

# Minnesota Urolith Center \* UNIVERSITY OF MINNESOTA

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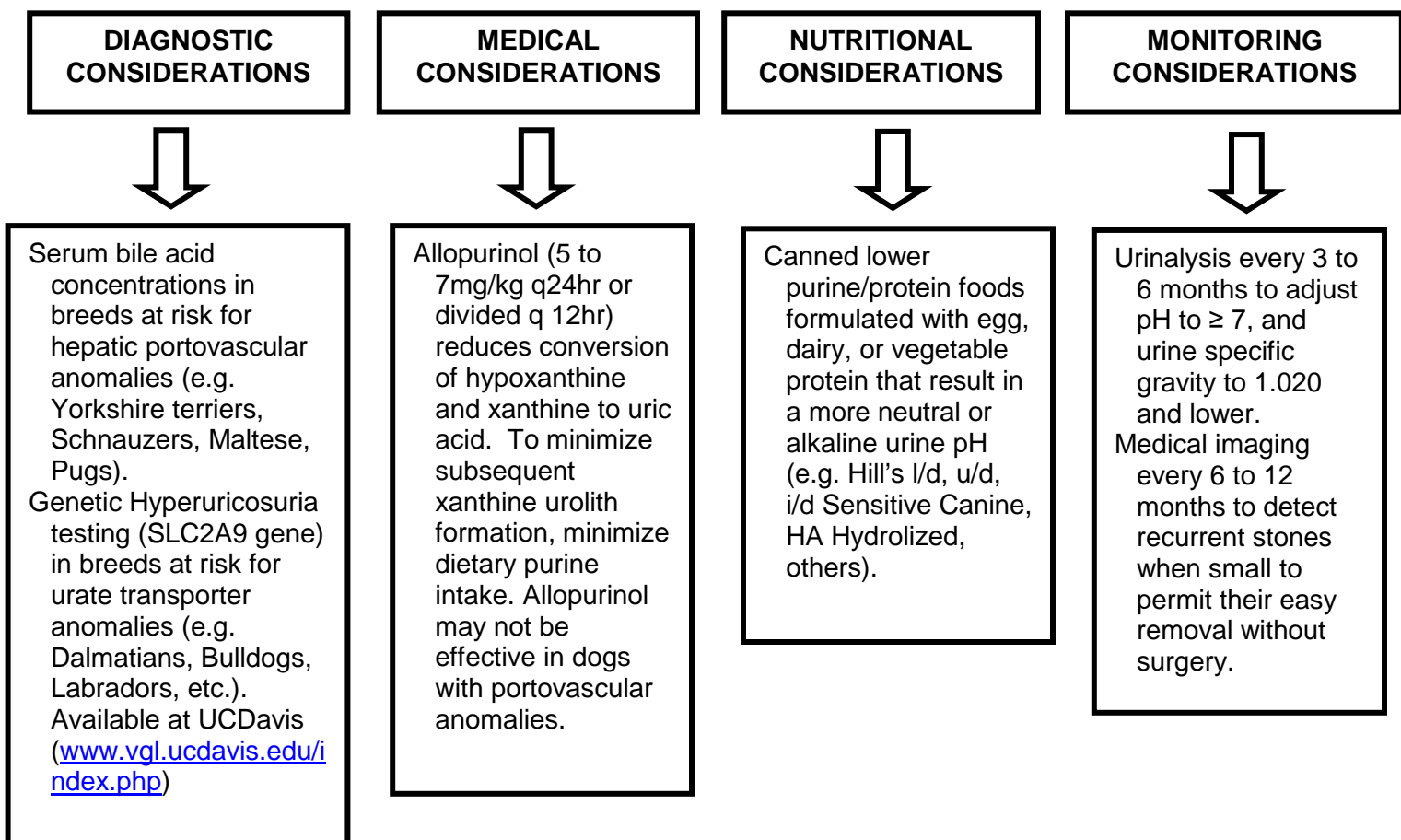
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## CANINE URATE UROLITHS

Two distinct diseases are associated with urate urolithiasis in dogs, hepatic portovascular anomalies and an inherited alteration of the urate transporter encoded by the SLC2A9 gene. Common to both is inefficient transport of serum uric acid into hepatocytes where uric acid is enzymatically degraded into the highly water-soluble end-product, allantoin.

## PREVENTION



\*\* 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.

