

## Kidney Stones and Diet

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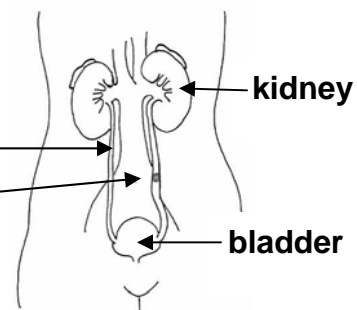
### What are kidney stones?

Urine is made up of water and substances such as calcium, oxalate and uric acid. Crystals begin to form first in the kidney when:

- there are higher than normal amounts of these substances in the urine
- the amount of water in the urine is low which makes the urine concentrated

The crystals get bigger and bigger as more substances build up around them. They are then called stones.

Stones may stay in the kidney or move down the **ureter** to be sent out of the body in the urine. Some **kidney stones** are too big to pass out in the urine. They may block the flow of urine from a kidney to the bladder and need to be removed by surgery.



Kidney stones are common. They tend to re-occur. Stones can be tested to find out what they are made of. About 80% of kidney stones contain calcium. The most common type of stone is calcium oxalate. Some stones are made of uric acid.

### How do I know I have a stone?

Kidney stones often cause severe back pain. The pain may move to the groin as the stone moves down. You may see blood in your urine.

### How are kidney stones diagnosed?

A CT scan of the kidneys, ureters and bladder can show the presence of most stones. An ultrasound or a dye injection can also show the size of a stone.

## How are kidney stones treated?

Most stones pass in urine on their own. When stones have to be removed, a treatment called Extra-Corporeal Shock Wave Lithotripsy (ESWL) can be used for very small stones. By using high energy shock waves, ESWL crushes the stone into fine sand which passes out in the urine. Large stones can be removed by surgery. Whether passed or removed, all stones should be sent to a lab to find out what they are made of.

Your stone is made of \_\_\_\_\_ ☐ not analyzed ☐ unknown

## Who gets kidney stones?

In the past 30 years research has shown that men and women of all ages get kidney stones. Kidney stones also seem to run in families. You have a higher chance of getting a stone if someone in your family has had one in the past.

People who are overweight, obese or have type 2 diabetes have a higher chance of forming kidney stones. Research has also shown that people who do not follow healthy eating habits of moderation and tend to over eat certain foods are often more at risk to get kidney stones since diet affects the type of substances found in urine.

People who have high urine calcium, oxalate, uric acid and salt and a low urine volume and citrate in their urine increase the chance of forming stones.

Diet management focuses on what type of kidney stone you have and your risk factors.

## What is a 24-hour urine collection?

A 24-hour urine collection is a test done to measure the amount of urine you make over 24 hours. The amount of calcium, citrate, oxalate, uric acid and salt are then measured. These amounts are compared with normal urine. This test helps people know when they are at risk for forming stones in the future.

## 24-hour Urine Collection

Normal 24-hour urine	Your test numbers	Your risk ↑ = high risk ↓ = low risk
Volume more than 2000 ml		
Calcium less than 7.5 mmol		
Citrate 1.5 to 6.0 mmol		
Oxalate less than 440 µmol		
Sodium 100 to 150 mmol		
Uric acid less than 4.0 mmol		

### Can I change my diet to lower my risk?

People who change their diets can reduce the risk of forming stones in the future by almost half. This includes eating less animal protein, eating less salt, eating the recommended amount of calcium and increasing the volume of urine to normal (more than 2000 ml a day).

### What do I need to learn about my diet?

There are 6 things to learn about:

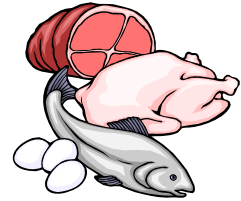
- animal protein
- calcium
- oxalate
- fluids
- salt
- potassium

Your diet plan is based on your risk factors and the type of kidney stone you had.

## Animal Protein

There are 2 types of animal protein:

- flesh protein such as meat, fish and poultry
- non-flesh protein such as eggs and dairy products



When you eat a lot of flesh protein, you increase the amount of calcium, oxalate and uric acid in your urine. A high flesh protein diet also lowers the amount of citrate in urine. Citrate helps your body stop stones from forming naturally.

