

Nutrition for Kidney Stones



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Overview

Kidney stones are more common than most people realize. Nearly 10% of the population will experience a kidney stone at some point in their life. Kidney stones are twice as common in men and are responsible for 1% of all hospitalizations in the United States. These small stones form in the kidney and may get lodged in the urinary tract - irritating the tissue and sometimes blocking the flow of urine and leading to a very painful experience (as known as renal colic) or possibly a kidney infection (pyelonephritis). Stones are mainly composed of mineral salts. When the concentration of these compounds in the urine is high, crystals form and grow into a 'stone' over an indefinite amount of time. In addition to the prevalence in our society, about half of all people who are treated for a kidney stone will have a recurrence within 10 years. The good news is that there is a close link between nutrition and successful prevention of most stones.

Kidney stones can develop in four different compositions:

1. **Calcium** – oxalate or phosphorus (~90% of all stones)
2. Uric Acid
3. Struvite or triple phosphate stones
4. Cystine

Nutrition factors are important in dealing with both Calcium and Uric acid stones. We will focus on these two types but also address steps to take for prevention or treatment of kidney stones in general. Please consult with your physician or

dietitian regarding which dietary changes might work best for you.

Fluids

Whatever type of kidney stone you may develop, the best and often most effective treatment is to drink plenty of fluids.

Why types of fluids should I consume?

Water is the most efficient way to dilute the urine - at least half of your fluid intake should be from water. Other beverages and foods do count towards your fluid intake. In fact, anything that is liquid at room temperature is considered 100% fluid.



- ☐ This includes: Milk, tea, coffee, juice, soda, soups, jello, ice cream.

Citrus fruit juice, especially orange juice and lemon juice (lemonade), may help *prevent kidney stones* by decreasing the crystallization of uric acid & calcium oxalate in the urine. Include 2-3 glasses per day in addition to other dietary changes to reap the benefits.

In contrast, studies have shown that **grapefruit juice** *increases the risk of developing a stone*. So if you include this beverage in your diet & have recurring kidney stones, it would be wise to cut back or avoid.



Should I avoid caffeinated beverages?

This is a very popular question as caffeine has a reputation of being a mild diuretic. However, the latest research shows that caffeine has almost no effect on our hydration status. Therefore, it is OK to include caffeinated beverages in your diet in moderation. However, coffee, tea, and cola do contain oxalate so if you are prone to developing calcium oxalate stones, try to limit your intake to no more than one cup per day.

What about alcohol?

Alcohol by itself might not increase your risk of developing a kidney stone. However, alcohol can make you more prone to dehydration. In addition, it can inhibit excretion of uric acid by the kidneys. Therefore, if you have gout, a condition which already impairs uric acid metabolism and can increase likelihood of uric acid stones, you will want to limit your alcohol consumption to no more than one alcoholic drink per day.

How many cups of fluid should I drink per day?

Make sure to drink at least 6-8 cups throughout the day or more (up to 12 or more 8-ounce glasses) in hotter weather to compensate for fluids lost in sweat.

How do I know if I'm getting enough?

A good way to measure your hydration level is by the **color** of your urine. There are exceptions, but if it is colorless or pale yellow, you are probably getting enough fluid.

Your body will also help you. When you are 'under hydrated' (or dehydrated) your body will trigger a thirst mechanism that will encourage you to drink. You can also tell if you are well hydrated if you rarely feel thirsty and produce about 1.5 liters (about 6 cups) urine per day.



Unfortunately, that is often not enough as the goal is approximately 2-2.5 liters of urine output a day (or more depending on body size). So, you must not rely on suppressing your thirst response alone and be aware of the great importance of drinking plenty of fluid in order to maintain this high urine output and protect you from forming stones.

The lower the urine output, the more stagnant the urine is, the more time there is for elements to interact and crystallize leading towards stone formation.

Calcium Stones

Calcium stones are **not** caused by too much calcium in the diet. This is a common misconception. Although it sounds counter intuitive, a *low calcium intake (less than 850 mg/day) might increase the risk of developing a stone*. In addition, too little calcium in the diet over a long period of time can result in loss of bone mass and osteoporosis.

Research has shown that calcium has a protective effect by binding to oxalates in the gut and preventing their absorption. If there is not enough calcium, oxalates are more readily absorbed and more available to develop stones. Therefore, it is important to ensure you are getting enough calcium (1,000 - 1,200 mg/day) and in many cases, reduce the amount of oxalate in your diet. Try to consume at least two servings of these high calcium foods every day.

