

Brookville Road Animal Hospital

8049 Brookville Road, Indianapolis, IN 46239

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 cats.

THE PET HEALTH LIBRARY

By Wendy C. Brooks, DVM, DipABVP

Educational Director, VeterinaryPartner.com

Struvite Stones - Feline

Struvite Bladder Stones in Cats

What is Struvite?

Struvite is a urinary mineral composed of ammonium, phosphate, and magnesium. These three substances are common in urine and if they exist in high enough concentrations, they will bind together in the form of crystals. Struvite crystals are normally found in urine and have no significance on their own. Problems occur when these crystals combine with mucus and form a urinary plug that can cause a blockage in a male cat's urinary tract (see [feline urinary blockage](#)) or when the crystals bind together to form a bladder stone.

Struvite is also sometimes called triple phosphate, based on some early studies that had misidentified the minerals. The name has stuck, though, so you may hear this term.



Historically, feline bladder stones could virtually be counted on to be struvite, as opposed to some other type of mineral. Nowadays, due to widespread cat food reformulation in the 1980s, approximately 50% of feline bladder stones are struvite and the other 50% are **calcium oxalate**.

If Struvite Crystals are Normal, why do Some Cats Form Stones?

There are several factors at play here. The pH of the urine, presence of proteins around which the crystals can aggregate, and urinary water content all are important issues. Ultimately, these factors come together to contribute to a urine that is supersaturated with struvite. In dogs, an infection is necessary to create a struvite bladder stone but in cats 95% of the time no infection is involved (though sometimes the stone can lead to infection.)



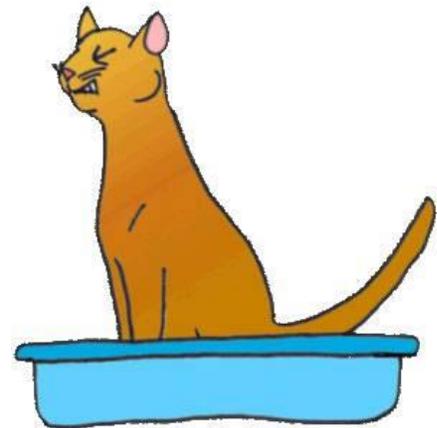
Struvite crystals in a urine sample as seen under the microscope

Symptoms

While bladder stones can sometimes be found incidentally while looking into another problem, most of the time they are found when the cat is showing signs of lower urinary tract disease:

- Straining to urinate
- Bloody urine
- Urinating in inappropriate locations
- Urinating small amounts frequently

These symptoms are expressed regardless of what the lower urinary tract disease is. Other lower urinary tract diseases include: **idiopathic cystitis, bladder infection, bladder tumor**, and more obscure issues such as healing bladder trauma. In cats showing signs of lower urinary tract disease, approximately 25% of them will have bladder stones so it is worthwhile to take a radiograph of the bladder to check. A urinalysis will be helpful in determining the type of stone and in ruling out other causes of urinary symptoms.



Treatment: Dietary Dissolution

Struvite stones can be dissolved by feeding specific diets. There are several commercial brands available and they all act by creating a bladder environment that is favorable to dissolving the struvite crystals back into the urine. In order to proceed with this form of treatment, the patient should be female (as the stone dissolves and the stone gets smaller, we do not want it lodging in the narrow male urinary tract and causing obstruction). Obviously, the cat should not have a second disease that makes the stone diet inappropriate, and the cat must be fed only the urinary diet and nothing else.

A typical protocol involves radiographs every 3 to 4 weeks to confirm that the stone is actually dissolving. If the stone does not completely dissolve, it may not be composed entirely of struvite (calcium oxalate stones will not dissolve with diet) or there may be some other reason why the stone is not dissolving; perhaps the cat is sneaking food elsewhere, etc. On the average, it takes about 6 weeks for a stone to dissolve. If the stone does not seem to be dissolving after a reasonable time, surgical removal may be necessary.

