

## All About Bladder Stones In Ferrets

**An inappropriate diet is one factor that causes bladder stones in ferrets.**

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Photo Courtesy Dr. Greg Rich, West Esplanade Veterinary Clinic, Metairie, Louisiana  
This view through a microscope shows a struvite crystal in the urine from a ferret.

Can ferrets get bladder stones? Yes, they can — just like cats, dogs and people do. Ferrets are actually at risk for three different types of bladder stones, so let's go over what bladder stones are, what causes them, how to recognize them, how to treat them and how to prevent them.

### What Are Bladder Stones?

Bladder stones form in the urinary bladder when minerals such as magnesium, ammonium, phosphorus and calcium precipitate out of the urine. These minerals form crystals. The crystals then join together and form stones. The stones can be very small like tiny pebbles or quite large like a golf ball. In some cases only one stone forms, but in others numerous small stones develop. One unusual type of bladder stone develops from cystine, an amino acid.

### What Causes Bladder Stones?

Three different types of bladder stones are known to occur in ferrets, and each has a different cause. The most common type by far is the struvite stone; the second most common type is the calcium oxalate stone; the uncommon type is the cystine stone. [Click image to enlarge](#)

These struvite stones were found in a dog.  
Photos Courtesy Jerry Murray, DVM  
This calcium oxalate stone was found in a dog.

### Struvite Stones

Three main factors cause struvite stones: diet, urinary pH and bacterial infections of the bladder.

The two main components of the diet involved in struvite stone occurrence are the source of the protein and the level of magnesium. The source of the protein is important because this affects the pH of the urine. Animal-based protein such as chicken, turkey, pork, egg and fish have the amino acids methionine and cystine in them. These two amino acids contain sulfur. When these two sulfur-containing amino acids are metabolized, they produce sulfuric acid. When sulfuric acid is excreted into the urine, it lowers the pH of the urine. On the other hand plant-based protein like corn gluten, wheat gluten, soy protein isolates and soybean meal do not have those two sulfur-containing amino acids. Thus plant-based protein does not acidify the urine, and the pH of the urine raises higher than normal (above 6.4). Struvites are unlikely to form when the pH of the urine is acidic (below 6.4).

Struvites are composed of three things: magnesium, ammonium and phosphate; therefore, avoid excessive amounts of these three things in the ferret's diet. Magnesium is the most important one to limit.

As previously mentioned, urinary pH is an important factor in struvite formation. When a ferret eats a diet with mainly plant-based protein, the pH of the urine rises above the normal range. A pH above 6.4 can cause struvite crystals and stones to form. This is why it is so important to feed a high-quality, meat-based ferret food or kitten food instead of a low-quality, plant-based non-ferret food.

Bacterial bladder infections from Staphylococcus or Proteus species can raise the urine pH to 8 or above. Struvite stones can form in less than one day when the pH is that high. Bladder infections are most common in unneutered jills during the breeding season and during pregnancy, and in ferrets with adrenal gland disease. Thus, it is important to use an appropriate antibiotic as soon as possible if a ferret has a bladder infection. [Click image to enlarge](#)

This radiograph shows a male ferret with several small bladder stones in the bladder and in his urethra. The rear legs are to the far right and his os penis is just to the left of his legs. Note the several small stones right behind the os penis. The bladder is just a little bit to the left of his os penis. Note the many bladder stones in his urinary bladder.  
Photos Courtesy Dr. Bob Wagner, University of Pittsburgh, Pittsburgh,

## Pennsylvania

In this autopsy photo, the ferret is lying on its back with the tail and rear legs to the right and the belly, chest, head, etc. going to the left. Numerous small bladder stones appear inside and outside the bladder.

## Calcium Oxalate Stones

Calcium oxalate stones are very different than struvite stones. The two main factors that lead to oxalate stones are diet and pH of the urine. These stones are formed from calcium and oxalate, so a ferret should avoid a diet with excessive calcium and oxalate. Other items to avoid include treats like milk, cheese and dairy products. Also, avoid supplements that contain excess calcium.

