

Brookville Road Animal Hospital

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phone: (317) 353-6143

Home Care Instructions

- Restrict activity for 10 days. He/she should be inside during this time, and not allowed to run or play with other pets.
- An e-collar should be worn for 10 days if he/she tries to lick at the incision. This is strongly recommended when unsupervised, as this is likely to occur.
- Monitor incision for swelling and discharge. Expect the area to be somewhat red for a few days. If excessive swelling or discharge is noted, please come in for recheck examination.
- He/she can be offered normal food tonight. Based on stone analysis results, we may recommend transitioning to a prescription diet, to reduce likelihood of recurrence.
- Expect some blood in the urine for the next few days – this is normal, as the bladder wall was incised, and the bladder lining will be irritated due to stone removal.
- Please see attached information regarding bladder stones in dogs.

Oxalate Bladder Stones (Canine)

The Pet Health Care Library

Oxalate Bladder Stones in Dogs

- 73% of calcium oxalate patients are male. This stone type is unusual in females.
- Breeds at especially high risk include: miniature schnauzers, Lhasa Apsos, Yorkshire terriers, miniature poodles, shih tzus, and Bichon frises.
- Most cases occur in dogs between ages 5 and 12 years of age.

How do we know these are Calcium Oxalate Stones?

Although a urinalysis can provide a clue, the only way to know for sure that a dog's bladder stone is an oxalate stone is to retrieve a stone and have a laboratory analyze it. If the stones are very small, flushing the urinary bladder and forcefully expressing it may produce a stone sample for testing. The only other way to obtain a sample is to surgically open the bladder and remove the stones. The surgical method is invasive but provides the most rapid resolution of the bladder stone issue. Calcium oxalate stones cannot be made to dissolve over time by changing to a special diet, as can be done with [struvite](#) or [uric acid](#) bladder stones.



Each division of these bladder stones = 1 millimeter

Why would my Dog Form Calcium Oxalate Stones?

It shouldn't be too surprising that there is a strong hereditary component to the formation of oxalate bladder stones. This is also true in humans. There is a substance called nephrocalcin in urine that naturally inhibits the formation of calcium oxalate stones. This substance is defective in both humans and dogs who form calcium oxalate bladder stones. The production of defective nephrocalcin may be a genetic problem.

In humans, the genetic predisposition for stone formation is coupled with dietary issues (problem foods include: spinach, peanuts, chocolate, dairy products, calcium supplements, vitamin C supplements, and tea). Dogs are more likely to eat simply a commercial brand of dog food without nearly the dietary variety that humans experience. This means that diet can be used to manage the problem in dogs but unless the dog is receiving an unusual treat supply, diet is probably not a cause.

There are some metabolic diseases that might predispose a dog to creating a calcium oxalate stone. For example, a dog with [Cushing's disease](#) will over-produce cortisol (commonly known as cortisone). This hormone increases calcium excretion in urine. The extra calcium in the urine will promote formation of a stone. Some animals may have an elevated blood calcium level ([hypercalcemia](#)) for any number of reasons and this could lead to excess calcium in the urine as the body attempts to restore calcium balance. Again, extra calcium in the urine promotes a stone. Screening for such medical conditions is important and is generally part of the medical work up once stones are detected on a radiograph. If any such metabolic problems are uncovered, they will need to be treated separately and as these problems are resolved, no further stone prevention measures should be needed.

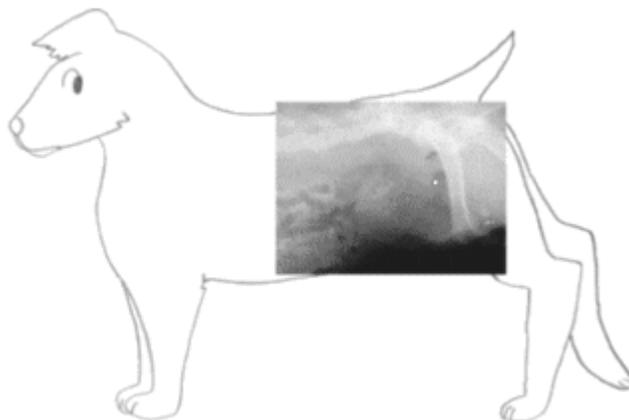
Why Can't the Stones stay where they are?

The most immediate concern for a dog with bladder stones is that the urinary opening may get obstructed as the dog attempts to pass the stones; this is largely a problem with male dogs, but the results can be life-threatening uremic poisoning. In such cases, the veterinarian will try to dislodge the stone, flushing it back into the bladder to restore the patency of the urinary opening. If the stone cannot be dislodged, a new urinary opening may have to be surgically created. The urethra (the narrow tube connecting the urinary bladder to the outside world) is a difficult place to perform surgery so it is preferable to move the stone back into the bladder for removal rather than attempting removal from the urethra.