Treatment: Surgery

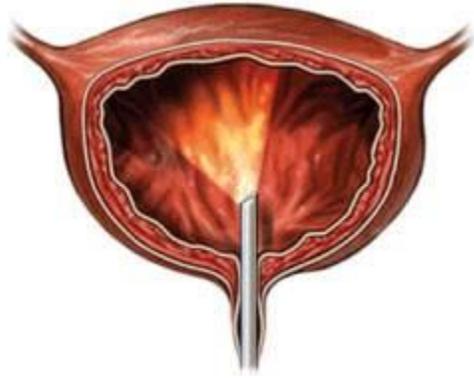
Surgery to remove a bladder stone is called a cystotomy. Here, the bladder is opened and the stones inside are simply removed. The bladder and belly are closed up and the cat is able to go home when he or she has a good appetite and normal urination. Some blood in the urine can be expected for several days after surgery. There may be some urinary discomfort at first but generally removing the stones is the fastest route to recovery from urinary symptoms.

The stones can be sent to a laboratory for analysis to confirm the stone type.

Other Methods of Stone Retrieval

Cystoscopy

A less invasive method involves using a cystoscope, a long skinny instrument, to remove stones from the bladder using a small basket-like retrieval accessory. This can only be done with small stones and can only be done in female cats. For larger stones, laser lithotripsy can be used to break the stone into smaller pieces that can be removed or passed. Laser lithotripsy requires the cystoscope laser to be in contact with the stone so, again, the cat must be female; the male cat's urethra is too small for a cystoscope.



Voiding Urohydropropulsion

This technique can work if the stones are small enough to pass through the patient's urethra. The patient is sedated, the bladder is distended with fluid, agitated, and manually expressed under pressure. By positioning the sedated patient vertically, gravity loads the stones in the neck of the bladder, positioned for expulsion. When the bladder is expressed, often stones can be passed that might otherwise have stayed in the bladder. Larger stones cannot be passed using this technique.

Prevention

To avoid forming new struvite stones it is helpful to use a diet that creates a bladder environment that is not conducive to stone formation. There are numerous such urinary formulas and sometimes the same diet that was used to dissolve the stone can simply be continued. Ideally, a canned formula is used because canned foods have extra water and that helps make more dilute urine - and dilute urine means a lower crystal concentration.

If it is not possible to feed an appropriate diet, the use of urinary acidifiers may be necessary. Your veterinarian may recommend some monitoring tests to make sure the pH and urine concentration stay in a range where struvite stones should not form.

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THE PET HEALTH LIBRARY

By Wendy C. Brooks, DVM, DipABVP

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Oxalate Bladder Stones (Feline)

Cats with bladder stones tend to have the classical symptoms of feline idiopathic cystitis: straining to urinate, bloody urine, urinating in unusual places, genital licking. In the course of testing to pursue these symptoms, a radiograph is taken and a stone or group of stones is seen in the urinary bladder. Alternatively, the cat might have no symptoms of any kind and the stone is discovered when a bladder infection fails to resolve after appropriate antibiotics. The stone may be found incidentally when the cat has radiographs taken for some other reason. At the point where we see the stone on the radiograph or on an ultrasound image, we do not know what kind of stones we are up against. To find out we must:



- Surgically remove the stones and analyze them.
- Retrieve a stone by getting the cat to pass one, even a small one (generally only possible in female cats).
- Retrieve a stone with a cystoscope (small gadget that enters the bladder) and submit it for analysis. (Again, generally only possible in female cats.)
- Look at a urinalysis for clues as to the stone type (urine pH, presence of crystals or infection can help us make an educated guess).

Unlike struvite stones, calcium oxalate stones cannot be dissolved with specific diets; surgery is needed to remove any stones too large to pass.

Why do Cats Develop Calcium Oxalate Bladder Stones?