Significant Food Sources of Calcium*:

Dairy**

- Milk, 1 cup: 250-300 mg
- Yogurt, 1 cup: 250-400 mg
- Cheese, 1.5 ounce: 300 mg
- Pudding, 0.5 cup: 150 mg
- Ice cream, vanilla, 0.5 cup: 85 mg





Fish

- Canned sardines, 3 ounces: 325 mg
- Canned salmon with bones, 3 ounces:
180 mg

Vegetables (leafy green)

- Spinach (cooked), 0.5 cup: 120 mg
- Kale, 1 cup: 90 mg

Other

- Tofu (made w calcium sulfate), 0.5 cup: 140-200 mg
- Soy beverage, calcium fortified, 1 cup: 80-500 mg
- Ready-to-eat fortified cereal, 1 cup: 100-1,000 mg
- Orange juice, calcium-fortified, 6 ounces: 200-260 mg

* Values taken from the USDA Nutrient Database.

** Calcium content varies slightly by fat content. The more fat, the less calcium the food contains.

Your doctor may recommend a calcium supplement but do not take without supervision. Supplementation has been shown to help decrease stones when taken with meals only, especially in the calcium citrate form.

Oxalates

Oxalate is a naturally occurring substance found in plants, animals, and humans. Although difficult to completely eliminate, the daily intake of oxalates should be minimized especially in those prone to forming calcium oxalate stones.

Foods High in Oxalate to minimize:

- Fruits
 - blackberries, blueberries, raspberries, strawberries, currants, kiwifruit, concord (purple) grapes, figs, tangerines, and plums
- Vegetables
 - spinach, Swiss chard, beet greens, collards, okra, parsley, leeks, rhubarb
- Nuts and seeds
 - almonds, cashews, and peanuts
- Legumes
 - soybeans, tofu and other soy products
- Grains
 - wheat bran, wheat germ, quinoa
- Other
 - beer, cocoa, chocolate, black tea, instant coffee (more than 8 ounces/day)



A Note on Vitamin C Supplements....

Research shows that high doses of vitamin C can increase your risk of stone formation. This is because vitamin C is converted to oxalate in your body. To avoid this risk, it is important to **stay below 2,000 mg/day of vitamin C** with a goal of closer to 1,000 mg through a dietary source. The majority of people exceed this amount if they are taking supplements, usually not via diet alone. Make sure to tell your doctor or dietitian about all vitamin and mineral supplements you are taking. A well-balanced diet should provide all the vitamins you need and excessive supplementation without physician oversight can lead to stone formation and other problems.



Sodium

To reduce the risk of developing a calcium oxalate kidney stones it is helpful to reduce the amount of sodium in your diet. Extra dietary sodium intake leads to the loss of more calcium in the urine. Therefore, more sodium = less calcium = more oxalate available to potentially form a stone.

The first step to reducing sodium in your diet is cutting out the salt shaker. One teaspoon of salt is equivalent to about 2,300 mg of sodium chloride, which is the maximum amount of sodium experts recommend per day!



The main source of sodium in our diets comes from processed and prepared foods. Sodium is used as a preservative and taste enhancer to extend the shelf-life of many foods - those that are frozen, canned, and cold cuts, specifically.

Try to minimize these known sodium culprits!

- **Salted snack foods:** popcorn, nuts, pretzels, potato and other chips
- **Condiments:** soy sauce, BBQ sauce, steak sauce, anything with salt in its name (garlic, sea, onion), gravy, sauce mixes
- **Cured, canned, smoked, or processed meats and fish:** anchovies, ham, lunch meats, lox, sausage, bacon, hot dogs
- **Canned entrees and soups:** bouillon, broth, consommé
- **Cheese:** regular processed and spreads, pizza
- **Boxed convenience foods:** Instant rice or noodle, stuffing or casserole mixes
- **Fast Food:** commercial hamburgers, pizza, tacos, Chinese food
- **Pickles, relishes, olives, and other pickled vegetables**



Become Label Savvy

Many of the above food products are now available in low sodium versions. Here are the phrases you will see on food packages and a good rule of thumb is to still to <140 mg of sodium/serving. Something that is 'lightly salted' may be double that amount so it is important to know these phrases to become food label savvy.

- **Sodium-free:** less than 5 mg per serving

- **Very low sodium:** 35 mg or less per serving or, if the serving is 30 grams (g) or less or 2 tablespoons or less, 35 mg or less per 50 g of the food

- **Low-sodium:** 140 mg or less per serving or, if the serving is 30 g or less or 2 tablespoons or less, 140 mg or less per 50 g of the food
- **Light in sodium:** at least 50% less sodium per serving than average reference amount for same food with no sodium reduction
- **Lightly salted:** at least 50% less sodium per serving than reference amount

- **Reduced or less sodium:** at least 25% less per serving than reference food

Uric Acid Stones

Uric acid is a breakdown product of purines, which are found in protein-containing foods. Increased uric acid makes the urine more acidic which is a persistent problem for people suffering from gout and therefore, they are more likely to develop this kind of stone.

