MINNESOTA UROLITH CENTER
UNIVERSITY OF MINNESOTA

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FELINE CALCIUM OXALATE UROLITHS

Calcium oxalate (CaOx) is a common and difficult stone to prevent because factors responsible for formation are incompletely understood. It is accepted that crystal growth and possibly initial crystal formation are at least partly a reflection of urine supersaturation. Therefore, controlling risk factors promoting urine CaOx supersaturation (e.g. hypercalciuria, hyperoxaluria, hyperaciduria, hypocitraturia, and highly concentrated urine) should minimize urolith recurrence.

MINIMIZING RECURRENCE

DIAGNOSTIC CONSIDERATIONS	MEDICAL CONSIDERATIONS	NUTRITIONAL CONSIDERATIONS	MONITORING CONSIDERATIONS
Identify and eliminate hypercalcemia by determining serum concentrations of ionized and total calcium.	Additional water to reduce urine specific gravity below 1.030. Potassium citrate (75mg/kg q12-24hr), if urine pH is consistently less than 6.5. Hydrochlorothiazide (1-2mg/kg q12hr) with highly recurrent urolithiasis if not hypercalcemic.	Canned foods that do not overly acidify urine and contain moderate levels of animal protein (e.g. Hill's c/d Multicare, diets for managing renal or hepatic disease).	Urinalysis every 3 to 6 months to adjust pH to 6.5 to 8.0, and urine specific gravity below 1.030. Medical imaging every 6 to 12 months to detect recurrent stones when small to permit their removal without surgery.

** Review manufacturer's therapeutic food literature to determine indications/contraindications. For pets with multiple health concerns, consult a veterinary nutritionist to select an optimal food.

Support from Hills Pet Nutrition, veterinarians, and pet owners make our work possible.

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FELINE CALCIUM OXALATE UROLITHS

Calcium oxalate (CaOx) is one of the most common stones in the bladder and kidneys of cats.[1] Although formation of CaOx uroliths is associated with a complex and incompletely understood sequence of events, it is accepted that initial crystal formation and subsequent crystal growth are at least partly a reflection of urine supersaturation. Therefore, controlling risk factors promoting urine CaOx supersaturation (e.g. hypercalciuria, hyperoxaluria, hyperaciduria, and hypocitraturia) should minimize urolith recurrence.

Medical Considerations:

- Hypercalciuria, a risk factor for CaOx urolithiasis has resulted from hypercalcemia, metabolic acidosis, high sodium consumption, and vitamin D excess.
- Evaluate serum ionized calcium concentration to avoid overlooking a diagnosis of hypercalcemia.

Nutritional Considerations:

- Avoid calcium supplements & high oxalate foods (e.g. chocolate, nuts, rhubarb, spinach).
- High moisture foods (i.e. canned formulations) are more effective because increased water consumption is associated with decreased urine concentrations of calculogenic minerals. Feed canned foods and/or add increasing amounts of water to food until specific gravity is less than 1.030.