Bladder stones are irritating to the bladder simply by rubbing on the tender lining. Bleeding typically results and, of course, the chance of developing chronic bladder infections is markedly increased with bladder stones.

BECAUSE CALCIUM OXALATE STONES CANNOT BE DISSOLVED BY DIET CHANGE, SURGICAL REMOVAL OF THE STONES IS USUALLY NECESSARY.

STUDIES HAVE SHOWN THAT 50% OF DOGS WHO HAVE UNDERGONE SUCH SURGERY WILL DEVELOP NEW CALCIUM OXALATE STONES WITHIN 3 YEARS.



The Following Therapeutic Plan has been Devised to Minimize the Chance of Recurrence

Step One: Diet

While specific diets cannot dissolve existing stones, they do help prevent the development of new stones.

Prevention centers on creating a urinary environment with minimal calcium and minimal oxalate as well as creating a urine pH that is not conducive to calcium oxalate formation. Your veterinarian can recommend appropriate therapeutic diets.

For commercial therapeutic diets, the canned form is preferable to dry so as to increase water consumption and thus help dilute the urine. It is especially important to avoid table scraps when caring for an oxalate stone-forming dog. Still, no one wants their dog to live life without treats. The following treats are acceptable for oxalate stone forming-dogs:

- Plain, cooked chicken
- Plain, cooked turkey
- eggs
- rice
- peas
- pasta
- white potatoes
- cabbage
- cauliflower
- bananas
- melon

Many pet owners ask if any non-therapeutic diets are appropriate for this condition. None are, however, it may be possible to have a veterinary nutritionist provide a recipe for an appropriate home-cooked diet. Visit www.balanceit.com or www.petdiets.com for details.

Some medications can increase the risk of calcium oxalate stone development and these should be avoided. [Prednisone](#) and other cortisone-type medications (commonly used for itchy skin, arthritis, inflammatory bowel disease, and other inflammatory conditions) should be avoided if possible. [Furosemide](#) (brand name: Lasix or Salix) is a diuretic mostly used to treat heart failure. Both these medications lead to excess calcium in urine. Should a diuretic be needed for a patient at risk for calcium oxalate stones, one from the thiazide class (see below) would be a better choice. Supplementation with Vitamins D or C also increases risk of forming oxalate stones, so such supplementation should be discontinued.

Step Two: Urinalysis

Two to four weeks after surgery, a urine sample is checked. If the urine is not adequately dilute (meaning the specific gravity is less than 1.020), water consumption will have to be increased (either by adding water to the food or increasing the amount of canned food).

If urinary pH is less than 6.5 or if oxalate crystals are seen, it is time to go to Step Three. If all is well, a urinalysis should be performed every 2 months or so for the rest of the dog's life (University of Minnesota's current recommendation).

Radiographs are taken every 3 to 6 months so that any new stones will still be small enough to be retrieved from the bladder by flushing. If one skips this monitoring, one may find stones present have developed to a large size and surgery is again needed to remove them.

Step Three: Potassium Citrate

When the pet takes potassium citrate pills, citrate levels increase in the urine. Calcium binds to citrate instead of to oxalate. This is a desirable event since calcium citrate tends to stay dissolved whereas calcium oxalate tends to precipitate out as mineral deposit. Potassium citrate also helps create alkaline urine (in which calcium oxalate stones have difficulty forming). Potassium citrate supplements are typically given twice a day.

Step Four: Urinalysis Again

Two to four weeks after potassium citrate is added to the therapeutic diet, a urine sample is checked. If

the urine is not adequately dilute, water consumption will have to be increased (either by adding water to the food or increasing the amount of canned food).

If urinary pH is less than 6.5 or if oxalate crystals are seen, it is time to go to Step Five. If all is well, a urinalysis should be performed every 2 months or so for the rest of the dog's life (University of Minnesota's current recommendation). Again, radiographs should be taken every 3 to 6 months.

Step Five: Thiazide Diuretics

A diuretic is a medication designed to increase the amount of urine produced. The thiazide class of diuretics does this in a way that reduces the calcium content of the urine. This medication is typically given twice a day and electrolytes are generally measured via blood test within the first two weeks of this treatment.

There will always be some dogs who continue to form stones no matter what is done. With radiography monitoring, it is hoped that new stones can be detected while they are still small. As research continues, it is possible that new developments will arise that will not require such frequent monitoring. Until then, [these are the guidelines for oxalate prevention](#) as proposed by the specialists at the University of Minnesota.

