/2 cup	131
Tofu, raw, regular	1/2 cup	127
Peanuts, all types, raw	1/2 cup	123
Broccoli, cooked	2 large stalks	120
Spinach, cooked	1/2 cup	79
Chard, Swiss, cooked	1/2 cup	76

## MAGNESIUM-RICH FOODS (cont.)

FOOD ITEM	SERVING SIZE	MAGNESIUM CONTENT (mg/serving)
Soybeans, cooked	1/2 cup	74
Tomato paste, canned	1/2 cup	67
Simulated meat products, meat extender	1 ounce	61
Small white beans, cooked	1/2 cup	61
Sweet potato, canned, mashed	1/2 cup	61
Black beans, cooked	1/2 cup	60
Dock (sorrel), cooked	1/2 cup	60
Nuts & seeds, all types	1 ounce	60 avg (9-152)
Pumpkin seeds	1 ounce	152
Chestnuts	1 ounce	9
Chili with beans, canned	1/2 cup	58
White beans, cooked	1/2 cup	57
Baked beans	1/2 cup	55
Navy beans, cooked	1/2 cup	53
Peanut butter	2 tablespoons	51
Succotash, cooked	1/2 cup	51

## Other dietary recommendations

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### ACID-ASH FOODS

Meat, fish, and poultry of all kinds are considered acid-ash foods. Minimizing your intake of these foods may be especially important if you have a history of uric acid stones. High intake of animal protein increases uric acid in the urine, which in turn promotes both calcium oxalate and uric acid stones. Acid-ash foods can also reduce the amount of urinary citrate, an important stone inhibitor.

### STONE INHIBITORS

Fruits and vegetables collectively provide many stone inhibitors that may prevent all types of urinary tract stones. These inhibitors include potassium, magnesium, fiber, citric acid, phytate, and antioxidants. Eating at least 5 servings of a variety of fruits and vegetables every day may not only prevent you from forming more kidney stones, but also keep you healthy in other ways.



In conclusion, whether you are a first-time kidney stone patient or a recurrent stone former, it is important to remember that there is no “one size fits all” diet for stone prevention. Talk to your physician or medical team about your need for a full metabolic or medical evaluation, including a consultation with a registered dietitian, to help develop a diet tailored to your specific situation.

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## References

1. A to Z health guide. Kidney stones. National Kidney Foundation Web site. <http://www.kidney.org/atoz/content/kidneystones.cfm>. Accessed April 13, 2010.
2. Hall PM. Nephrolithiasis: treatment, causes, and prevention. *Cleveland Clinic J Med*. 2009;76:10,583-591.
3. Asplin JR, Coe FL, Favus MJ. Nephrolithiasis. In: Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, Loscalzo J, eds. *Harrison's Principles of Internal Medicine*. 17th ed. New York, NY: McGraw Hill Medical; 2008:1815-1820.
4. Scales CD Jr, Curtis LH, Norris RD, Springhard WP, Sur RL, Schulman KA, Preminger GM. Changing gender prevalence of stone disease. *J Urol*. 2007;177:979-982.
5. Mayo Clinic Health Letter discusses kidney stone treatment options [news release]. Rochester, MN: Mayo Clinic Health Letter; September 17, 2009. <http://www.news-medical.net/news/20090917/Mayo-Clinic-Health-Letter-discusses-kidney-stone-treatment-options/>. Accessed March 11, 2010.
6. Oxalate table of foods. Harvard School of Public Health Nutrition Department Web site. <http://regepi.bwh.harvard.edu/health/oxalate/files>. Accessed November 23, 2010.
7. Bradley L, et al. General guidelines in medical management. In: Resnick MI, Pak CYC, eds. *Urolithiasis: A Medical and Surgical Reference*. Philadelphia, PA: WD Saunders and Company; 2009:chap 11.

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