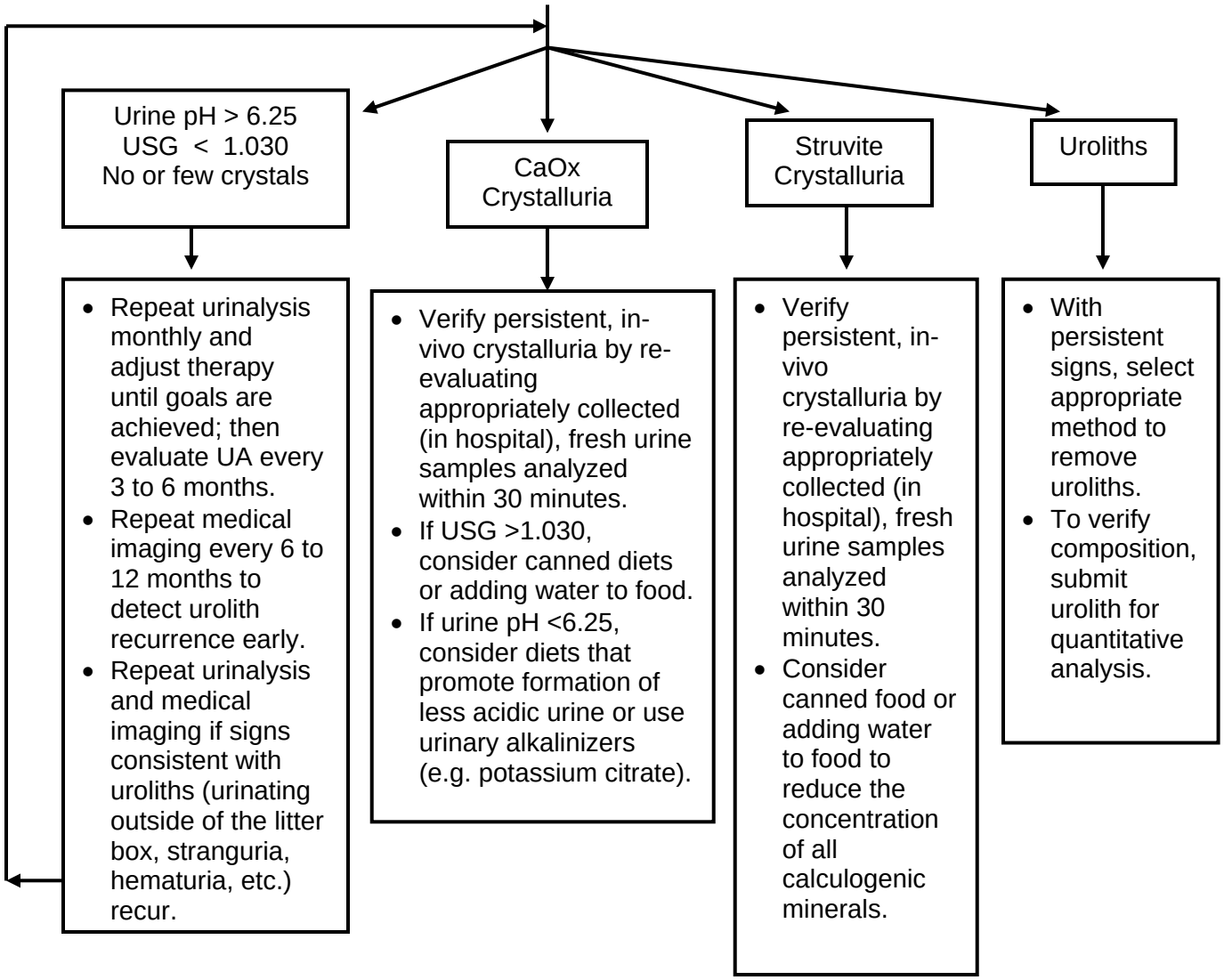
Pharmacological Considerations:

- Consider potassium citrate (75mg/kg q12-24hr), if urine pH is consistently less than 6.2.
- Consider vitamin B_6 (2 to 4mg/kg q 24 to 48 hr) in patients consuming primarily human food or diets with insufficient B_6 content.
- Consider hydrochlorothizide (1-2mg/kg q12hr) with highly recurrent urolithiasis in cats without hypercalcemia.

Consider These Facts:

- ✓Experienced surgeons failed to remove all uroliths in 20% of cats.[2] Therefore, be diligent during surgery, and perform medical imaging immediately following surgery to verify complete urolith removal.
- ✓Studies have confirmed the ability of diets to reduce urine CaOx saturation. However, selecting the best diet is challenging because: 1) all risk factors underlying CaOx urolith formation are not completely known, and 2) diet efficacy determined using clinically relevant endpoints (i.e. urolith recurrence), has yet to be published.
- ✓Epidemiologic studies indicated that the strongest association between CaOx urolith formation and diet was diet's propensity to overacidify urine; diets promoting urine pH less than 6.25 were at highest risk.[3] Of the diets marketed to prevent CaOx, Prescription Diet® c/d® Multicare promotes formation of the least acidic urine.[4]
- ✓When serum ionized calcium was measured in 194 cats with normal total calcium, 48 (25%) were hypercalcemic.[5] To identify a treatable risk for calcium oxalate uroliths, measure ionized calcium.
- ✓Feeding Prescription Diet® w/d® feline was associated with normalization of hypercalcemia in cats with calcium oxalate urolithiasis.[6]
- ✓*Oxalobacter formigenes* is an intestinal bacterium that ingests oxalate as its sole nutrient.[7] By consuming dietary oxalate in the intestine, less oxalic acid is available for absorption and less is excreted in urine. To preserve healthy populations of intestinal Oxalobacter, avoid indiscriminant use of antimicrobics.
- ✓In a retrospective study of recurrent feline uroliths, 8 of 13 recurrences over a suture nidus were composed of calcium oxalate.[8] To minimize iatrogenic urolith formation, use suture patterns that minimize suture exposure to the bladder lumen.
- ✓Rats fed a cyclooxygenase-2 selective inhibitor induced mild renal tubular injury and calcium oxalate crystal formation at the renal papilla.[9] Until humane studies can be performed and evaluated in cats, to minimize risk of calcium oxalate urolith formation select medications other than cyclooxygenase inhibitors to manage pain.

Monitoring Feline CaOx Urolith Risk Management:
Perform Urinalysis, Serum Ionized Calcium, & Medical Imaging



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