



Nutritional Approach to Managing Lower Urinary Tract Disease in Cats and Dogs

Royal Canin USA

RACE Continuing Education Lecture Notes

The urinary system can be divided into the upper urinary system (kidneys & ureters) and the lower urinary tract (bladder & urethra). Diseases affecting the lower urinary tract are commonly seen in dogs and cats. Some are medically managed, such as bacterial cystitis, while others respond to dietary management. It is important to identify those conditions in which nutrition can play a role and then determine which diet is most appropriate for your patient. There is no “one size fits all” approach so a number of different diets and strategies must be considered. This presentation will provide an overview of urolithiasis, with a focus on struvite, calcium oxalate, and purine-based uroliths, as well as an overview of feline idiopathic cystitis (FIC). The main objective of this presentation is to provide insight into recognition and management of lower urinary tract disease in dogs and cats with a focus on nutrition.

Urinary Tract Basics

Lower urinary tract disease (LUTD) can include a variety of conditions including urolithiasis, urinary tract infections, feline idiopathic cystitis, urinary incontinence and neoplasia. Clinical signs are frequently similar regardless of the etiology of LUTD, and more than one etiology may be present in a single patient. Clinical signs of LUTD include:

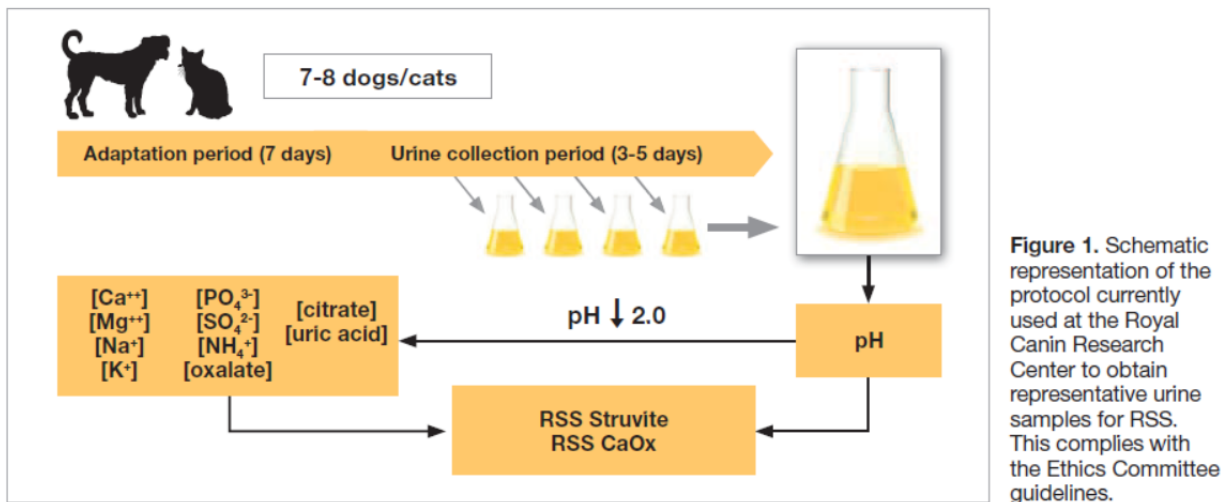
- Hematuria
- Pollakiuria
- Dysuria
- Stranguria
- Inappropriate urination (cats urinating outside the litter box, dogs having accidents)
- Vocalization during urination
- Urethral obstruction

The most common causes of LUTD in dogs are cystitis (including bacterial urinary tract infections [UTI]), incontinence, and urolithiasis, while the most common causes of LUTD in cats are FIC, urolithiasis, and urethral plugs leading to urethral obstruction.

Diagnostics for LUTD in dogs and cats include history, physical examination, imaging, urinalysis, other laboratory testing, urine culture and sensitivity, and stone analysis. The urinalysis is frequently the test that is performed most often and includes macroscopic evaluation, urine specific gravity (USG), dipstick evaluation, and microscopic sediment analysis. Other tests may need to be performed as well, including radiographs, ultrasound, CBC, and chemistry.

Relative Supersaturation

Relative supersaturation (RSS) is the gold standard for assessment of risk of crystal formation in urine. It utilizes urine pH and urinary concentration of 10 solutes in order to predict the risk of crystal formation in cats or dogs fed a specific diet. The protocol is described in Figure 1 (source: Veterinary Focus, 2014).



After measurement of pH and solute concentration in the urine, a software program is used to calculate an RSS value for struvite and an RSS value for calcium oxalate. The lower the RSS value, the lower the risk of stone and crystal formation. RSS may be altered by lowering urinary solute concentration and/or altering urine pH, depending on the stone type.

Major pet food companies that produce veterinary therapeutic diets measure RSS on urinary diets as well as non-urinary diets. Non-urinary diets that have low RSS values can have a urinary label such as Royal Canin's S/O Index. The S/O Index (and similar labels from other manufacturers) indicates that even though the diet may not be formulated specifically for lower urinary tract disease, it can help prevent struvite and calcium oxalate stone and crystal formation.

