Struvite Stones
By Dr. Karen Becker

Hi, I'm Dr. Becker. Struvite stones, also called triple phosphate stones and magnesium ammonium phosphate stones, are a type of bladder stone or bladder crystal that occurs in both dogs and cats.

Magnesium, ammonia and phosphate are common substances found in urine. In very high concentrations, they can bind together to form crystals that irritate your pet's bladder and cause inflammation. If the crystals combine with mucus, they can actually form a plug that partially or completely block the urinary tract. In worst case scenarios, these crystals kind of congeal together to form uroliths, which is the medical term for bladder stones that can actually require surgery in some advanced cases.

Struvite stones account for about one-third of all urinary tract stones in dogs and about half of all urinary stones in cats. Female pets around 6 to 7 years of age are at the highest risk group for struvite stones.

Causes of Struvite Stones

Struvite stones can have a bunch of different causes, including extremely alkaline urine, which is often a baseline result of a biologically inappropriate diet; a urinary tract infection, or another disorder of the urinary tract. Sometimes abnormal urine retention, where urine is stored in the bladder for unnaturally long periods of time, can predispose animals to struvite stones. Prolonged or high doses of steroids have also been implicated.

Dog breeds prone to struvite stones include the miniature Schnauzer, Shih Tzu, Bichon Frise, miniature poodles, cocker spaniels and the Lhasa Apso.

Struvite Stones Symptoms

Some pets with bladder stones show no obvious signs, but common symptoms can sometimes include frequent urination, straining to urinate, abnormal urination – for example, your dog can lift his leg and you think that it's in the morning and he should have a good stream of urine, and maybe just a few drops come out – as well as urinating in inappropriate places or dribbling.

Kitties will oftentimes urinate outside of their litterbox as a first clue. If you actually can visualize urine on the floor, sometimes there's a cloudy urine or bloody urine. Oftentimes, there's increased thirst.

It's very important to know that a urinary blockage can be possible with this type of stone and is an absolute medical emergency. If your pet isn't able to pass urine, you need to go to a veterinarian immediately. You can't wait until the next day or the day after. You've got to seek care instantly.

Complete blockages are seen much more often and much more seriously in male pets than female pets. If your pet's bladder is extremely inflamed, it may also be enlarged. Sometimes with non-obese pets, your vet can actually palpate the bladder through the abdominal wall and can actually feel bladder stones in the bladder.

Diagnosis of the Conditions Related to Struvite Stones

A urinalysis will check for the presence of blood, protein and glucose, as well as ketones and bilirubin. It will also determine the concentration of the urine, which is really the measure of kidney health and function. But urinary concentration is also a contributing factor to stone formation. A urinalysis will also pick up the presence of white blood cells, which are an indication of inflammation or infection.

A urine culture and sensitivity test will reveal if there's a bacterial infection present. It can also determine what medication will be the most effective in clearing the infection. Because certain bacteria can contribute to struvite stone formation, this is a really important step that should not be skipped. I cannot stress that enough.

I would say almost on a daily basis, in fact yesterday alone, I've had one phone call and one email about, "I have a dog that has been identified with struvite stones. What do I do?" The veterinarian sadly didn't recommend this really critical initial step of culturing the urine to make sure that the root cause is not an underlying urinary tract infection. In my opinion, this should be the very first step in properly identifying the root cause of why this entire syndrome is occurring. Don't let your veterinarian skip that step.

It is possible for your pet actually to have bladder inflammation with crystals without infection. This condition is called cystitis. If this is the case, then your treatment protocol will obviously be quite different for cystitis than with a urinary tract infection. This is why it's really important that your veterinarian establishes right off the bat whether there is infection present or not.

If there is infection present, then don't guess at the type of antibiotic. If your veterinarian says, "Oh. Your dog or cat has crystals. There might be infection. Just use this antibiotic." It's really unnecessary. It can actually foster antimicrobial resistance. Don't let your veterinarian guess or just wantonly prescribe antibiotics.

X-rays and ultrasounds are typically also quite important, especially if your pet has had a recurrent issue, because they help identify the size, shape and the location of the stone. It can also help determine treatment options.