A Note on the Bichon Frise

The Bichon Frise appears to have a unique situation with oxalate bladder stones in that they seem to begin to recur virtually as soon as they have been removed. In a study presented by Jody Lulich's group at the University of Minnesota at the 2004 meeting of the American College of Veterinary Internal Medicine, 24 out of 33 Bichons had oxalate stone recurrence after cystotomy (37% had had their first recurrence in the first year after surgery, by the end of the second year 57% had recurred, and by the end of the third year 73% had recurred, some more than once.) Steps to prevent recurrence need to be particularly aggressive from the beginning in this breed.

Prevention of Male Dog Obstruction

In the male dog, a bone called the "os penis" is located in the penis, and it surrounds the urethra. Urine passes through this hollow bone like water through a pipe. Because it is bone, it cannot stretch or expand to accommodate a stone trying to pass. A stone blockage of this type leads to an emergency and death if it goes untreated.

In a perfect world, controlling the bladder stones controls the risk of obstructions, but controlling the bladder stones is not always easy and treating a dog over and over for obstruction becomes expensive. A surgical procedure called urethrostomy can be performed to prevent obstruction. This procedure involves creating a new urinary opening in the scrotum area. This allows urine to be expelled earlier in its course so that passage through the os penis does not occur. The flexibility of the non-bony part of the urethra plus the surgically enlarged urinary opening allows for smaller stones to pass rather than stick in the os penis.

In order to perform this surgery, the male dog must be neutered (which can be done at the time of the urethrostomy). The creation of the new opening usually requires removal of the empty scrotum.

While this is not as good an outcome as preventing stone recurrence, at least the emergency obstruction is prevented.

Calcium oxalate bladder stones can be very frustrating. Not only do they tend to recur but following monitoring recommendations involves a visit to the veterinarian's office every two months. How rigidly the monitoring schedule is followed depends on the owner, but keep in mind that the trouble and expense of a stone surgery weighs against the much less trouble and expense of monitoring.

A new technique of stone removal involves the use of a laser to blast the stone into pieces small enough to pass. This option is especially useful when the number of stones is small and/or when a stone is lodged in the urethra and cannot be flushed into the bladder.

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THE PET HEALTH LIBRARY

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Struvite Stones - Canine



- 85% of patients with struvite bladder stones are female.
- Breeds felt to have an increased risk for the formation of struvite stones are the Miniature Schnauzer, Shih Tzu, Yorkshire terrier, Labrador retriever, and Dachshund.
- The average age of patients with struvite bladder stones is 2.9 years.

Some patients with bladder stones show no symptoms of any kind and the stones are discovered incidentally, but there are some symptoms that might promote a search for stones. Bloody urine, recurrent bladder infection (especially by the same organism), or straining to urinate all would raise suspicion. Fortunately, struvite stones are radio-opaque, which means they show up readily on radiographs (x-rays).

Occasionally stones are simply passed. If this occurs, it is important to have radiographs taken to check to see if there are more stones. If possible, a stone should be sent in for analysis to determine for certain the stone type.

When to Suspect Struvite Stones

Bladder stones come in several mineral compositions. The most common stone types are oxalate and struvite. Since the approach is different for each type, it is crucial to determine the stone type. The stone type can be confirmed if a sample stone is available (either passed naturally or obtained via surgery, voiding urohydropropulsion, or cystoscopy). A laboratory analysis can easily determine the content of the stone and even determine if the stone consists of layers of different mineral types. Without a sample stone, there are still some hints that can be obtained through other tests.

Struvite stones in dogs are almost always formed because of the urinary changes that occur with specific types of bladder infection: almost always staphylococcal infection but occasionally a Proteus infection. If a urine culture from a patient with a bladder stone should grow either Staph or Proteus, this would make struvite more likely than oxalate. Also, struvite requires an alkaline pH to form while oxalate requires an acid pH to form; urine pH is a part of any urinalysis and thus provides another clue as to the stone identity.

An educated guess is better than nothing but does not replace the actual analysis of a stone. Occasionally a stone of one type forms the center of a stone of another type. A complete analysis is needed to effectively prevent recurrence.

How do Struvite Stones Form?

Struvite is the name given to the crystal composed of magnesium, ammonium, and phosphate. (Struvite is also occasionally referred to as "triple phosphate" due to an old erroneous belief that the phosphate ion was bonded to three positive ions instead of just magnesium and ammonium.) Struvite crystals are not unusual in normal urine and are usually of no consequence unless they are accompanied by an infection with a bacterial species that produces an enzyme called urease.

