

## Urolithiasis

*Urinary bladder calculi, bladder stones*

### **Affected Animals:**

Dogs and cats. Cats of any age, sex, or breed can develop bladder stones. Struvites, the most common stone type, usually are found among younger adult cats. Calcium oxalate stones occur most often in male cats aged four to nine years old.

### **Overview:**

Bladder stones are rock-hard collections of minerals, clinically known as uroliths, which can rub and irritate the bladder wall, causing it to bleed. As a result of the irritation, the cat may feel like it needs to urinate frequently, even if it has only a small amount of urine to release. Bladder stones may also obstruct urinary flow. A cat that meows or cries while in the litter box may be experiencing bladder stone-related pain.

A variety of minerals can develop into different stone types. Cats will get each of the different stone types for different reasons. The various stones, which are named based on their mineral components, include the following: struvite, calcium oxalate, urate, calcium phosphate, xanthine, and cystine. In cats, struvite is the most frequently encountered stone, accounting for 50 to 65 percent of the stones analyzed. Calcium oxalate, seen in about 20 percent of bladder stone cases, is the second most common type of stone. The other types are uncommon in the cat.

Bladder stones come in many different sizes and shapes. Smaller stones often pose the greatest health risk because they are more likely to obstruct a cat's ability to urinate. Small stones sometimes can escape from the bladder into the exiting canal called the urethra, only to get stuck as the urethra becomes narrower. As a stone becomes wedged, it will block the flow of urine partially or completely, making it difficult or impossible for the cat to urinate. This is the most serious problem associated with bladder stones, because an obstruction of the bladder, if untreated, can lead to irreversible damage to the kidneys, and in turn, death.

The method of treatment and prevention of bladder stones is based on the stone type. A stone usually is collected from the cat and analyzed for its mineral content in order to determine what method should be followed.

#### **Clinical Signs:**

Clinical signs associated with urolithiasis are influenced by the location of the stone or stones. Common findings include pollakiuria, hematuria, and dysuria or stranguria. Some cats can become obstructed by stones lodged in the urethra. Symptoms of obstruction can include frequent, unsuccessful attempts to urinate; vocalization and pacing; hiding; vomiting; depression; weakness; and excessive grooming of the urogenital area.

#### **Symptoms:**

Symptoms will depend on the type, size and location of the stone. The disease becomes serious or life threatening when the stones obstruct a cat's ability to urinate. Thus, "red flags" to watch for include urinating outside of the litter box, frequent urination, meowing or crying during urination, and the presence of blood in the urine. Cats unable to urinate as a consequence of bladder stone obstruction still may attempt to urinate even if nothing is produced. They also may hide, vomit, cry or howl, or show signs of depression and weakness.

#### **Description:**

A bladder stone, or urolith, is comprised of minerals held together in an organic matrix. There are many different types of bladder stones -- they vary according to which minerals they contain. Of all the different kinds of bladder stones, though, struvite is the most commonly encountered in cats. In a certain urinary environment, the amount of struvite stone minerals present in the urine becomes so significantly high that they are unable to remain in the dissolved state. Instead, the magnesium and phosphorus minerals will precipitate, or fall out of solution, into crystals that in turn will conglomerate into stones. The incidence of the struvite stone has decreased in the last 10 or so years due to the development of preventive diets.

Among felines, calcium oxalate is the second most commonly diagnosed stone type. The mode of formation of these stones is not completely understood. It is believed that the struvite prevention diets are inadvisable for cats prone to forming calcium oxalate stones, since the magnesium restriction and urine acidification may influence calcium oxalate stone formation.

With all types of bladder stones, frequent urination, blood in the urine, and difficulty urinating may result. Irritation of the bladder generally is the cause of blood in the urine and frequent urination. When a stone obstructs the bladder outflow -- a much more threatening condition -- a severely decreased ability or inability to urinate results.

#### **Diagnosis:**

The examining veterinarian may be able to feel the bladder stones while

palpating the cat's bladder. X-rays and ultrasound techniques also may be used to detect the stone's presence, number, size, and location. Other common diagnostic tests include a complete urinalysis, a complete blood cell count, a blood chemistry panel, and a urine culture to check for bacterial infection.

In addition, it is very likely that the veterinarian will order a quantitative urolith analysis. This test will determine which type of bladder stone the cat has; this is important since different types may require different treatment protocols. Knowing the type of stone involved is also important in attempting to prevent stone formation in the future. Some cats may pass very small stones in their urine, which if collected, allow urolith analysis to be performed without surgical retrieval. However, in most cases, the stone, or stones, must be removed surgically for this test to be performed.

#### **Prognosis:**

The prospect of recovering from bladder stones is likely if the cause of the stone formation can be diagnosed and corrected. Bladder stones that result in an obstruction of the cat's ability to release urine carry a more serious prognosis. Recurrence of stone formation is not uncommon.

#### **Transmission or Cause:**

Bladder stones form when the amount of mineral present in the urine is high enough that the mineral is unable to remain dissolved. Instead, the minerals fall out of solution and become crystals, which, in turn, will coalesce into a stone. Different characteristics of the urine -- such as how acidic or basic the pH level is -- can make certain minerals more likely to precipitate into bladder stones. Some diseases can cause increased amounts of minerals to accumulate in the urine. Diet can also play a role. In addition, urinary tract infections can lead to struvite stone formation, as can different abnormalities in a cat's anatomy and metabolism.

Each bladder stone type has predisposing factors that cause certain cats to form that type repeatedly. Cats who develop cystine bladder stones, for example, usually have a genetic inability to absorb the cystine mineral within the kidney.

#### **Treatment:**

Treatment is based on the results of the diagnostic tests and determination of the stone type. The veterinarian will prescribe an antibiotic if an infection is present.

A special stone-dissolving diet may be prescribed to eliminate struvite stones. This food must be fed exclusively in order for it to be effective. The veterinarian will monitor the cat's response to the diet by follow-up exams and repeated bladder x-rays. If the diet fails to dissolve the stones, surgical removal will have to be considered.

Most of the other bladder stones do not respond to medications; thus, alternative methods of removal will be required. If the stones are very small, a procedure

called urohydropropulsion can be performed to flush the stones out of the bladder. However, larger stones will need to be removed surgically through an operation called a cystotomy. This is done after the cat is put under general anesthesia; it involves incisions into the abdomen and the bladder.

**Prevention:**

There are different methods for preventing some types of bladder stones. Stone prevention diets are appropriate for struvites; for others, medications to control the urine pH may be used. The animal's owner should follow the veterinarian's recommendations for bladder stone prevention, and continue regular follow-up visits for early detection and treatment of any recurrences.