In depth recommendations and references are available on our website: [urolithcenter.org](http://urolithcenter.org) under the resources tab.

# Minnesota Urolith Center

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## CANINE URATE UROLITHS

Salts of uric acid (e.g. ammonium urate, sodium urate, uric acid, etc.) are sparingly soluble in urine, and are the end product of purine catabolism in humans, higher primates, and Dalmatian dogs. In most other mammals, the hepatic enzyme uricase further oxidizes uric acid to allantoin, which is highly soluble in urine and not lithogenic. Although this stone type is very common in Dalmatians, urate uroliths only represent approximately 5% of all canine stone submissions to our center.<sup>1</sup>

Risk factors promoting urine urate supersaturation and subsequent urate urolith formation include hyperuricosuria (e.g. Dalmatian dogs, dogs with hepatic porto-systemic shunts, and some dogs receiving chemotherapy), acidic urine, and highly concentrated urine. Minimizing these risk factors has been associated with minimizing urate urolith recurrence.

### Minimizing Urate Urolith Recurrence

#### Medical considerations:

- A mutation in the urate transporter has been identified in Dalmatians, English Bulldogs, and Black Russian Terriers. Other breeds should be tested for hepatic porto-vascular anomalies. If bile acids are normal, consider genetic testing to identify possible hereditary defects in the urate transporter gene.<sup>2,3</sup>
- Treatment of uroliths should complement, and not supersede appropriate management of liver disease.

#### Nutritional considerations:

- Feed diets with lower quantities of high-biological-value protein (i.e. lower protein is consistent with lower purine). Avoid diets containing organ meat (e.g. liver and kidney) as their primary protein source, and favor diets containing egg and whey (e.g. dairy, casein).
- Feed diets that promote diuresis, and excretion of alkaline urine.
- 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 1.020.

#### Pharmacological considerations:

- If dietary therapy alone is ineffective, consider long-term therapy with allopurinol (5 to 7 mg/kg/day). Higher doses of allopurinol, especially when given with higher protein foods, increase the risk of xanthine urolith formation. Allopurinol may not be as effective in dogs with porto-vascular disease.
- Consider potassium citrate (75mg/kg, q 12-24hr) if urine pH is consistently less than 6.6.

### Consider These Facts:

- ✓ In a cross-over study, feeding Dalmatians Prescription Diet<sup>®</sup> u/d<sup>®</sup> reduced urate urolith recurrence and urine urate concentration, and increased urine pH and volume.<sup>4</sup>
- ✓ Rice and eggs are excellent sources of low purine nutrition; and are the major ingredients of Prescription Diet<sup>®</sup> i/d<sup>®</sup> Sensitive Canine, Prescription Diet<sup>®</sup> i/d<sup>®</sup> Canine, and Prescription Diet<sup>®</sup> u/d<sup>®</sup> Canine.
- ✓ In a case series of 10 dogs with previous urate urolithiasis, allopurinol administration in excess of 9 to 38 mg/kg/day was associated with xanthine urolith formation. This occurs because allopurinol inhibits the breakdown of xanthine to uric acid, and because xanthine is less soluble in urine than uric acid. The dose of allopurinol to sufficiently prevent urate urolith recurrence without xanthine urolith formation is variable and influenced by the severity of disease, the quantity of protein (i.e. purines) in the diet, urine pH, and urine volume. Therefore, a reduction in dietary purine, should precede the prescription of allopurinol.<sup>5</sup>
- ✓ Urate uroliths are rare in female Dalmatians (3% of 9095 urate urolith forming Dalmatians). Therefore, urate prevention in female Dalmatians without a history of uroliths is probably not needed.<sup>6</sup>

