
Kidney Stones and Diet

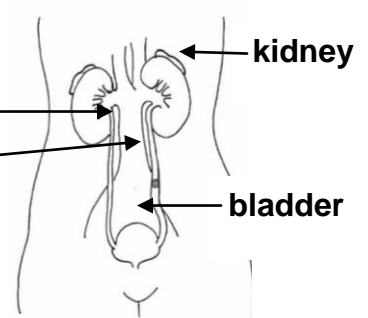
What are kidney stones?

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 and the incidence continues to rise in women and younger adults. 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. People with diabetes tend to form more uric acid stones. People with certain bowel diseases such as Crohn's disease or ulcerative colitis have a higher risk of developing kidney stones. People who have had bariatric surgery for weight loss also have a higher risk of developing 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 (These numbers are normal when 2 litres of urine is tested*)	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		

*When less or more urine is tested, these numbers are not accurate. It is the concentration that is important; the lower the number the better. Your health care provider will help you understand your numbers.

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 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. Beware of high protein diets for weight loss. They increase the risk factors in urine for stone formation.

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

Remember that having meat and chicken based broth soups are the same as eating meat.

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

The following animal proteins are purine rich and increase uric acid in urine more than other meat and fish:

- Liver, kidney and other organ meats
- Sardines, anchovies, herrings, gravy and meat extracts such as Bovril[®] and Marmite[®]

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

People who follow vegetarian diets have 50% less kidney stones compared to the general population.

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.



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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. Calcium from dairy or non-dairy products is equally good for you.

Avoid calcium supplements and antacids such as Tums[®] and Roloids[®] 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.

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.



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.

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

Amount of Calcium in Some Dairy Foods and Products

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	cottage cheese ½ cup (125 ml)	75 mg
ice cream ½ cup (125 ml)	100 mg	buttermilk 1 cup (250 ml)	300 mg
pudding ½ cup (125 ml)	150 mg	pizza – 2 slices	300 mg

Amount of Calcium in Some Non-Dairy Foods and Products

Food	Amount of Calcium	Food	Amount of Calcium
almonds 20 or ¼ cup	72 mg	salmon – canned with bones – ½ cup (125 ml)	232 mg
beans – white 1 cup (250 ml) cooked	191 mg	sardines 7	321 mg
black eyed peas ½ cup (125 ml) cooked	185 mg	sesame seeds 1 tablespoon (15 ml)	88 mg
blackstrap molasses 1 tablespoon (15 ml)	172 mg	soymilk 1 cup (250 ml)	300 mg
bok choy 1 cup (250 ml)	74 mg	tofu – firm ½ cup (125 ml)	260 mg
broccoli ½ cup (125 ml)	75 mg	tofu – raw ½ cup (125 ml)	125 mg
collards 1 cup (250 ml) cooked	268 mg	turnip greens 1 cup (250 ml) cooked	197 mg
edamame (soy bean) 1 cup (250 ml) cooked	100 mg		
figs – dried 8 or ½ cup (125 ml)	120 mg		
kale – 1 cup (250 ml) raw chopped	100 mg		
oatmeal – instant 1 cup (250 ml)	187 mg		
okra – 1 cup (250 ml)	82 mg		
orange – 1	75 mg		
orange juice with calcium 1 cup (250 ml)	500 mg		

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"/> navy and fava beans |
| <input type="checkbox"/> rhubarb | <input type="checkbox"/> leeks | <input type="checkbox"/> potatoes and sweet potatoes |
| <input type="checkbox"/> swiss chard | <input type="checkbox"/> peanut butter | <input type="checkbox"/> coco powder |
| <input type="checkbox"/> beets | <input type="checkbox"/> chocolate | <input type="checkbox"/> miso soup and lentil soup |
| <input type="checkbox"/> nuts | <input type="checkbox"/> hot chocolate | <input type="checkbox"/> TVP (textured vegetable protein) |

For cereals, choose Cheerios, Special K, Wheatabix and oat bran flakes. Avoid Shredded Wheat, Raisin Bran and All Bran.

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.



Vitamin D

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. Vitamin D supplements are not associated with increased risk of kidney stones when taken in moderate amounts such as 1,000 International Units (IU) a day. You need to make sure that you have good urine volume.

Fluids

You need to drink at least 2500 to 3000 ml 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 more to produce 2 litres of urine. This is because you lose fluid from skin (sweat), bowel movements and breathing.

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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 and juice. You can have cranberry juice in small amounts such as 1 to 2 cups (250 ml to 500 ml) a day. Caffeine is associated with a lower risk of kidney stones since it increases urine flow and lowers the amount of calcium oxalate and uric acid in urine. However, drink caffeine in moderation or as advised by your health care provider due to other effects it can have on health.

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. You can use fresh lemon or Real Lemon[®] juice.



Beer, wine, tea, coffee and orange juice decrease the risk of developing kidney stones. Use in moderation. Alcohol, tea and coffee help by promoting urine flow. Regular cola and non-cola pop and punch increase the risk of kidney stones. Limit the amount you drink. Pop is sweetened with corn syrup which is high in fructose and can increase the risk of developing kidney stones. Drink diet pop in small amounts only.

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

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 apples, apricots, asparagus, bananas, blueberries, broccoli, brussel sprouts, cabbage, cantaloupe, carrots, cauliflower, corn, mango, nectarine, papaya, peaches, pears, peas, plums, rapini, watermelon and zucchini.

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.



Diet and Follow-up

The special diet you follow is based on your stone type and 24-hour urine results.

A follow-up 24 hour urine collection helps find out how effective the changes you make in your diet have been. It is important to know if you are passing an old stone or a newly formed stone while following the diet. You and your health care providers can see if a special diet is helping if you pass an old stone.

Remember

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

To help 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 daily to get the normal amount of calcium.
- Reduce foods high in oxalate.
- Reduce salt.
- Eat plenty of low oxalate fruit and vegetables.
- Maintain a healthy weight.

Sample Menu

Breakfast

- 1 cup (250 ml) of Cheerios or Special K or Oat bran flakes
- 1 cup (250 ml) skim or 1% milk
- 1 slice whole wheat toast with apple butter
- ½ cup (125 ml) calcium enriched orange juice

Lunch

- Low salt chicken noodle soup
- 1 sandwich on whole wheat bread
- 1 ounce (30 grams) turkey breast and 1 ounce (30 grams) cheese
- 1 teaspoon (5 ml) mayonnaise
- small lettuce salad with low salt dressing
- 1 peach or 1 plum or 1 apple or ¼ cantaloupe
- 1 cup (250 ml) skim or 1% milk or yogurt
- 1 glass water with lemon juice or Real Lemon[®] juice added

Afternoon snack (if needed)

- 2 oatmeal cookies
- 1 peach or 1 banana

Dinner

- 3 ounces (90 grams) of chicken or meat or fish
- 1 cup white rice or a dinner roll
- ½ cup (125 ml) cooked cauliflower or broccoli
- 1 cup raw kale or bok choy
- ¾ cup (175 ml) yogurt or 1 cup (250 ml) milk

Evening Snack (if needed)

- 1 fruit or
- 2 digestive or arrowroot cookies

Metric Amounts:

1 cup	250 ml
½ cup	125 ml
1 teaspoon	5 ml
1 tablespoon	15 ml
1 ounce	30 grams

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