

# Dietary treatment of urinary risk factors for renal stone formation. A review of CLU Working Group

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## Summary

**Objective:** Diet interventions may reduce the risk of urinary stone formation and its recurrence, but there is no conclusive consensus in the literature

regarding the effectiveness of dietary interventions and recommendations about specific diets for patients with urinary calculi. The aim of this study was to review the studies reporting the effects of different dietary interventions for the modification of urinary risk factors in patients with urinary stone disease.

**Materials and Methods:** A systematic search of the Pubmed database literature up to July 1, 2014 for studies on dietary treatment of urinary risk factors for urinary stone formation was conducted according to a methodology developed a priori. Studies were screened by titles and abstracts for eligibility. Data were extracted using a standardized form and the quality of evidence was assessed.

**Results:** Evidence from the selected studies were used to form evidence-based guideline statements. In the absence of sufficient evidence, additional statements were developed as expert opinions.

**Conclusions:** General measures: Each patient with nephrolithiasis should undertake appropriate evaluation according to the knowledge of the calculus composition. Regardless of the underlying cause of the stone disease, a mainstay of conservative management is the forced increase in fluid intake to achieve a daily urine output of 2 liters.

**Hypercalciuria:** Dietary calcium restriction is not recommended for stone formers with nephrolithiasis. Diets with a calcium content  $\geq 1$  g/day (and low protein-low sodium) could be protective against the risk of stone formation in hypercalciuric stone forming adults. Moderate dietary salt restriction is useful in limiting urinary calcium excretion and thus may be helpful for primary and secondary prevention of nephrolithiasis. A low-normal protein intake decrease calciuria and could be useful in stone prevention and preservation of bone mass. **Omega-3 fatty acids and bran of different origin** decreases calciuria, but their impact on the urinary stone risk profile is uncertain. **Sports beverage** do not affect the urinary stone risk profile. **Hyperoxaluria:** A diet low in oxalate and/or a calcium intake normal to high (800-1200 mg/day for adults) reduce the urinary excretion of oxalate, conversely a diet rich in oxalates and/or a diet low in calcium increase urinary oxalate. A restriction in protein intake may reduce the urinary excretion of oxalate although a vegetarian diet may lead to an increase in urinary oxalate. Adding bran to a diet low in oxalate cancels its effect of reducing urinary oxalate. Conversely, the addition of supplements of fruit and vegetables to a mixed diet does not involve an increased excretion of oxalate in the urine. The intake of pyridoxine reduces the excretion of oxalate. **Hyperuricosuria:** In patients with renal calcium stones

the decrease of the urinary excretion of uric acid after restriction of dietary protein and purine is suggested although not clearly demonstrated. **Hypocitraturia:** The administration of alkaline-citrates salts is recommended for the medical treatment of renal stone-formers with hypocitraturia, although compliance to this treatment is limited by gastrointestinal side effects and costs. Increased intake of fruit and vegetables (excluding those with high oxalate content) increases citrate excretion and involves a significant protection against the risk of stone formation. Citrus (lemons, oranges, grapefruit, and lime) and non citrus fruits (melon) are natural sources of dietary citrate, and several studies have shown the potential of these fruits and/or their juices in raising urine citrate levels. **Children:** There are enough basis to advice an adequate fluid intake also in children. Moderate dietary salt restriction and implementation of potassium intake are useful in limiting urinary calcium excretion whereas dietary calcium restriction is not recommended for children with nephrolithiasis. It seems reasonable to advice a balanced consumption of fruit and vegetables and a low consumption of chocolate and cola according to general nutritional guidelines, although no studies have assessed in pediatric stone formers the effect of fruit and vegetables supplementation on urinary citrate and the effects of chocolate and cola restriction on urinary oxalate in pediatric stone formers. Despite the low level of scientific evidence, a low-protein (< 20 g/day) low-salt (< 2 g/day) diet with high hydration (> 3 liters/day) is strongly advised in children with cystinuria. **Elderly:** In older patients dietary counseling for renal stone prevention has to consider some particular aspects of aging. A restriction of sodium intake in association with a higher intake of potassium, magnesium and citrate is advisable in order to reduce urinary risk factors for stone formation but also to prevent the loss of bone mass and the incidence of hypertension, although more hemodynamic sensitivity to sodium intake and decreased renal function of the elderly have to be considered. A diet rich in calcium (1200 mg/day) is useful to maintain skeletal wellness and to prevent kidney stones although an higher supplementation could involve an increase of risk for both the formation of kidney stones and cardiovascular diseases. A lower content of animal protein in association to an higher intake of plant products decrease the acid load and the excretion of uric acid has no particular contraindications in the elderly patients, although overall nutritional status has to be preserved.

**KEY WORDS:** Urinary calculi; Dietary treatment; Urinary risk factors; Hypercalciuria; Hyperoxaluria; Hypocitraturia; Children; Elderly.

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