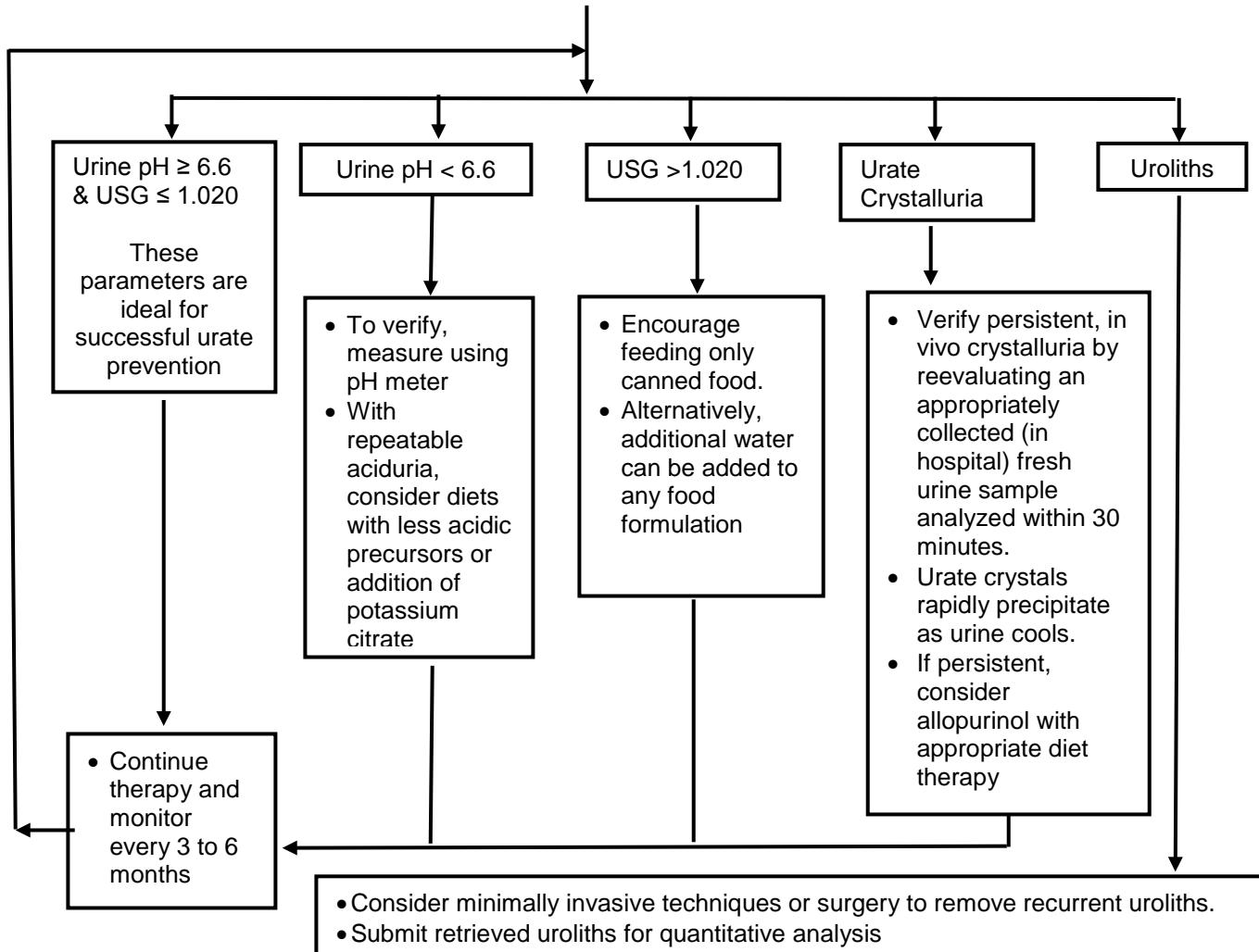
## MINIMIZING CANINE AMMONIUM URATE UROLITH RECURRENCE

### Therapy:

- Correction of portovascular anomalies appears logical. However, further studies are needed to determine the efficacy of hepatic vascular restoration on urate urolith recurrence.
- Consider diets with reduced protein (and therefore reduced purines) that promote formation of urine with a pH  $\geq 6.6$  (e.g. Prescription Diets<sup>®</sup> u/d<sup>®</sup>, k/d<sup>®</sup>, l/d<sup>®</sup> Canine fit these criteria)

### Monitor:

- Urinalysis in 1 month and then every 3 to 6 months
- Consider appropriate medical imaging (early stones are likely to be small and radiolucent, consider ultrasonography) every 6 months, or sooner in patients with recurrent urinary signs.



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1. Osborne, CA, Canine urolith update, 2009: Perspectives from the Minnesota Urolith Center, DVM, July, 2010
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3. [www.vgl.ucdavis.edu/services/index.php](http://www.vgl.ucdavis.edu/services/index.php)
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5. Ling GV. Xanthine containing urinary calculi in dogs given allopurinol. JAVMA 1991;198:1935-1940.
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