

UW Hospital Metabolic Stone Clinic

Citric Acid and Kidney Stones

What is it? How can it help?

Citric acid is an organic acid and a natural component of many fruits and fruit juices. It is not a vitamin or mineral and is not required in the diet. However, citric acid, not to be confused with ascorbic acid (vitamin C), is beneficial for people with kidney stones. It inhibits stone formation and breaks up small stones that are beginning to form. Citric acid is protective; the more citric acid in your urine, the more protected you are against forming new kidney stones. Citrate, used in calcium citrate supplements and in some medications (such as potassium citrate), is closely related to citric acid and also has stone prevention benefits. These medications may be prescribed to alkalinize your urine.

How does citric acid protect against kidney stones?

Citric acid makes urine less favorable for the formation of stones. In its natural form, such as from citrus fruits, citric acid does not alkalinize the urine as citrate (from medication) does. Rather, it prevents small stones from becoming “problem stones” by coating them and preventing other material from attaching and building onto the stones.

What are the best food sources of citric acid?

Citric acid is most prevalent in citrus fruits and juices. Of these fruits, **lemons and limes have the most citric acid**. While oranges, grapefruits, and berries also contain appreciable amounts, lemons and limes will most significantly contribute to the citric acid content of your urine. Pharmacological doses of citric acid, prescribed as potassium citrate, are effective in the treatment of stones. However, treatment may be costly and require as many as 12 tablets daily.

A half-cup (4 ounces) of pure lemon juice per day or 32 ounces of prepared lemonade provide about the same amount of citric acid as does pharmacological therapy.

Keep reading for tips to increase your citric acid intake and minimize your risk for developing kidney stones. In addition to increasing your citric acid consumption, **drinking adequate fluids** (at least ten 8-ounce glasses per day) – more in hot weather or when physical activity promotes heavy perspiration – may be the most powerful way to decrease your risk of developing stones.

Increase Your Citric Acid Intake: 10 Easy Tips

1. Eat 5 or more fruits and vegetables daily.

As lemons and limes provide the most citric acid per gram, these tips focus on them. Remember, though, that increasing your intake of **all fruits and vegetables** – especially the citrus variety – will add to your citric acid intake and provide other health benefits as well. For example, the potassium, magnesium, and phytate contained in fruits and vegetables protect you against forming new stones. Other phytochemicals in plant foods prevent cancer and other chronic diseases.



2. **Squeeze fresh lemon (or reconstituted lemon juice) into ice cube trays** before freezing. Directions: Fill trays almost full with water. Then, squeeze half a lemon or more over the tray, and freeze. Use these cubes for sprucing up plain tap water and other beverages. If you like the taste of lime, use lime instead of, or in addition to, lemons. Remember to drink at least 10 glasses of fluid every day to keep your urine dilute enough to prevent stones.
3. Squeeze fresh lemon or lime juice **directly into your soda, fruit juice, tea, or water.**
4. **Use lemon juice.** Dilute 2 ozs. lemon juice with 6 ozs. water and drink **twice a day** – once in the morning and once in the evening – to reach the goal of 4 ozs. lemon juice per day.
5. **Drink lemonade every day.** Depending on your urinary citrate concentration, 16-32 ozs. daily may be recommended, distributed throughout the day. **To make homemade lemonade,** squeeze a ½ cup (4 ounces) of fresh lemon juice into a pitcher of cold water; bottled lemon juice may also be used. Add sugar or sugar substitute, if desired. Make it by the glass for a single serving. **Or, use commercially available lemonade products and mixes.** We strongly recommend low-calorie lemonades and lemonade mixes (such as Minute Maid Light, Tropicana Light, or Crystal Light). These are high in citric acid but have little sugar and few calories. Of the commercially-available lemonade products, those that are ready-to-consume have more citric acid than those that come as a powder.
6. **Make a lemon or lime spritzer.** Here's how: Pour 2 cups fresh lemon or lime juice (from about 9 medium size lemons or limes; or use lemon or lime juice concentrate) into a large pitcher. Add 1 cup Splenda®, a no-calorie sweetener made from sugar. When sugar is fully dissolved, add 1 liter chilled club soda, thin lemon & lime slices, and a few ice cubes. Stir and chill thoroughly before serving.
7. **Use fresh lemon on lettuce or spinach salads.** You may find yourself using less of those high-fat salad dressings!

** Here's a tip to get more juice from lemons – roll them on a hard surface while pressing down with your palm. Or, heat them for about 30 seconds in the microwave before squeezing.*
8. **Use freshly squeezed lemon or lime on fruit salads.** Besides adding a zesty taste, the acid in the juice will prevent cut fruits, such as apples, from browning with exposure to air. You'll have better-looking and healthier fruit salads.
9. **Use lemon or lime juice on fish and in marinades for any type of meat.** When looking for marinades and other recipes, try the ones that call for lemon or lime juice, and incorporate them into your menus at home.
10. **Read the label.** Choose products that are high in citric acid. Some lemon-lime sodas, for example, are relatively high in citric acid. If you drink soda, consider switching to one that's high in citric acid.

If you have questions, contact UW Health Clinical Nutrition at one of the following locations:

Nutrition Clinic Room 193
University Station
2880 University Avenue
Madison, WI 53705
(608) 263-5012

Nutrition Clinic Room 1296
UW Health West Clinic
451 Junction Road
Madison, WI 53717
(608) 265-7526

Nutrition Clinic Room 2085
UW Health East Clinic
5249 East Terrace Drive
Madison, WI 53718
(608) 265-0963