The total amount of protein you need is based on your body size. A large person needs more protein than a small person.

### **Lower the amount of animal protein you eat:**

- Limit meat, fish and poultry to 4 to 6 ounces (120 to 180 grams) a day
- Try to spread the protein you eat through the day
- Avoid a large dinner late in the evening
- Avoid liver, kidney and other organ meats
- Avoid sardines, anchovies, herrings, gravy and meat extracts such as Bovril<sup>®</sup> and Marmite<sup>®</sup>
- Meat and chicken based broth soups are the same as eating meat.

Ask your dietitian to help you decide how much you can eat. This is based on what your healthy body weight should be.

## Calcium

Dairy products are good sources of calcium. Adults less than 50 years old need 1000 mg of calcium in the diet each day to keep bones healthy. Adults 50 years old and over need 1200 mg of calcium a day. This prevents bone loss and lowers the risk of fractures in the future.



Try to get the recommended amount of calcium in your diet. Choose 2 to 3 servings of dairy products everyday. You should not cut milk and other dairy products completely from your diet.

Avoid calcium supplements and antacids such as Tums<sup>®</sup> and Roloids<sup>®</sup> as they contain calcium. If you need to take calcium supplements, take them with meals. Before you start taking calcium supplements, talk to your health care provider or dietitian to learn the things you can do to avoid forming kidney stones. You need to make sure that you have good urine volume.

Vitamin D helps you absorb more calcium from your diet. Vitamin D is found in milk, yogurt and some fish. Try to get Vitamin D from your diet. Avoid Vitamin D supplements, cod liver oil and halibut oil as they increase calcium in urine and increase the risk of forming kidney stones. If you need to take Vitamin D supplements talk to your health care provider or dietitian to learn the things you can do to avoid forming kidney stones. You need to make sure that you have good urine volume.

Use the list of calcium rich foods below to make sure you have the recommended amount of calcium each day from your diet. The amount of calcium you should have from this list depends on the amount you need to have each day based on your age and health. Most people need to aim to have between 700 and 800 mg of calcium from this list each day.



You can choose a combination of food to get the amount you need. The rest of your calcium can come from foods not on this list.

Food	Amount of Calcium	Food	Amount of Calcium
milk 1 cup (250 ml)	300 mg	macaroni and cheese 1 cup (250 ml)	300 mg
yogurt ¾ cup (175 ml)	200 mg	ricotta cheese ½ cup (125 ml)	300 mg
cheese 1 ounce (30 gm)	200 mg	pizza – 2 slices	300 mg
ice cream ½ cup (125 ml)	100 mg	salmon with bones ½ cup (125 ml)	300 mg
pudding ½ cup (125 ml)	150 mg	cottage cheese ½ cup (125 ml)	75 mg
buttermilk 1 cup (250 ml)	300 mg	tofu – raw ½ cup (125 ml)	125 mg
broccoli ½ cup (125 ml)	75 mg	tofu – firm ½ cup (125 ml)	260 mg

When your diet is very low in calcium, your body will absorb more oxalate. From your daily allowance, use high calcium foods in small amounts with each meal. This helps calcium and oxalate to bind together. You will then absorb less oxalate. Also choose low fat dairy products to lower the amount of saturated fat in your diet.

## Oxalate

If your urine oxalate is high, avoid foods very high in oxalate. They increase oxalate in urine. A high oxalate in urine increases your risk for stones more than high calcium in urine.

### Foods very high in oxalate

- |                                      |  |                                      |
|--------------------------------------|--|--------------------------------------|
| <input type="checkbox"/> spinach     | <input type="checkbox"/> wheat bran    | <input type="checkbox"/> tea         |
| <input type="checkbox"/> rhubarb     | <input type="checkbox"/> leeks         | <input type="checkbox"/> green tea   |
| <input type="checkbox"/> swiss chard | <input type="checkbox"/> peanut butter | <input type="checkbox"/> instant tea |
| <input type="checkbox"/> beets       | <input type="checkbox"/> chocolate     |                                      |
| <input type="checkbox"/> nuts        | <input type="checkbox"/> sweet potato  |                                      |

The longer the tea steeps the more oxalate the tea has. Stirring tea also increases oxalate. You absorb more oxalate from black tea than from tea with milk. If your oxalate is high, do not drink more than 1 to 2 cups (250 ml to 500 ml) of weak tea with milk a day.