About 25 years or so ago, cats virtually never developed calcium oxalate bladder stones. Cat bladder stones could reliably be assumed to be made of struvite (a matrix of ammonium-magnesium-phosphate). In those days, feline lower urinary tract symptoms were generally thought to be caused by struvite crystals in urine and feline lower urinary tract symptoms were extremely common. The pet food industry responded by acidifying cat foods to prevent crystals from developing. In a way, it worked. Feline lower urinary tract symptoms declined. Male cats with struvite urinary blockages became far less common. The trade off was that calcium oxalate bladder stones began to develop. Acidifying the body leads to an acid urine pH and more calcium loss into the urine, both factors in the development of a calcium oxalate stone.

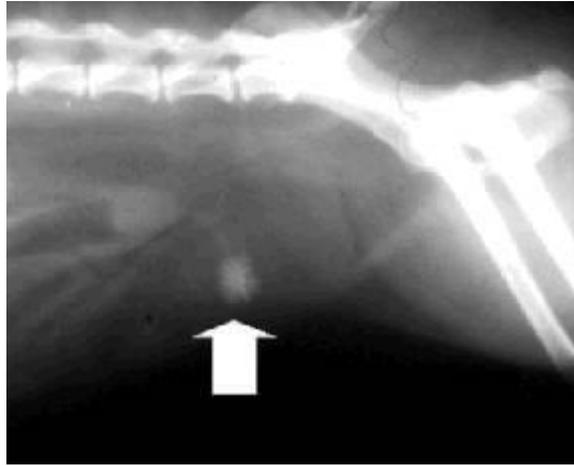
Currently most bladder stones formed by cats are calcium oxalate stones.

Burmese and Himalayan cats appear genetically predisposed to the development of calcium oxalate bladder stones.

Most calcium oxalate stones develop in cats between ages 5 and 14 years.

*35% of cats with calcium oxalate bladder stones have elevated blood calcium (**hypercalcemia**).*

Cats with calcium oxalate stones tend not to have bladder infections and to have acid urine pH on their urinalysis.



How to get Rid of the Stones

Cystotomy (Surgical Removal)

The fastest way to resolve a bladder stone issue is to remove the stones surgically. To accomplish this, the cat is anesthetized and an incision made through the belly. The bladder is lifted into view, opened, and stones are removed. Cultures to rule out infection are obtained if not done previously. The bladder is closed in several layers. The belly is closed and the patient is awakened. Pain medication and antibiotics are routinely used after surgery. The patient usually remains hospitalized for a day or two to observe urination. The stones are sent to the lab for analysis. It is normal for some blood to be seen in the urine for several days after surgery.

Cystoscopy

A less invasive method involves using a cystoscope, a long skinny instrument that remove stones from the bladder using a small basket-like retrieval accessory. This can only be done with small stones and can only be done in female cats. For larger stones, laser lithotripsy can be used to break the stone into smaller pieces that can be removed or passed. Laser lithotripsy requires the cystoscope laser to be in contact with the stone so, again, the cat must be female; the male cat's urethra is too small for a cystoscope.

Voiding Urohydropropulsion

This technique can work if the stones are small enough to pass through the patient's urethra. The patient is sedated, the bladder is distended with fluid, agitated, and manually expressed under pressure. By positioning the sedated patient vertically, gravity "loads" the stones in the neck of the bladder, positioned for expulsion. When the bladder is expressed, oftentimes stones can be passed that might otherwise have stayed in the bladder. Larger stones cannot be passed using this technique.

USING DIET TO DISSOLVE A CALCIUM OXALATE STONE IS NOT POSSIBLE.

Once a stone has been retrieved, it can be submitted to the laboratory for analysis.

After it is confirmed as calcium oxalate, the goal is to prevent future stones.

