



Uroliths, stones and crystals and your cat.

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This discussion is only related to uroliths (which are stones found in the bladder or less commonly in other portions of the urinary tract) and crystaluria (crystals in the urinary tract) and how Young Again foods can help with these persistent problems.

There are many different types of stones and crystals that can be identified in the urine of cats. After we at Young Again have reviewed the available literature, it became obvious to us that there are several important steps that you, as a cat owner, can take to help avoid many of the most common urinary tract problems that are currently plaguing many cats. The first is the type of food and water that you supply to your cats; these will, by far, have the biggest impact on the health of their urinary tract (UT). The second is by finding out what the specific gravity (SG) and pH value of their urine is, and what changes to the diet should be made to correct any abnormalities.

When it comes to drinking water, please do not offer your cat distilled water. This is water with virtually all of the minerals removed through the distillation process. Distilled water acts as a mild acid and can contribute to bone loss, dental problems and other medical issues.

There are many scientific papers that discuss uroliths and crystaluria. The University of Minnesota is the best place to start as they have published a considerable amount of excellent information.

Researchers understand how some crystals and uroliths form and do not understand why others form; genetics may be involved. Some types of crystals and stones are common and some are rare. Some will dissolve, if given the appropriate diet and others require surgery or other types of therapy. However there is one common thread throughout all the research. The specific gravity of the urine should be maintained below 1.030. A healthy urine pH range for cats has been established for the prevention of the different types of crystals.

Study reference:*
Am J Vet Res. 2004 Feb;65(2): 138-42

The specific gravity of urine is the measurement of how much mineral or other waste products are suspended/dissolved in the urine. Pure water has a SG of 1.000 and sea water has a SG average of 1.025. The reference range for the urine specific gravity of normal cats is 1.015-1.050. The research shows a SG of less than 1.030 is essential to help avoid all precipitates.

The higher the SG, the higher the level of crystal/urolith causing minerals/waste products suspended in the urine. As the SG rises, it becomes more likely that the minerals will precipitate out of suspension and uroliths will form somewhere in the urinary tract of your cat. The lower the SG the lower the chances are that minerals will precipitate out of the urine. It is suggested that feeding canned food or adding water to all foods will encourage lower SG levels. In other words, cats should drink more water to prevent crystaluria or uroliths.

Young Again believes that the specific gravity of the urine is directly related to what a cat consumes. All of our foods are carnivore-based and contain less than 5% digestible carbohydrates and our Zero Carb has none.

In 2004, there was a study* done to determine the effects of dietary carbohydrates on the formation of struvite crystals in urine. The conclusion was that starch/carbs did potentially stimulate the formation of struvite crystals or uroliths. They recommended reducing the levels of starch/carbs in the cat's diet. The study also found another interesting fact. When starch/carbs were added to a protein/fat diet and the cats were allowed to eat free choice, urine volume went down. When urine volume goes down, SG generally goes up. It would appear that carbs decrease a cat's desire to drink water. Drinking less water is not something that healthy cats should do.

Young Again foods will typically produce a urine specific gravity between 1.015-1.025 for all of our foods and a cat will drink water as it sees fit. There is no need to add water to the

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Young Again dry cat food. Typically, cats fed Young Again will have, on average, a urine SG of 1.020. It is also important that you feed your cats one of our Mature Health formulas as soon as they are done growing bone. For most cats that will be at about 2 years of age, however, for breeds like the Maine Coon cat, it may be as long as 5 years. Please consult your veterinarian or breeder if you are unsure if your cat is done growing bone.

It should also be noted that most cats develop crystals or uroliths between the ages of 2 and 10 years of age. Most people normally do not consider using the lower mineral/senior/mature formulas until their cat is about 10 years of age. Feeding excess minerals to cats will probably be shown to be one of the leading factors contributing to the formation of crystals and uroliths. Any time a cat is overweight she is not only consuming excess calories/food, but excess minerals as well. Please see our section on obesity. Our Mature Health formulas have roughly half of the minerals of our growth formulas. Low magnesium, calcium and phosphorus are essential for long term UT health in mature cats and many of the most commonly seen crystals and uroliths are composed of at least one of these three minerals.