Foods High in Purine to Avoid:

- **Organ Meats**
 - Liver, sweetbreads, brain, kidneys, heart
- **Fish**
 - Anchovies, herring, sardines, fish roe, mussels
- **Other**
 - Gravies, broths, beer, wine

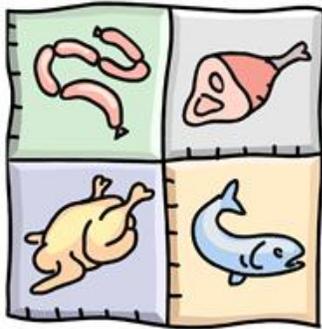


Foods Moderate in Purine (limited to one serving per day for those who develop uric acid stones):

- **Vegetables**
 - Peas, cauliflower, beans, asparagus, mushrooms, spinach

- **Grains**
 - Lentils, yeast, whole-grain cereals
- **Meats, fish, fowl (except as listed above)**

Protein



The majority of Americans consume double the amount of protein they need for the day. Some research indicates that this excess can increase your risk for developing stones, especially protein from animal sources.

To figure out the amount of protein you need per day, take your weight in pounds and divide by 2.2 to get your weight in kilograms. Multiply that by 0.8 to get the grams of protein you need per day. You should not restrict below this number, just DO NOT consume in extreme excess of this on a daily basis.

If most of your meals contain animal protein (beef, poultry, pork, fish, dairy, and eggs) you might want to scale back or reduce the frequency of consumption.

1 ounce = 7 or 8 grams of protein.

Serving Size	Food Choice
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1 ounce	Poultry, fish, beef, veal, pork (fresh or frozen)
¼ cup	Canned salmon, tuna Cottage cheese Fresh shellfish: crab, oyster, lobster, clams
1 large	Egg (or 2 egg whites or ¼ cup substitute)
5 large	Shrimp
½ cup	Tofu

Additional Considerations

Extreme Dieting



Every day it seems as though there is another fad diet which has hit the market - low carbohydrate, liquid diets, very low calorie meal plans, the list is endless. Any quick weight-loss diet can increase your risk for developing a kidney stone. This is because weight loss causes a turnover of your body tissue and the breakdown of this tissue results in products such as uric acid, oxalates, and other acids. Consequently, when weight loss is

rapid, an excess of these byproducts can result in increased stone formation. In addition, weight loss drugs which inhibit fat absorption, such as Orlistat, can increase urinary oxalate. If you are trying to lose weight for medical reasons, seek out the advice of your physician or a dietitian to help you reach your goals in the healthiest way possible.

Eating Disorders

People who suffer from eating disorders are also at increased risk for stone formation. Whether it is anorexia, bulimia, or binge eating, all of these conditions affect the chemical balance of your body. Stone formation is likely the least of the medical problems that can occur but is worth mentioning in this context.

With both extreme dieting and eating disorders the medical problems that can occur have the potential to be life threatening. Seek the counsel of a physician or dietitian to determine if the way you are eating is negatively affecting your health.

Pregnancy

During pregnancy, our bodies take calcium from wherever they need it to supply to the fetus. More calcium is absorbed from the intestines therefore, more oxalate is available in the lower intestine. The pregnant woman also makes more citrate and



other natural inhibitors of kidney stones. However, it is still possible to have an increased likelihood of developing kidney stones.

As stated in the Calcium section previously, restricting calcium intake will not reduce your risk of developing a stone. Most prenatal vitamins will provide the calcium needed which ranges from 1000-1500mg depending on the woman's age. However, a low oxalate diet might be warranted.

Another factor could be dehydration. During pregnancy, fluid needs are higher but many women will actually limit the amount of fluids they consume to minimize bathroom trips. Make sure you are drinking enough to make at least 2 liters of urine per day, especially during the last trimester.

Conclusion

The first line of prevention for all types kidney stones is to ensure you are drinking adequate fluids. You may have heard of the three most important things in real estate: location, location, and location... Well, when it comes to kidney stones the **three most important things to remember: DRINK, DRINK, and DRINK.** From there, you can make additional dietary changes depending on the type of stone you are prone to develop based on the information in this guide. Remember, not all of the pieces may make sense for you based on your individual needs. So be sure to consult with your physician regarding which changes may be most beneficial for you.

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