Urolithiasis

Stones in the lower urinary tract can be managed with four basic steps:

1. Relieve obstruction if necessary
2. Eliminate existing uroliths
3. Reduce risk factors if possible
4. Help prevent recurrence

Basic stone recurrence prevention can involve using a diet designed to prevent recurrence of a specific type of urolith. Diets should be chosen based on the stone analysis from an individual patient. Struvite, calcium oxalate, and purine-based stones are most common in dogs and cats. While stone type cannot be determined without analysis by a reference laboratory, there may be certain clues that can help identify if a patient is at risk for a specific stone type. Factors that help predict urolith composition include: signalment, radiographic density of the urolith, urine pH, crystalluria, presence of urinary tract infection, concurrent disease, and diet history. It is important to note, however, that crystals do not always correlate to stones. Crystals may be unrelated to the type of urolith present and may form spontaneously in stored urine.

Struvite Urolithiasis

Struvite uroliths are composed of magnesium, ammonium, and phosphate. Struvite stones in dogs are typically associated with UTI, while sterile struvite stones occur more commonly in cats. Struvite is more likely to form at high urine pH, at high urine specific gravity, and with excess urinary mineral composition (specifically magnesium, ammonium, and phosphate). Struvite stones may be removed surgically, but can usually be dissolved with diet +/- antibiotic therapy if appropriate. If dissolved with diet, the struvite dissolution diet +/- antibiotics should be continued for at least four weeks after radiographic resolution. Recurrence is possible, especially when sterile or in an animal predisposed to UTI, so a struvite preventative diet should be used in those patients. Dietary therapy involves urine dilution, controlling urinary mineral content, and acidifying the urine.

Calcium Oxalate Urolithiasis

Calcium oxalate stones, unlike struvite stones, cannot be dissolved with diet. Calcium oxalate stones are also not dependent on pH like some other stone types; they can form at any urine pH. Calcium oxalate uroliths can form when the USG is high, urinary calcium and oxalate are high, and with excessive vitamin C or D supplementation. For patients with calcium oxalate stones, hypercalcemia should be ruled out to ensure that metabolic problems are not present. Calcium oxalate stones must be removed surgically, with laser lithotripsy, or with urohydropropulsion. Recurrence of calcium oxalate stones is common. After stone removal, a calcium oxalate preventative diet should be used. These diets reduce risk for spontaneous crystallization of calcium and oxalate, and involve urine dilution and controlling urinary calcium and oxalate.

Purine-Based Urolithiasis

Purine-based stones include urate and xanthine, and occur due to incomplete metabolism of dietary purines. Certain dogs, such as the Dalmatian, have a high genetic risk for purine-based uroliths, and purine-based stones are also more common in dogs and cats with liver disease such as portosystemic shunts. Low purine diets should be used for management of purine-based stones. Low purine diets may have low dietary protein content and/or low-purine sources of protein such as plant-based proteins or eggs. Some urate stones can be dissolved using a low-purine diet in conjunction with allopurinol, but it can take several months to dissolve the stone. Urate stones are more likely to form at low urine pH. Urine dilution and alkalinizing the urine can help manage purine-based stones.

Diets for Urolithiasis

Commercial veterinary therapeutic urinary diets, commercial veterinary therapeutic diets designed for multiple conditions, and home-cooked diets can be used. Home-cooked diets should be formulated to be complete and balanced by a board-certified veterinary nutritionist. When fed, any diet used in the management of urolithiasis should be fed as the sole source of nutrition. Any treats included in the dietary plan may alter the animal's tendency to form crystals and stones.

Feline Idiopathic Cystitis

FIC is the most common cause of lower urinary signs in cats, and is a noninfectious, complicated syndrome. Clinical signs can be similar to that of other LUTD. It typically occurs in young to middle-aged cats and LUTD signs can be present in conjunction with other signs involving other body systems. Signs usually resolve within seven days, if not sooner. Therefore, management of FIC lies in preventing recurrence.

Preventing recurrence of FIC involves environmental management and nutritional management. Environmental management can help reduce stress and enrich the environment of the affected cat. Nutritional management aims to maximize water intake and urine volume, because concentrated urine may irritate the bladder wall. In addition, limiting dietary changes can help reduce stress and calming nutrients such as alpha-casozepine may be introduced to help manage anxiety.

Summary

Clinical signs can be similar for different types of LUTD, so a thorough work-up is necessary to identify the cause of the signs and to help determine the best approach for management. Urolithiasis management can vary based on stone type, but lowering USG and urinary solute content is common to all stone types. Management of FIC should focus on environmental modification, urine dilution, and increasing water intake.

Additional Resources

- Osborne et al. Analysis of 451,891 canine uroliths, feline uroliths, and feline urethral plugs from 1981 to 2007: perspectives from the Minnesota Urolith Center. *Vet Clin North Am Small Anim Pract*, 2009;39:183-197.
- Pibot et al, eds. Encyclopedia of Canine Clinical Nutrition. 2006.
- Pibot et al, eds. Encyclopedia of Feline Clinical Nutrition. 2008.
- Queau and Biourge. Urinary relative supersaturation and urolithiasis risk. *Veterinary Focus* 2014; 24: 24-29.