

## Calcium and Kidney Stones

### *Information for Patients*

Calcium is essential for living organisms to survive. In addition to its well-known function of maintaining the health of bones and teeth, it is also critical for blood clotting, nerve conduction, and muscle contractility. Calcium metabolism is controlled by the parathyroid glands, kidneys and the gastrointestinal system.

There are several types of calcium-containing kidney stones including:

1. Calcium Oxalate
2. Calcium Phosphate
3. Mixed Calcium

High *urinary* calcium levels can promote kidney stone formation. However, because of the complex way in which stones form and how calcium levels are controlled, a

**diet either *too LOW* or *too HIGH* in calcium will *INCREASE* stone formation in most people.** Therefore, the majority of people benefit from a diet with normal calcium intake – about 1000 mg per day.

Reducing your salt intake will also reduce urinary calcium. As you will see below, oxalate is important in stone formation – more so than calcium. Consuming oxalate and calcium containing foods *at the same time* limits oxalate absorption because the calcium-oxalate complex is not absorbable in the gut.

There are exceptions to these guidelines and your urologist will let you know if they apply to you.

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## Oxalate and Kidney Stones

Oxalate is a chemical that is naturally found in the body. The liver is the major source of urinary oxalate production but the diet can also be a major source.

Oxalate is found in many plant foods but is not found in animal foods. Oxalate binds to calcium to form calcium oxalate (CaOx) stones – the most common type of kidney stone. In fact, high urinary levels of oxalate are thought to be a more important factor in stone formation than urinary calcium levels.

**Consuming oxalate and calcium containing foods *at the same time* limits oxalate absorption** and can prevent CaOx stones. The critical factor in dietary oxalate

is *bioavailability*. The high oxalate found in many foods is not present in a form which is readily absorbable. There are differences in how well people absorb oxalate – some people are ‘super absorbers’ and can absorb 50% more oxalate than regular people.

In general, the disadvantages of oxalate in beverages is outweighed by the extra water you intake when drinking them. The primary goal is to avoid excessive oxalate intake rather than cut it out completely. The goal is to keep your daily oxalate intake to less than about 50 mg per day.



**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

\* This advice is applicable to any type of stone composition



**BALANCED CALCIUM INTAKE**

Aim for about 1000 mg total calcium per day

<u>Food</u>	<u>Serving</u>	<u>mg Ca</u>
Antacids	1 tablet	200-600
Bread, oat bran	1 slice	23
Broccoli, cooked	½ cup	30
Canned salmon with bones	1/3 can	170
Cottage cheese	125 ml	70
Hard cheese	30 g	400
Lentils & beans	¾ cup	25-50
Milk	250 cc	300
Orange	1	60
Orange juice, from concentrate	250 ml	20
Orange juice, calcium fortified	250 ml	300
Yogurt	¾ cup	300



**LIMIT HIGH OXALATE FOODS**

Eat with calcium-containing foods to reduce absorption

- Spinach (raw)
- Rhubarb
- Star fruit
- Beet roots or leaves
- Tea (black)
- Tree nuts: almonds, cashews, hazelnuts, walnuts, pecans, pistachios
- Chocolate (esp. dark)
- Wheat bran
- Legumes: beans, peanuts, soybeans, tofu, textured vegetable protein, meat substitutes, links and patties

Sources: Borghi et al. Dietary therapy in idiopathic nephrolithiasis. Nutrition Reviews 2006; Massey. Food Oxalate: factors affecting measurement, biological variation and bioavailability J Am Diet Assoc 2007