Urea is an important biochemical excreted in urine. When urine is infected with bacteria that are able to digest urea, urea is broken down into ammonia (NH₃). Ammonia in water ionizes into ammonium (NH₄⁺). Ammonia is toxic to the cells of the bladder wall and when there it generates inflammation (although the infection also generates inflammation). The proteins released in the inflammatory reaction form a matrix that the struvite crystals use to form a stone. The reaction takes place only in an alkaline pH but ammonia creates just the alkaline pH needed for stone formation.

Bacteria capable of digesting urea are called urease positive bacteria and in most cases we are talking about *Staphylococci*. In dogs, the general rule is: No infection, no bladder stone.

The hereditary situation of the English cocker spaniel is an exception because in at least one genetic line of this breed, the tendency to form a purely metabolic struvite stone has been documented.

What should be done about Struvite Bladder Stones?

Struvite stone can be removed in several ways: surgically; with a technique called voiding urohydropropulsion; with a cystoscope (if they are small enough); or dissolved through diet.

Surgery

Surgical removal is the most direct method. The advantage is that the stones are removed and healing may commence all in one day. The chief disadvantages are those inherent to surgery: anesthetic risks, post-operative pain, risk of contaminating the abdomen with infected urine, possibility that not all stones will be removed, and the possibility that the bladder stitches will not properly hold. These risks are generally considered minor and complications associated with cystotomy (opening of the urinary bladder) are unusual. The patient usually stays in the hospital a day or two to be sure urine production is normal, to properly confine the patient, and to assess pain.



Voiding Urohydropropulsion

If the stones are small enough to pass, the bladder can be manipulated to expel the stones through the urethra. This is called voiding urohydropropulsion and it involves filling the bladder, agitating the bladder so the stones float freely in the urine, and then generating a high pressure urine stream to force the stones out. The patient must typically be held vertically so that gravity can assist in the expulsion. This technique only works if the stones are small and the patient is not too large. If there are numerous stones, often several attempts are needed if this is to be the only means of removal. Often this technique is used to obtain a sample stone for analysis to determine if dietary dissolution is feasible.

Cystoscopy



If one wishes to avoid surgery and the stones are small enough, a cystoscope can be passed into the patient's bladder and the stones retrieved with a type of basket (or fragmented via laser lithotripsy). This requires specific equipment, referral to a specialty practice, and generally greater expense than surgery although recovery time for the patient is typically much faster.

Dietary

Dietary dissolution of stones is possible with struvite bladder stones. Some therapeutic foods are made for the specific purpose of dissolving struvite stones. The therapeutic diet must be the only food fed until the stone is dissolved. Antibiotics are needed as long as stones are in the bladder (bacteria are encrusted within the stone and as the stone dissolves, they are released). On the average, three and a half months are needed to dissolve the stone but the diet should be continued for a full month after the stones are no longer visible on radiographs because there may be small stones that are not large enough to see. Radiographs are taken monthly to monitor progress. If a dry food is used, ideally water should be added to it; the extra water helps keep the urinary crystals diluted and able to dissolve. Talk to your veterinarian about which prescription diet is best for your pet.

Aside from the long treatment time, an important disadvantage of this approach is the possibility of urinary tract obstruction as the stone gets smaller and an unsuccessful attempt to pass the stone occurs. This is potentially a life-threatening hazard for male dogs as they have a narrow urethra.

Some of the appropriate therapeutic diets are high in fat and salt and should not be fed to patients with a past or current history of **pancreatitis**, patients with heart disease, **kidney insufficiency**, or **high blood pressure**.

Recurrence of Stones?

After stones are removed one way or another, the focus shifts to prevention. Often patients are somehow predisposed to bladder infection, which means they are also predisposed to form more struvite bladder stones. A stone can form as quickly as 2 weeks after infection with a urease positive bacterium sets in.

After surgery, antibiotics must be continued until the infection is confirmed to have cleared (i.e., a negative urine culture is obtained). After this, a follow up schedule of radiographs and/or urine testing is recommended. For a single episode, only a few follow-up visits may be necessary. Some individual animals are predisposed to recurring bladder infections and these individuals may form new struvite stones repeatedly. Obviously, if stones were to recur, a more regular monitoring schedule would have to be revised.

Dietary therapy to prevent struvite stones is of secondary importance in dogs (with the exception being the English Cocker Spaniel for which this is a hereditary metabolic problem rather than a matter of infection). The focus is on preventing infection. If your dog has had a history of struvite bladder stones, be sure to discuss with your veterinarian long-term monitoring and understand what schedule of testing is best for your pet. Expect periodic urine cultures to be needed.

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