

Lower Urinary Tract Signs in a Cat

Joe Bartges, DVM, PhD, DACVIM (SAIM), DACVN
University of Georgia

Kara M. Burns, MS, MEd, LVT, VTS (Nutrition)
Academy of Veterinary Nutrition Technicians

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Gregg K. Takashima, DVM
*WSAVA Global Nutrition Committee
Series Editor*

THE CASE

Inky, a 7-year-old, 7.8-lb (3.55-kg), neutered male domestic shorthair cat, was presented for recurrent signs of lower urinary tract disease (LUTD) characterized by urinating outside the litter box, hematuria, and pollakiuria.

History disclosed at least 5 episodes of LUTD over 2 years. Urinalyses, when performed, had revealed only hematuria; crystalluria and pyuria were not present. Other parameters on CBC and serum chemistry profile were normal. One urine culture had been performed and revealed no growth. Inky had previously been

LUTD = lower urinary tract disease



treated with amoxicillin, amoxicillin-clavulanic acid, and prednisolone, and his diet was changed after the second LUTD presentation. Clinical signs for each episode were reported to have resolved after therapeutic intervention over 4 to 14 days.

Examination

Physical examination showed the patient was bright and alert with a palpable, moderately distended urinary bladder that was not painful. Blood work (ie, CBC, serum chemistry profile, total thyroxine) results were within normal limits. Urinalysis via cystocentesis showed a urine specific gravity (USG) of 1.045 and a pH of 6. RBCs per high-power field were too numerous to count. Other

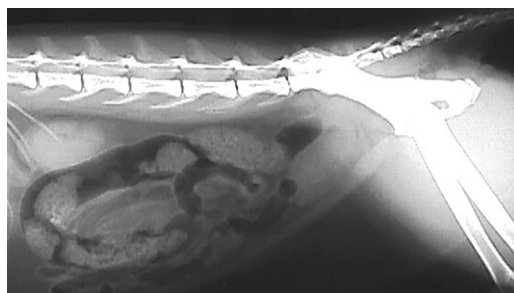
results were within normal limits. Urine culture showed no growth after 72 hours. Muscle mass was normal, and BCS was 5 of 9.

Dietary History

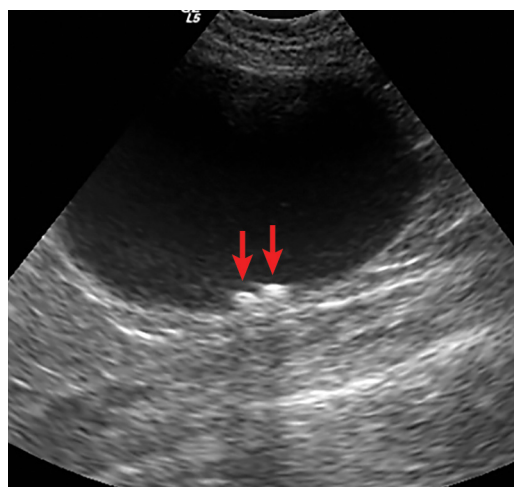
A comprehensive nutritional evaluation was completed. The patient had been eating a therapeutic canned struvite and oxalate preventive diet for approximately one year. He was occasionally (<1 time/week) fed over-the-counter treats. He was an indoor-only cat in a household with no other pets.

Testing & Treatment

Abdominal radiography and ultrasonography were conducted. Abdominal radiography revealed no abnormalities (*Figure 1*); ultra-



▲ **FIGURE 1** Lateral abdominal radiograph of patient



▲ **FIGURE 2** Ultrasound of urinary bladder showing urocystoliths (red arrows)



▲ **FIGURE 3** Percutaneous cystolithotomy is a minimally invasive technique for urocystolith removal from a young adult cat.



▲ **FIGURE 4** Urocystoliths from patient

sonography revealed 2 small urocystoliths (*Figure 2*). Medical dissolution was not attempted because the uroliths were not believed to be composed of struvite due to their radiolucency, lack of crystalluria, and aciduria. Because the patient was a male cat, no attempt was made to retrieve the urolith by voiding urohydropulsion. Percutaneous cystolithotomy¹ (*Figure 3*) was performed. Urocystoliths (*Figure 4*) were removed and submitted for quantitative analysis.

DIAGNOSIS:

AMMONIUM URATE UROCYSTOLITHS

Idiopathic Urate Urolithiasis

Ammonium urate accounted for approximately 5% of uroliths obtained from cats and submitted to the Minnesota Urolith Center in 2016.² Urate uroliths form as a result of liver disease (usually a portosystemic vascular shunt)^{3,4} or because of an inborn metabolism error that causes hyperuricosuria (eg, in dalmatians and English bulldogs).^{5,6} However, the underlying mechanism for ammonium urate urolithiasis in cats without liver disease is unknown. Idiopathic urate urolithiasis usually occurs in cats between 4 and 7 years of age⁵⁻⁷ but can occur in kittens secondary to congenital liver disease (eg, portovascular anomalies).⁸

There are no published protocols for medical dissolution of ammonium urate uroliths in cats with idiopathic urate urolithiasis.

Follow-Up

Despite normal laboratory results, provocative bile acid testing was performed; results were normal.

Nutritional Consultation

In the author's experience, prevention of urate urolith recurrence is successful in more than 90% of feline cases in which a therapeutic kidney diet is fed.⁹ There are several goals of nutritional treatment of urate urolithiasis in cats. The diet should be low in purines; however, the purine content of a diet is not provided on food labels. Thus, a low-protein diet is often fed (<30% on a dry matter basis). In addition, feeding a canned product to induce more dilute urine (USG <1.030) is preferred over feeding a dry product. The diet should also induce alkaluria (urine pH >7).