Stone Prevention

Retrieving the stones is generally the easy part of managing calcium oxalate stones. Preventing future stones is more challenging. If the patient is one of the 35% with an elevated blood calcium, then steps to control the calcium level and determine why it is high should be taken. (See hypercalcemia). If blood calcium levels are normal, the following step by step regimen is recommended:

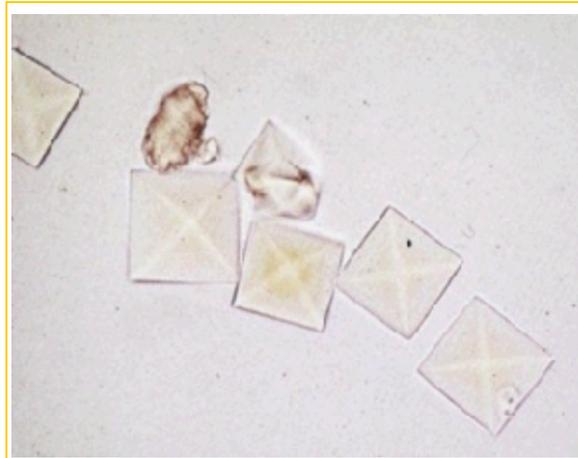
Step one: Feed a non-acidifying diet that minimizes calcium oxalates in urine

Such diets use normal calcium content, a moderate magnesium content, and citrate to bind urinary calcium. Your veterinarian can recommend an appropriate therapeutic food.

Canned diet is preferred over dry food due to the high water content of canned foods. Part of the goal is to create a dilute urine and the extra water consumption is helpful. Meal feeding rather than free feeding also may be helpful in maintaining the desired urinary pH.

Avoid supplementation with vitamin C. Vitamin C is converted to oxalic acid, which modifies into oxalate. Be careful of pet vitamin supplements.

In 2 to 4 weeks, perform a urinalysis to see if there are calcium oxalate crystals (there should not be), if the urine is dilute (the specific gravity of the urine should be less than 1.020), and if the urine pH is alkaline (it should be 6.8-7.5).



Oxalate crystals are classically marked with an "X" (the "X" is naturally present in the crystals when viewed under a microscope)

Step two: Correcting problems in the first urinalysis

If the urine specific gravity is greater than 1.020, this means that the urine is not adequately diluted. The cat will need to drink more water. This is best accomplished by increasing the percentage of canned food in the diet.

If the urinary pH is less than 6.5, the urine is too acidic and potassium citrate must be given as a supplement, either as a chewable tablet, capsule or oral liquid.

Another urinalysis is performed in 2 to 4 weeks.

Step three: If oxalate crystals are present, the urine is not dilute, or if the pH of the urine is acid (pH less than 7.5) the following steps are taken:

A thiazide diuretic is added to dilute the urine and correct the necessary electrolyte balance in the urine. Vitamin B6 is supplemented. A population of cats has been identified for which a B-6 deficiency leads to oxalate stone development. This may or may not be helpful but is worth trying. The vitamin B-6 deficiency leads to an increase in blood oxalic acid, which in turn leads to an increase in urine oxalates. A different food may need to be selected.

Once a urinalysis with the appropriate values is obtained, the patient is rechecked every 3 to 6 months with a urinalysis and radiographs. In females, stones may be identified when they are still small enough to be induced to pass naturally. A male cat will require surgery to remove stones as the male tract is invariably too small for stones to pass.

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THE PET HEALTH LIBRARY

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Urinary Blockage

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THIS IS AN EMERGENCY!!

Recognizing the Emergency

We have already described the signs of feline idiopathic cystitis (F.I.C.) as straining to urinate, bloody urine etc. If the cat is a male, he is at risk for an especially life-threatening complication of this syndrome: the urinary blockage.

Mucus, crystals and even tiny bladder stones can clump together to form a plug in the narrow male cat urethra. The opening is so small that it does not take a lot to completely or even partially obstruct urine flow. Only a few drops of urine are produced or sometimes no urine at all is produced.

It is hard to tell when a cat is blocked as the inflammation, urgency, and non-productive straining also accompany cystitis whether or not there is a blockage. The easiest way to tell is by feeling in the belly for a distended bladder. It is often the size of a peach and if there is an obstruction the bladder will be about as hard and firm as a peach. (Normal bladders are usually soft like partly filled water balloons, and non-obstructed inflamed bladders are usually very small or empty). Still, while this size and texture difference is obvious to the veterinarian, most pet owners are not able to feel for the bladder correctly. If there is any question about whether a male cat is blocked, he should be taken to the vet for evaluation as soon as possible.