If your pet has crystals or stones but is still capable of urination, then the situation is oftentimes managed with medication and dietary adjustments. The first thing we'd want to do for pets with crystals or stones is to create a healthy urine pH that is neither too acidic nor too alkaline.

A urinary pH of 7 is neutral. Everything above 7 is alkaline, and everything below 7 is acidic. Most pets with struvite crystals or bladder stones will have a urinary pH well above 7, so they have an alkaline urine, which actually creates a perfect environment for bacteria proliferation. Some pets that originally just start out with a struvite crystal issue and they have alkaline urine eventually can develop urinary tract infections because it's this prime environment.

It's the naturally acidic urine of dogs and cats that actually helps prevent urinary tract infections from occurring. When you have alkaline urine, dogs and cats lose that natural ability to fight off UTIs. It's not uncommon for pets to, over time, develop UTIs when they have these struvite crystals.

The second condition that also develops is that a lot of dogs and cats with struvite crystals developed what we call bladder sludge. It's this kind of blend of crystals and mucus, along with inflammatory debris that can be picked up on ultrasound. Dogs and cats, as carnivores, should have a slightly acidic urinary pH, optimally between 6 and 6.5. We want to maintain the urine pH no more than 7, because above 7, your pet is at risk for developing additional struvite crystals.

Some pets are generally predisposed to producing a protein as well, called cauxin. If your pet is a cauxin excretor, then cauxin is excreted into the urine, which can cause sterile crystals or sterile crystalluria, which means crystals can form without infection even being present because of this genetic predisposition. These animals are very prone to chronic cystitis. These very sharp crystals can cause micro trauma to the lining of the bladder, which is incredibly uncomfortable for pets.

Treatment and Recommendations for Struvite Stones

Many holistic veterinarians use blends of Chinese herbal medicines, as well as homeopathy and lots of different nutraceuticals to help with this condition, including things like glucosamine, which has been proven to help maintain the mucous membranes, which is what the lining of the bladder is, as well as cranberry extract, which helps not only fight urinary tract infection, but it helps promote a healthy urinary pH.

We also use substances like D-mannose to help prevent future UTIs from forming. Once the infection has been controlled, D-mannose can be your best friend at preventing future urinary tract infections.

Herbs that may be really beneficial for struvite bladder stones include chanca piedra, dandelion, goldenseal, horsetail, marshmallow, plantain, Oregon grape root, uva ursi, yarrow and maitake mushrooms. The herb called corn silk as well can be quite beneficial, as well as cranberry and nature's antibiotic, which is called olive leaf.

If you are a dog parent, I recommend that you buy pH testing strips from your veterinarian or the local drug store, and that you check your dog's urinary pH at home. Because if you're

checking on a daily basis, then you're going to know whether your pet is at risk of forming struvite stones, or whether you've created a perfect pH.

In the morning, prior to feeding your dog breakfast, when your dog goes outside for that first urination of the morning, you can run a piece of pH test strip through your pet's urine stream and check to see what the urine pH is. This is a really great way to proactively make sure that you're keeping your pet's pH in an optimal range. I do recommend that you keep a log of your pet's urinary pH to show your veterinarian at appointments, so that you both agree that your dog's pH is exactly where it needs to be.

Actually, in some cases – I have two kitties, when they're squatting in the box, they'll allow their moms to just check their urine. Kitties tend to not be so hip on anyone being in the litterbox when they're using it, but if you're capable of running a urinary test strip through a cat's urine stream, do it, because it can provide really valuable information.

In some cases, your pet may need medical assistance getting his or her pH down into a healthy range. This can be accomplished not by using a prescription diet, but by adding the amino acid DL-methionine. DL-methionine can be found in tablet or in powder form. It's an all-natural amino acid that is really quite inexpensive, but it's actually the therapeutic ingredient that's added to prescription diets to make them "prescription."

There's no reason to decrease the quality of food you're feeding by putting your pet on to some of these poorly formulated prescription diets, but there could be a reason to institute DL-methionine therapy, which you can get from your veterinarian and use in conjunction with a high-quality, species-appropriate diet.