Inky was transitioned to a canned therapeutic kidney diet with instructions to minimize treats. Periodic monitoring via urinalysis and abdominal ultrasonography, as well as follow-up with the owner and patient by the nutritional healthcare team, has shown no recurrence in more than 5 years.

Conclusion

This case illustrates that not all cats with LUTD have idiopathic cystitis or uroliths composed of struvite or calcium oxalate.^{10,11} Thorough evaluation of a patient, including an in-depth nutritional history, is important, especially when clinical signs are recurrent or when response to treatment does not match expectations.

LUTD = lower urinary tract disease
USG = urine specific gravity

Continues ►

ASK YOURSELF ...

QUESTION 1

What is the most common cause of LUTD signs in young adult cats?

- A. Struvite urolithiasis
- B. Bacterial UTI
- C. Urethral matrix-crystalline plugs
- D. Calcium oxalate urolithiasis
- E. Idiopathic cystitis

MOST ACCURATE ANSWER: E

Idiopathic cystitis is the most common LUTD diagnosis in young adult cats and accounts for more than 50% of cases.¹¹⁻¹⁵ Urolithiasis is the next most common diagnosis, with struvite being the most common mineral in young adult cats. Urethral plugs have only been diagnosed in male cats. Bacterial UTI is uncommon and accounts for 1% to 4% of LUTD cases.¹¹⁻¹⁵

QUESTION 2

What is the most common mineral found in feline urocystoliths submitted for analysis from countries in North America?

- A. Ammonium urate
- B. Calcium oxalate
- C. Cystine
- D. Struvite
- E. Xanthine

MOST ACCURATE ANSWER: D

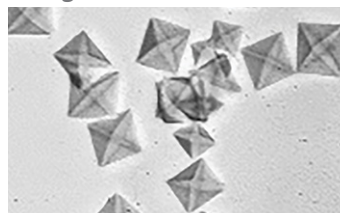
Data from the Minnesota Urolith Center for 2016 show that struvite occurs more commonly than does calcium oxalate in feline uroliths submitted from countries in North America ($\approx 45\%$ vs 35%)²; however, this is not true in other parts of the world. Feline uroliths submitted from South America are approximately equal in distribution between struvite and calcium oxalate ($\approx 40\%$ each). Uroliths submitted from Africa, Asia, Australia, and Europe are more likely to be composed of calcium oxalate than of struvite ($\approx 50\%$ - 75% calcium oxalate vs $\approx 15\%$ - 40% struvite).²

LUTD = lower urinary tract disease

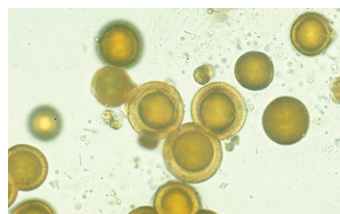
QUESTION 3

Which image shows ammonium urate crystals?

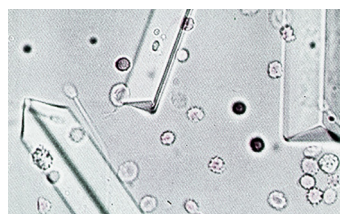
A.



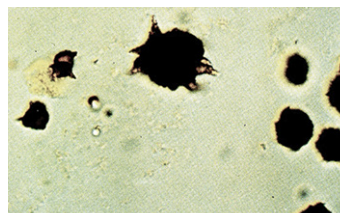
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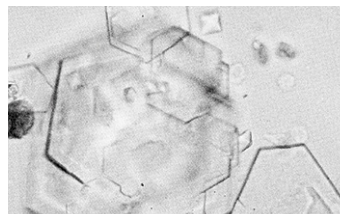
C.



D.



E.



MOST ACCURATE ANSWER: D

Figure A shows calcium oxalate dihydrate crystals, Figure B shows xanthine crystals, Figure C shows struvite crystals, and Figure E shows cystine crystals.

QUESTION 4

Allopurinol is a drug used to manage urate urolithiasis in dogs. Allopurinol's mechanism of action for prevention of urate urolithiasis is inhibition of:

- A. Adenosine deaminase
- B. Xanthine oxidase
- C. Allantoinase
- D. Uricase
- E. Purine oxidase

MOST ACCURATE ANSWER: B

Allopurinol is a xanthine oxidase inhibitor that competitively inhibits the conversion of hypoxanthine to xanthine and xanthine to uric acid in the purine pathway. Competitively inhibiting xanthine oxidase decreases uric acid levels in serum and urine. Side effects may include increased xanthine levels, which can result in xanthine crystal and urolith formation.^{10,16,17}

QUESTION 5

Which dietary measure is indicated for prevention of ammonium urate urolithiasis in cats without underlying liver disease?

- A. Low purine, alkalinizing
- B. Low purine, acidifying
- C. High purine, alkalinizing
- D. High purine, acidifying

MOST ACCURATE ANSWER: A

Purine content is not provided on food labels. Because purines are found primarily in animal protein, it is assumed that a low-protein diet would also be low in purines. Ammonia and uric acid concentrations in blood and urine are influenced by dietary protein—and thus by dietary purine intake. Limiting dietary protein intake decreases risk for ammonium urate urolithiasis.

In addition, ammonium urate is more soluble with alkaluria as compared with aciduria. Increasing urine volume can also help prevent recurrence.^{9,10,18}

EDITOR'S NOTE: The author is an advisory board member for Blue Buffalo and a consultant for Veterinary Information Network.

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