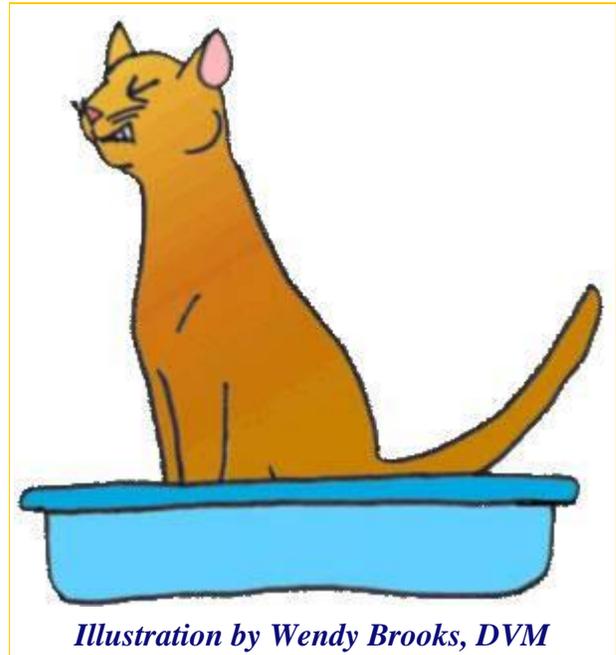


Illustration by Wendy Brooks, DVM

If the blockage persists 3 to 6 days, the toxin build up will result in death.

DO NOT PUT OFF HAVING THE CAT CHECKED!

Confirmation and Assessment

The veterinarian will feel the bladder in the abdomen and attempt to express urine. Sometimes gentle pressure will actually expel the obstruction but usually the cat will require more aggressive means of relief. The blocked cat will be assessed for dehydration and toxin build up. The urinary toxins that build up in obstructions commonly cause vomiting, nausea, and appetite loss. They can also cause life-threatening heart rhythm disturbances. Your cat is assessed for all these complications as they will need to be addressed.

A partial blockage can be just as serious as a complete blockage. Treatment is usually the same.

If the blockage persists for longer than 24 hours, urinary toxins will have started to build up in the system.

Initial Treatment

The single most important thing for the obstructed cat is to have the blockage removed. This is done by placing a urinary catheter through the urethral opening and either through the obstruction itself, or using pulses of flushing solution to move the plug back into the bladder where it can be dissolved. This procedure is often painful and sedation will most likely be needed. Some cats are unblocked with great difficulty only. Some cats cannot be unblocked and must have an emergency perineal urethrostomy to re-establish urine flow (see below for details on this surgery).

Fortunately, most cats are successfully unblocked. The urinary catheter is sewn in place and will stay in place for a couple of days. Often a urinary collection bag is attached to the catheter so that urine production can be measured. Sometimes, the bladder is filled with sterile fluid and flushed out to remove crystals, inflammatory debris, and blood.

When the blocked cat has filled his bladder to capacity, his kidneys stop making urine as there is nowhere for it to go. Once urine flow returns, the kidneys quickly begin to correct the metabolic disasters that have been taking place. Often an extremely sick blocked cat can be snatched literally from the jaws of death by having proper fluid support and by re-establishing urine production. It is amazing how efficient the working kidneys can be in restoring the body's balance; still, it is important to realize that this is a serious condition and not every cat can be saved.

Occasionally a cat is brought in soon after blocking and achieves an excellent urinary stream immediately after unblocking. These cats may be able to proceed with treatment without having to spend a few days in the hospital or without having to have the catheter sewn into place. Most blocked cats do not fit into this category but it is important to realize that some cats are able to avoid more aggressive treatment.

Further, in the event of extreme budget limitations on the owner's part, a blocked cat can be unblocked quickly and returned to the owner for aftercare. This is not a good idea as the cat is likely to need additional support for the best chance of survival; still, given that leaving the cat blocked would be cruel and ultimately end in the cat's death, this may be an alternative in some cases.

