

Citrate & Stone Disease

Lemonade therapy

appears to be a reasonable alternative to help prevent recurrence of kidney stones in patients who cannot tolerate potassium citrate.

Citrate, or citric acid, is an antioxidant and known inhibitor of calcium-based stone formation that is found naturally in fruits and vegetables, particularly citrus fruits ¹. In combination with increased fluid intake and dietary changes, the medication *potassium citrate* is commonly used to reduce the rate of stone formation. Although generally well tolerated, potassium citrate therapy has been demonstrated to cause gastrointestinal symptoms in 17 to 45% of patients on long-term therapy ². Potassium citrate therapy also requires a rigorous schedule of numerous tablets or liquid supplement which may be difficult for some patients to maintain. In those who are poorly compliant with or intolerant of the potassium citrate, dietary citrate may be an addition, or even an alternative, to potassium citrate therapy.

While citrus fruits and juices contain some citrate, they generally do not contain enough to reduce stone recurrence. Studies investigating the effects of citrus juices have used amounts ranging from 330 millilitres (ml) to 1.2 litres (L) per day ³. This provides an average of 125 kilocalories and 30 grams of carbohydrate per cup! Drinking excessive amounts of fruit juice contribute to a higher carbohydrate load and can lead to weight gain due to a higher energy intake, both of which may increase kidney stone risk.

An easy to use, well tolerated and cost effective solution is to use a mixture of 120 ml reconstituted lemon or lime juice with 2 L of water. This has only 3 calories per cup and 1 gram of carbohydrate while delivering 5.9 grams of citrate, more than 5 times that found in orange juice or commercial lemonade.

Recipe for Citrate Therapy ⁴:

120 ml (~ ½ cup) reconstituted lemon or lime juice
2 L (8 cups) water or low-sodium mineral water/club soda
Artificial sweetener, to taste (if needed)

1. Mattle D, Hess B. Preventive treatment of nephrolithiasis with alkali citrate – a critical review. *Urological Research* 2005; 33: 73-9.
2. Seltzer MA, Low RK, McDonald M, Shami GS et al. Dietary manipulation with lemonade to treat hypocitraturic calcium nephrolithiasis. *Journal of Urology*, 156:907-9, 1996.
3. Curhan C, Willett WC, Rimm EB, et al. Prospective study of beverage use and the risk of kidney stones. *American Journal of Epidemiology* 1996; 143(3):240-7.
4. Kang DE, Sur RL, Haleblan GE, et al. Long-term lemonade based dietary manipulation in patients with hypocitraturic nephrolithiasis. *Journal of Urology* 2007; 177(4): 1358-62.



Department of Urologic Sciences
Faculty of Medicine
University of British Columbia

Developed by:
Meredith Cushing, RD, MS, MSHSE
Kristin Wiens, BSc (FNH)

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For more information, please call (604) 875-5006.