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Physiology of acid-base balance: links with kidney stone prevention.

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Two processes permit the urine pH and the medullary interstitial pH to remain in an "ideal range" to minimize the risk of forming kidney stones. First, a medullary shunt for NH_3 maintains the urine pH near 6.0 to minimize uric acid precipitation when distal H^+ secretion is high. Second, excreting dietary alkali excreting alkali as a family of organic anions--including citrate--rather than as bicarbonate maintains the urine pH near 6.0 while urinary citrate chelates ionized calcium, which minimizes CaHPO_4 precipitation. In patients with idiopathic hypercalciuria and recurrent calcium oxalate stones, the initial nidus is a calcium phosphate precipitate on the basolateral membrane of the thin limb of the loop of Henle (Randall's plaque). Formation of this precipitate requires medullary alkalinization; K^+ -depletion and augmented medullary H^+/K^+ -ATPase may be predisposing factors.