Oxalate is formed from the metabolism of plant-based protein, which contains the amino acids glycine and serine. It can also be formed from the metabolism of vitamin C. Increases in urine oxalate levels promote calcium oxalate stones more so than increases in calcium. This is another great reason to avoid plant-based protein! Calcium oxalate stones are more likely to develop in acidic urine, but they can form in alkaline urine too. [Although meat-based protein makes the urine acidic, it doesn't cause oxalate to form, so calcium oxalate stones shouldn't form when a ferret is fed a meat-based diet. – Eds.]

## Cystine Stones

Cystine stones are uncommon and uniquely different. These stones are a result of a genetic defect in the kidneys. The kidneys do not reabsorb the amino acid cystine. The kidneys may also have a problem reabsorbing three other amino acids: ornithine, lysine and arginine. Because cystine is the least soluble amino acid, the stone is composed almost entirely of cystine. Cystine solubility depends on urine pH, and cystine stones are more likely to form in acidic urine.

## Recognizing A Bladder Stone

The signs of a bladder stone in ferrets can include straining to urinate, vocalizing in pain when urinating, urinating small amounts frequently, dribbling urine, wet fur around the prepuce or vulva, and discoloration of the urine. Occasionally the ferret will be totally unable to urinate and rapidly becomes lethargic and depressed.

Most of the time the bladder stone can be palpated by a veterinarian, but a radiograph (X-ray) should be done to confirm the presence of a stone or stones, to visualize the location of the stone or stones, and to look for other urinary problems such as a prostate problem in males.

## Different Than Dogs & Cats

Although ferrets are similar to dogs and cats when it comes to bladder stones, they are more sensitive to plant-based protein and elevated urinary pH.

When it comes to treating bladder stones, it is a little bit harder in ferrets. Specialized diets for the various types of bladder stones are available for dogs and cats, but there are no diets specifically made for ferrets with bladder stones.

Cystine stones are tricky because ferrets require a high protein diet for maintenance, but need a low protein diet to avoid forming more cystine stones.

## Treatment For Bladder Stones

Once a bladder stone has been found, surgery is recommended to remove it. The surgery is usually a relatively simple procedure in ferrets unless the stone is located in the urethra. Intravenous or subcutaneous fluids should be used to produce and dilute the urine. This helps to flush out the bladder. An antibiotic is also used to clear up any bladder infection.

After surgery, the bladder stone should be analyzed to determine exactly what type of stone it is. The Minnesota Urolith Center through the College of Veterinary Medicine at the University of Minnesota provides stone analysis at no cost. Once the stone has been analyzed, an appropriate diet change can be made to prevent future stone formation.

If the stone is a struvite stone, then two things need to be adjusted. The protein source of the diet needs to be changed to a high-quality meat-based protein, and the pH of the urine needs to be lowered. If the diet change does not lower the urinary pH, then a urinary acidifier like dl-methionine can be added to the diet.

An antibiotic such as amoxicillin (Amoxi-drops or Clavamox drops), cefadroxil (Cefa drops), cefovecin (Convenia), trimethoprim-sulfa (Tribrissen), enrofloxacin (Baytril), or marbofloxacin (Zeniquin) can be used to eliminate a bacterial infection in the bladder.

If the stone is a calcium oxalate stone, then the protein in the diet needs to be changed to a high-quality meat-based



protein. Plant-based protein must be eliminated to prevent oxalate from being excreted into the urine. In some cases, potassium citrate may be needed to raise the pH of the urine.

If the stone is a cystine stone, then a reduction in protein is needed to reduce the amount of cystine in the diet and in the urine.

After proper treatment, a ferret with a bladder stone will soon be back to its usual Jumping-Jack-Flash self and should enjoy a normal life span.

Dr. Jerry Murray practices at the Animal Clinic of Farmers Branch in Dallas, Texas. He currently has two senior ferrets, Bam-Bam and Mr. Slate, and one hyperactive Rottie puppy, Katarina.