What Happens during Hospitalization?

The kidneys do most of the work during the recovery phase. The cat must wear a type of collar that prevents biting at or removing the crucial urinary catheter. Urine production is monitored closely as after the obstruction is relieved often dramatic urine volumes are produced. (This is called post obstructive diuresis and if the cat is not drinking on his own, it is crucial that his fluid therapy matches the volumes produced as urine. If they do not, he will dehydrate.) Fluid therapy is given either intravenously or under the skin, depending on the degree of support needed by the cat. Medications are given to relieve pain and relax the irritated urethra.

After a couple of days of catheterization, the catheter is removed and the patient is observed for re-blockage. He will not be allowed to go home until his urine stream seems strong and relatively easy. Some cats will leak urine at this point as it is painful for them to engage in normal pushing; this is generally a temporary problem. Once he seems to be urinating reliably on his own, he will be released for home care.

What to Watch for at Home after Discharge from the Hospital

In an ideal world, owners can learn how to feel the abdomen for a firm obstructed bladder. This is hard to teach at discharge mostly because at this point, the cat is pretty sore. There will usually be medications and dietary recommendations to go home with the cat.

It is crucial to realize that the cat is at risk for re-blocking for a good week or two from the time of discharge.

This is because the irritation syndrome that led to blocking in the first place is still continuing and as long as the episode continues, blocking is a possibility.

At home, the same straining and possibly bloody urine will still be produced. It is important for the owner to be aware of urine volume being produced and of bladder size, if possible. Any loss of appetite or vomiting should be reported to the veterinarian at once. If there is any concern about reblocking, the veterinarian can determine fairly easily if the cat has re-blocked.

Most cats recover uneventfully and most do not need continuing medication after they have recovered. Some cats, especially if they have blocked before, will require on-going treatment. Once the cat is no longer obstructed, management is the same as for any other cat with **feline idiopathic cystitis** that is not obstructed.

Occasionally the bladder over-stretches while it is blocked and is permanently damaged. Such cats require medication to help them contract and empty their bladders normally. This is unusual but one should be aware of the possibility.

The Perineal Urethrostomy

Urinary blockage is almost exclusively a problem reserved for males. This is because the female urethra is shorter and broader and thus far more difficult to obstruct. When urinary blockage becomes recurrent in a male cat, it becomes time to consider surgical reconstruction of the genitalia to create a more female-like opening. This surgery is called the perineal urethrostomy or PU for short. Basically, the penis is removed and a new urinary opening is made.

Before considering this surgery, here are some considerations:

- This surgery is done to prevent obstruction of the urinary tract. It does not prevent feline idiopathic cystitis. This means the cat is likely to continue to experience recurring bloody urine, straining etc. He just will not be able to block and complicate the situation.
- Cats with perineal urethrostomies are predisposed to bladder infections and infection-related bladder stones. The University of Minnesota currently recommends that male cats with perineal urethrostomies have regular periodic urine cultures even if they are asymptomatic. This basically means that your cat should go to the vet to be tested 3 or 4 times a year for urine cultures.

What you need to know if you are Considering this Procedure for your Cat

- The metabolic complications from the urinary blockage should be resolved before the surgery is performed. In some emergency situations this is not possible (the male cat cannot always be unblocked with a urinary catheter and a new urinary opening may have to be constructed on an emergency basis.) Residual urinary toxin build up is an important risk factor that should be eliminated or minimized if possible.
- Shredded paper or pelleted newspaper litter should be used during the 10 days following surgery. Clay and sand litter may stick to the incision and disrupt healing.
- The most serious complication that can occur post-operatively is scar (stricture) formation. This causes a narrowing of the urinary opening and the surgery may have to be revised.
- In theory, local nerve damage can occur during the surgery leading to urinary and/or fecal incontinence. Obviously these are disasters for a household pet but fortunately this is a very rare complication.
- As mentioned, regular urine cultures are recommended for cats with perineal urethrostomies.

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