Try herbal tea instead such as peppermint, lemon, camomile, mint and apple cinnamon.

Avoid using products such as cranberry concentrate pills that are sold in health food stores as beneficial for kidney urinary health. These can increase the risk of forming kidney stones.

## Vitamin C

You need 75 to 90 mg of Vitamin C a day. You can get Vitamin C from oranges and orange juice.

Vitamin C supplements may increase oxalate in urine in some people. It is better to avoid Vitamin C supplements if you have high oxalate in your urine or you make calcium oxalate stones.



## Fluids

**You need to drink at least 2500 to 3000 mls of fluid every day to increase urine volume and to dilute the stone forming substances in urine.**

Your goal is to produce more than 2 litres of urine each day. You produce less urine than the amount of fluid you drink so you have to drink a lot to produce 2 litres of urine.

Drink 10 to 12 glasses of fluid every day. One glass is 8 ounces or 250 ml. You need to have 5 to 6 glasses of water and the rest can be coffee, tea, milk, pop and juice. You can have cranberry juice in small amounts such as 1 to 2 cups (250 ml to 500 ml) a day. Avoid grapefruit juice.

Another good drink to have is lemon water. Mix  $\frac{1}{2}$  cup (125 ml) of lemon juice with water to total 2 litres. Include this in your total fluid intake as you drink it. This may help increase citrate in urine and lower the risk of forming kidney stones.



Avoid pop with phosphoric acid such as Coca Cola, Dr. Pepper and Root Beer. Drink pop with citric acid such as Gingerale, 7-Up, Mountain Dew, Creme Soda, Orange Crush, Grape Crush, and Tonic water. Avoid Pepsi as it contains both phosphoric and citric acid. Limit the amount of pop you drink. Pop is sweetened with high fructose corn syrup which is high in fructose. Fructose can increase the risk of forming kidney stones.

Drink fluid throughout the day. Drink with meals and in between meals. If you wake up at night to urinate, drink 1 to 2 glasses of water.

You need more fluid on a hot day or after exercise. When you have heavy sweating, you pass less urine unless you drink more. To avoid gaining weight, have diet drinks and water.



## **Salt (Sodium)**

Reduce salt in your diet. It may help lower calcium in your urine. Avoid using a salt shaker and use less salt when you cook. Use foods with less salt and choose salty food less often.

Foods high in salt are canned and packaged soups, deli meats, sausages, bacon, corned beef, sauces, pickles, fast foods and processed foods. Healthy people should limit their salt intake to less than 2300 mg a day. Read labels to compare the amount of sodium (salt) in food products.

## **Potassium**

Choose plenty of low oxalate fruit and vegetables to increase potassium in your diet and lower the risk of kidney stones.

Some examples of low oxalate fruit and vegetables are asparagus, corn, carrots, cauliflower, peas, bananas, apples, pears, peaches, prune plums.

## Weight Control and Exercise

Try to maintain a healthy weight. Eat in moderation and follow healthy eating habits to help you control your risk factors. Exercise also helps control weight. If you have other health problems, talk to your health care provider about starting an exercise program that is right for you.



## Remember

- Less urine + more stone forming substances → concentrated urine → kidney stones ☹️
- More urine + less stone forming substances → diluted urine → no kidney stones 😊

## To Prevent Kidney Stones:

- Drink a lot of fluids to increase urine volume.
- Drink the right kind of fluids.
- Reduce the amount of meat, fish and poultry you eat.
- Have 2 to 3 servings of dairy products to get the normal amount of calcium each day.
- Reduce foods high in oxalate.
- Reduce salt.
- Eat plenty of low oxalate fruit and vegetables.
- Maintain a healthy weight.

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