I don't recommend feeding these highly processed diets for many reasons. First of all, they're made with feed-grade ingredients. All of the prescription diets on the market, except for certain fresh food brands, have been made with rendered human ingredients, which are not great quality resources. They also contain unnaturally high amounts of synthetic nutrients, as well as grains. Those starchy carbohydrates are ultimately one of the main reasons that pets develop crystals in the first place.

It seems kind of backwards to feed a high grain or starch diet, and then add DL-methionine into that. It's kind of two steps backwards and then a step forwards. You can do so much better by actually creating a home-prepared, starch-free diet and adding in DL-methionine as needed to help control your dog's urinary pH. You can do that with kitties as well. Ask your holistic or integrative veterinarian about dosing instructions for DL-methionine, depending on your pet's body weight.

Occasionally, I have also had really good success modulating urinary pH using ascorbic acid, which is vitamin C. Now remember, using buffer vitamin C buffers urinary pH so you have to use true ascorbic acid, which helps pets drop urinary pH down into normal range. However, be aware that too much vitamin C can create loose bowels. In those situations where you've used

vitamin C in an attempt to control urinary pH but you're not getting control, you'll need to switch to DL-methionine.

Carnivores have acidic urine. Herbivores, or vegetarian animals, have alkaline urine. Actually, inappropriate over-the-counter diets – in fact I will venture to say the majority of dog and cat diets on the market that you are buying at either big box stores, or even from your veterinarian, contain a tremendous amount of carbohydrates. They're not listed on the label.

When you flip the bag over, you're going to see things like corn, wheat, rice, soy, but also hidden carbohydrates like oatmeal, chickpea, sweet potato and potato, as well as tapioca. All of those carbohydrates alkalize your pet's urine. One of the best things you can do if you have a pet struggling to maintain healthy urine pH is to reduce the amount of carbohydrates or starches that you're feeding your pet.

To reduce urine pH on a species-appropriate level, which is the goal for most pets with struvite crystals, I recommend that you feed your pet a low-carb, grain-free, including starch-free, potato-free, and preferably fresh food diet. Or at a minimum, a canned food diet or a dehydrated or freeze-dried diet that has been reconstituted with lots of water.

Oftentimes, your pet's pH can be naturally maintained between 6 and 6.5 just from picking healthy species-appropriate nutrition. Dry food can cause a tremendous increase in the concentration of urine, which means when your pet's urine becomes super concentrated, it really increases the risk of struvite formation. Ensuring a high-moisture diet is one of the cornerstones of preventing struvite crystals from occurring. Getting your pets off of dry food is really important.

You also want to ensure that your pet is drinking a lot of fresh, clean drinking water. Encouraging kitties to drink from a water fountain or moving water is also a really great idea. For cats, you can put fountains or water bowls in separate locations to encourage lots of hydration. You can also add bone broth, low-sodium bouillon or stock to your pet's food to also entice them to consume more water.

Creating more dilute urine and offering a moisture-rich diet is a really important aspect of preventing stones and crystals from occurring, as well as feeding a species-appropriate diet in combination with infection management. This particular combination is the best thing you can do, not only for dissolving struvite crystals, but to prevent crystals from forming in the first place.

Stones located in the urethra or the ureters, which are the tubes that connect the kidneys to the bladder, oftentimes must be surgically removed. If they get stuck there, they oftentimes have to come out through surgical intervention. Sometimes, depending on the location and the size of the stone, there is a technique called laser lithotripsy that breaks down the stones into smaller pieces that can then be passed out. There's also a second procedure called voiding

urohydropropulsion, which actually is a technique that involves manually expressing the stones out through the urethra while the patient is being sedated.

If your pet has been diagnosed with struvite crystals or stones, it's really imperative that you continue treatment until the condition is totally resolved, and then you incorporate a proactive plan to prevent the problem from coming back. A urinalysis should absolutely be performed monthly until all the crystals are dissolved, and then I recommend you check your pet's urine every six months to make sure that no new crystals or stones are forming.

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