

Medical Nutrition Therapy for Pediatric Kidney Stone Prevention, Part Two



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Intended Audience: Pediatric Patients, Nephrology Outpatient Clinic Patients, Pediatric Kidney Stone Clinic Patients

THE ARTICLE THAT follows represents the second in a three-part series of handouts intended to provide a comprehensive nutrition education tool for the prevention of pediatric nephrolithiasis. The dietary recommendations presented in the handouts are described in the following along with the evidence-based rationale and application in the clinical setting.

Choose More Plant Protein

Changes in agricultural technology and a shift from family farms to concentrated animal feeding operations have led to increased consumption of low-cost meat products. Since the 1960s, meat production has increased threefold, and meat consumption in the United States is now more than triple the global average.¹ This rise in availability, combined with affordability and the popularity of high-protein fad diets such as Atkins, has resulted in higher intakes of animal protein. The detrimental health effects of this dietary shift on public health is of significant concern. With regards to kidney stones, it has been demonstrated that excessive intake of animal protein leads to a mild state of chronic metabolic acidosis and high potential renal acid load which has been shown to worsen hypercalciuria.^{2,3} Furthermore, an overconsumption of meat, particularly high-sodium processed meats, exacerbates hyperuricosuria and hypocitraturia.^{4,5} A disproportionate amount of animal protein in the diet will increase purine intake and

replace healthier proteins from beans, dairy, and nuts, further decreasing protective nutrients such as calcium, magnesium, and potassium. Parents should be encouraged to limit excessive animal protein.⁶ That said, dietary restrictions should not compromise adequate nutrition necessary for the child's proper growth and development. A registered dietitian can help families meet their child's needs from a variety of protein sources by encouraging the incorporation of plant foods such as nuts, beans, and soy.

Know the Facts About Nutrients and Supplements

Families should be encouraged to discuss dietary supplements with their physician and medical team. The Internet abounds with misleading information about alternative treatments for "kidney health." It is important for nephrologists and nephrology dietitians to be prepared to discuss nutrient toxicities and deficiencies related to nephrolithiasis.

Calcium

One common misconception among patients and their caregivers is the belief that kidney stones are caused by too much calcium in the diet; when, in fact, the exact opposite may be true. Greater dietary calcium intake, irrespective of the source, is associated with a decreased risk of nephrolithiasis likely because of the binding of calcium and oxalate in the gut, thereby reducing urinary oxalate excretion. This seeming paradox should be explained in detail to parents, as misinformation on calcium and kidney stones continues to proliferate on the Web.^{4,7} We recommend that all children meet the Recommended Dietary Allowance for calcium (700–1300 mg/day for ages 1–18 years).⁸ Foods should be encouraged first, but supplementation can be used when patients are not meeting nutrition requirements from diet alone. Timing is key. Taken with meals, oral calcium supplementation can reduce oxalate absorption and kidney stone risk without compromising its benefits.^{3,7}

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Vitamin D

This fat-soluble vitamin is a key factor in calcium homeostasis because of its role in regulating dietary calcium absorption, bone mineralization, and renal calcium reabsorption. While high levels of active vitamin D (1,25 dihydroxyvitamin D) increase urinary calcium excretion, the conversion of dietary vitamin D 25 (OH) to its active form is tightly controlled. In fact, existing evidence supports that normalization of serum vitamin D 25 (OH) with short-term dietary supplementation is not harmful and may be beneficial for maintaining bone health. That said, randomized control trials are needed to further evaluate the safety of vitamin D supplementation among children at risk for stone formation. Presently, we recommend short-term supplementation for repletion only in children with insufficient vitamin D stores.⁹

Vitamin C

High-dose ascorbic acid supplementation can promote nephrolithiasis by way of oxalate formation and urinary excretion. Studies in adults suggest increased risk with excessive supplementation, although the precise dose relationship has yet to be clarified. It is reasonable to assume, however, that the safety threshold may be lower in children.¹⁰ Interestingly, ascorbic acid has been suggested for the prevention of struvite stones because of potential for urine acidification; however, experimental studies on this have had mixed results. Insignificant risk has been established for dietary ascorbic acid; therefore, we recommend that children obtain vitamin C from food sources rather than supplements. Parents and caregivers should be informed that dietary recommendations can easily be met with adequate amounts of fruits and vegetables in the diet. Supplemental vitamin C, if deemed necessary, should be limited to age-appropriate dietary reference intakes and should not exceed 1 g/day in children at risk for calcium oxalate stone formation.¹⁰⁻¹² The nephrology dietitian

can further instruct caregivers to be aware of excessive intake from juices, snacks, nutritional supplements and powders, and functional foods.

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Tip #4: Choose more plant protein.

Encourage your child to enjoy more protein from plant foods like beans, peanut butter, veggie burgers, and unsalted nuts. Proteins from plant foods have the added benefit of other nutrients, such as potassium and phytates, that help to prevent stones.

Try these tips:

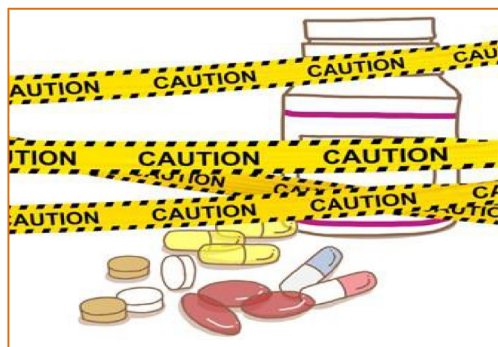
1. Go vegetarian for lunch or try “Meatless Mondays.”
2. Avoid high-protein fad diets which can lead to high calcium and acidity of the urine.
3. Avoid processed meats such as bacon, sausage, and hot dogs. These foods lack nutrients and are generally high in sodium.



Tip #5: Know the facts about nutrients and supplements.

Your doctor may prescribe a vitamin supplement. It is important that your child takes this only as prescribed and visits the doctor to monitor blood levels regularly.

Always talk to your doctor before giving your child a vitamin or supplement.



Calcium supplements should be taken with food. It is best to take when eating a meal. Calcium-rich foods do not cause kidney stones. In fact, a diet that is rich in calcium can help protect against calcium-oxalate stones. Talk to your dietitian about how much calcium is recommended for your child. Choose a variety of sources such as yogurt, dairy, almond or soy milk, fortified orange juice, cooked greens, cheese, and tofu.

Vitamin C (ascorbic acid) may be prescribed for children at risk for urinary tract infections. Avoid giving your child vitamin C unless instructed to do so by your physician. **Supplements can be harmful if taken in excess** and are generally *not* recommended for children with calcium oxalate stones. Daily requirement of vitamin C for children aged 4-18 years is 25-75 mg.

| Food | Vitamin C per serving (mg) |
|--------------------------|----------------------------|
| Red pepper (1) | 150 |
| Broccoli (1 cup, cooked) | 100 |
| Strawberries (1 cup) | 90 |
| Orange (1) | 70 |
| Apple (1) | 9 |



Encourage your child to eat a rainbow of fruits and vegetables.

A large yellow rectangular area containing ten horizontal orange lines, intended for writing notes.