

Uric Acid and Kidney Stones

Information for Patients

Uric acid stones are one of the more common types of kidney stones (about 1 in 10 stones). Other types of kidney stones include calcium oxalate, calcium phosphate and struvite.

Uric acid is a chemical created when the body breaks down substances called purines. It is normal for purines to be found in the body and they are also found in many foods. Uric acid does not have any specific function and therefore is excreted by the kidneys as a waste product.

High concentrations of uric acid in the urine (*hyperuricosuria*) can lead to kidney stones. High concentrations of uric acid in the blood (*hyperuricemia*) can lead to gout – a condition in which painful crystals develop in the joints (especially the big toe). About 1 in 4 people who have uric acid kidney stones also have hyperuricemia.

Conversely, about 1 in 4 people with gout develop uric acid kidney stones. Therefore, not everyone with gout develops uric acid kidney stones and vice versa.

Formation of uric acid stones is promoted by:

1. Hyperuricosuria
2. Acidic urine (i.e. low pH)
3. Low urine volume

The main factor is high concentrations of uric acid in the urine. Therefore, one of the most important ways to prevent uric acid stones is to reduce uric acid secretion by limiting purine intake. A high concentration of uric acid in the urine is a

risk factor for uric acid stones *and* it is also a risk factor for the development of other stone types (e.g. calcium oxalate stones). Uric acid crystals can form very quickly under the right circumstances and other stone types can form on this crystal ‘seed’ (like a piece of sand in an oyster makes a pearl).

Alkalinizing the urine (raising its pH) is another effective strategy which can actually dissolve uric acid stones. Calcium intake does not play a major role in uric acid stone formation. However, since uric acid stones may promote formation of calcium oxalate stones, the general advice applicable to those other stone types may be helpful if you have uric acid stones.

There are several important differences between uric acid stones and other types of stone. Uric acid stones are *radiolucent* – invisible on a plain X-ray. Therefore, either a CT scan or an ultrasound is necessary to detect them. In addition, uric acid stones are one of the few stone types that may be dissolved. This only works if the stones are not acutely obstructing the urinary tract since flow of urine around the stones is required. Uric acid stones that are acutely obstructing the urinary tract (e.g. causing symptoms) are treated the same way as other types of kidney stones. Lastly, medications are commonly used to prevent and dissolve of uric acid stones – whereas they are not commonly used for other stone types.



GENERAL ADVICE THAT WORKS FOR ANY TYPE OF STONE

1. **MORE FLUIDS:** Aim for a urinary volume of 2-3 L/day. This amounts to about 8-10 glasses. Increase fluid intake in hot/humid weather or with physical activity. **AVOID** sugary soda and drinks – any other fluid type is good.
2. **MORE CITRATE:** Citrate reduced stone formation. Found in citrus fruits and juices. Orange and lemon/lime juices are good. Lemon is a little more acidic and is not as good as orange for uric acid stones but can easily be added to drinking water.
3. **LESS MEAT:** Limit animal protein to < 200 g/day (4-6 ounces).
4. **LESS SALT:** Limit salt/sodium to < 6 g/day. Limit table salt, soy sauce, pickled vegetables. Processed/canned food, restaurant food and baked goods/bread are often high in salt.
5. **NORMAL CALCIUM INTAKE:** Do NOT reduce your dairy/calcium intake



AVOID foods high in purine

Beans and peas	Seafood: Anchovies*,
Broth*, bouillon*, consommé*	Sardines*, Herring*, Mackerel, Crab,
Game meats*: goose, duck partridge	Mussels*, Scallops*, Shrimps, Fish Roe
Organ meats*: liver, kidney, brain, heart,	Vegetables: Asparagus, Cauliflower, Spinach
Sweetbreads	Mushrooms
Red meats	Alcohol (esp. beer)*



Low purine foods which are OK

Carbonated soft drinks	Vegetables
Tea	Bread & Cereals
Coffee	Pastas
Cocoa/Chocolate	Rice
Milk	Dairy products
Eggs	Sweets
Fruit juices	Nuts
Fruit	Peanut butter

* Foods very high in purines should be avoided whenever possible

Medication	Comments
Oral alkalinization	These medications raise urinary pH to prevent crystal formation. Most helpful if your urinary pH is consistently acidic. Stones can be dissolved at a rate of about 1 cm every few months. Examples: <ul style="list-style-type: none"> • Orange juice, mineral water • Potassium citrate 20 mEq (max 80 mEq/day), Sodium bicarbonate 10 mEq (0.5-1 grams) twice daily.
Allopurinol	Limited use in most cases. Allopurinol reduces the production of uric acid and is helpful if the urinary section of uric acid is high or if there is an elevated level of blood uric acid (or gout). Typical dosing: 300-600 mg daily divided into 2 doses.

Your physician will discuss if these medications are applicable to your case and any potential side-effects to be aware of.