**FELINE URATE**

The primary etiology underlying ammonium urate uroliths in most cats is unknown. Although porto-vascular anomalies have been identified in some, this abnormality is uncommon. Small quantities of urate (10% or less) can be admixed with struvite and/or calcium oxalate, and until proven otherwise, is not considered clinically important when developing a treatment plan.

**MINIMIZING RECURRENCE**

**DIAGNOSTIC CONSIDERATIONS**

Serum bile acid concentrations are necessary to eliminate liver disease as the cause.

**MEDICAL CONSIDERATIONS**

The therapeutic benefit of allopurinol in the management of urate uroliths in cats is unknown. Because of potential side effects, we only use allopurinol in cats with highly recurrent disease and monitor for adverse effects. Consider potassium citrate (75mg/kg, q 12-24hr) if urine pH is consistently less than 6.6.

**NUTRITIONAL CONSIDERATIONS**

Canned foods with lower purine/protein that do not overly acidify urine (pH>6.6). Example diets include k/d early support, k/d, and other diets for cats with kidney disease.

**MONITORING CONSIDERATIONS**

Urinalysis every 3 to 6 months to adjust pH to 6.6 or greater, Medical imaging every 6 to 12 months to detect recurrent stones when small to potentially 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 veterinarians, pet owners, and Hills Pet Nutrition, make our work possible.
FELINE AMMONIUM URATE UROLITHS

Ammonium urate uroliths represent approximately 5% of all feline uroliths submitted to our center. The causes underlying ammonium urate urolith formation in most cats are unknown. Although portovascular anomalies have been identified in some, this abnormality is uncommon. Protocols designed to consistently dissolve ammonium urate uroliths in cats have not yet been developed. Minimally invasive procedures or surgery remain the most reliable methods to remove active uroliths from the urinary tract.

Consider These Facts:

- Urate crystalluria is not commonly observed in cats. In a 2007 study at the University of Minnesota, neither urate nor amorphous urate crystals were observed in cats with ammonium urate uroliths.
- Urate uroliths are typically radiolucent. In a 2007 study at the U of MN, only 2 of 6 cats had uroliths sufficiently radio-opaque to be detected by survey radiography. Contrast cystography or ultrasound are necessary to consistently visualize urate uroliths in the urinary tract.
- We have successfully dissolved ammonium urate uroliths in 2 cats with a combination of allopurinol (15mg/kg PO q12 hr in one cat, and 15 mg/kg PO q24hr in the other) and canned Prescription Diet® k/d® Feline.
- In a retrospective study, urate urolith recurrence was detected in 13% of cats; recurrent uroliths were detected 1.8 ± 1.0 years following initial removal. Compared to uroliths composed of struvite or calcium oxalate, the recurrence rate was greatest for urate.
- In an in vitro study, the most effective urine pH to prevent ammonium urate formation was 6.6. Prescription Diet® k/d® Feline is formulated to produce urine with a pH of 6.6 to 6.9. To minimize dietary purines Prescription Diet® k/d® Feline contains relatively lower levels of high quality protein.

Minimizing Urate Urolith Recurrence

Medical considerations:
- Although uncommon, portovascular anomalies have been documented in association with urate uroliths in a few cats. Therefore, serum bile acid testing is recommended.
- 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; lower protein is often synonymous with lower purine.
- Consider diets that promote formation of urine with a pH of 6.6 or greater.
- 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 to promote less concentrated urine.

Pharmacological considerations:
- The therapeutic benefit of allopurinol in the management of urate uroliths in cats is unknown. Because of potential side effects, we reserve the use of allopurinol for cats with highly recurrent disease and monitor for adverse effects (in humans dermatological hypersensitivity, renal disease and liver disease have been reported).
- Consider potassium citrate (75mg/kg, q 12-24hr) if urine pH is consistently less than 6.6.
**FELINE AMMONIUM URATE RISK MANAGEMENT**

**Therapy:**
- Correction of portovascular anomalies, when diagnosed, 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 ≥ 6.6 (e.g. Prescription Diet® k/d® Feline fits these criteria)

**Monitor:**
- Urinalysis in 1 month and then every 3 to 6 months
- Consider appropriate medical imaging every 6 months, or sooner in patients with recurrent urinary signs.

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![Diagram showing the process of risk management for feline ammonium urate uroliths](image)

**Urine pH ≥ 6.6 & USG ≤ 1.030**
- These parameters are ideal for successful urate risk management
  - To verify, measure using pH meter
  - With repeatable aciduria, consider diets with less acidic precursors or addition of potassium citrate
  - Continue therapy and monitor every 3 to 6 months

**Urine pH < 6.6**
- Encourage feeding only canned food.
- Alternatively, additional water can be added to any food formulation

**USG > 1.030**
- Verifying persistent, in vivo crystalluria by reevaluating an appropriately collected (in hospital) fresh urine sample analyzed within 30 minutes
- If persistent, add more water to food to reduce concentrations of crystallogenic minerals

**Struvite Crystalluria**
- Submit retrieved uroliths for quantitative analysis
- Consider minimally invasive techniques or surgery to remove recurrent uroliths.
- Verify with repeatable aciduria by reevaluating an appropriately collected (in hospital) fresh urine sample analyzed within 30 minutes

**Uroliths**
- Encourage feeding only canned food.
- Alternatively, additional water can be added to any food formulation
- To verify, measure using pH meter
- With repeatable aciduria, consider diets with less acidic precursors or addition of potassium citrate

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**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.**

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Albasan H: Rate and Frequency of Recurrence of Uroliths After an Initial Ammonium Urate, Calcium Oxalate, or Struvite Urolith in Cats. JAVMA 2009; 235:12: 1450
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