The pH of cat's urine is largely controlled by the food and water consumed. Struvite uroliths/crystals were very common in cat urine 10 years ago and are less common today. Calcium oxalate crystals and uroliths are more common today than they were 10 years ago. What changed was that struvites can be dissolved with acidic urine so most companies made their cat foods to produce more acidic urine. The struvite crystals and stones do not often form or will clear when the urine pH is less than 6.4 and the SG is less than 1.030. Calcium oxalate crystals and stones, on the other hand, do not often form if the urine pH is greater than 6.25 and SG is less than 1.030 and they do not dissolve and always have to be removed by surgery or in some cases, by lithotripsy. As the pH dropped in foods the incidence of calcium oxalate crystals and uroliths rose. Generally a pH range of 6.0-6.5 is desirable in most cats; however, pH can range between 5.0-7.0 in many cats. Ammonium urate crystals and stones also rose as dietary pH dropped; they are rare when the urine pH is greater than 6.6 and the SG is less than 1.030.

It is obvious that one diet cannot produce a pH that will satisfy the lowest risk factors for multiple types of crystals and stones. It is unlikely that a cat will develop any precipitates if pH is the only variable in play. For example, the car accident did not happen only because the road was icy; it happened because the driver was driving too fast and or that the driver also tried to answer a cell phone or adjust the radio or the other guy did one or all of the above. It almost always takes more than one factor to cause an adverse condition.

The common thread running through the research, however, is that the specific gravity must be kept low, less than 1.030 in order to prevent precipitates. It is difficult to form crystals or stones if the urine is always dilute and devoid of excess minerals (by offering a low mineral food) that can precipitate out and form crystals or stones. Low SG is not going to be

an absolute guarantee in every case because some problem cats may have a genetic abnormality or an inability to regulate minerals like calcium in their body.

Young Again foods produce a urine pH range of 6.0-6.5 with a typical pH of 6.3 and this range can be affected by water, other foods fed to the cat and the cat's own unique physical nature. Water can have a wide pH range. City water and bottled water can range from acidic to alkaline. Reverse osmosis water is always acidic. However if you know the pH of your cat's urine, it may be possible to modify what is being offered to your cat in order to alter the urine pH. There are supplements to both lower and or raise urine pH, but first you need to know what the urine pH is.

Urine can be difficult to collect at a veterinarian's office and many exams never include urine pH or SG. If your cat proves difficult to collect urine from at the vet's office, it is relatively easy to collect urine at home and bring it with you to the exam. There are many web sites that can show you how to collect a urine sample. There are urine collection systems available for purchase that will collect a clean urine sample that you can then bring to your veterinarian for examination. You can also do urine SG and pH testing at home, if you want to invest in a SG refractometer for approximately \$30 and some pH test strips.

Urine pH and specific gravity tests are critical when it comes to the monitoring of your cat's health. Young Again foods generally produce low urine SG of 1.020. If you're feeding our food and the SG level is consistently higher on multiple tests then other medical conditions will need to be evaluated. For example, your cat has a SG of 1.050 and a pH less than 6.25 and your vet also sees high levels of calcium in the blood (best test is the ionized calcium test) your cat is now at an increased risk for developing calcium oxalate precipitates. Your vet might even palpate stones in the bladder. Based on the previous tests (assuming no stones) I would want to make sure the cat was on a low mineral food (Mature Health) and I would want to bring down the SG. Adding sodium chloride (table salt) to the cat's drinking water will cause your cat to consume more water each day, thereby lowering the urine SG; your vet may also have other suggestions. Canned food may work, but Young Again food generally produces lower SG levels than canned foods containing carbohydrates. It would also be best to raise the pH with a supplement. Always consult your cat's veterinarian before adding a supplement to your cat's diet. Through preventive testing you should be able to determine if your cat is likely to have a propensity for one type of crystal or another.

Keep in mind that reoccurring UT bacterial infections may be an early warning sign of crystaluria or the formation of uroliths. Urolith stones in the bladder are porous and are good hiding places for bacteria, since the antibiotic does not usually penetrate the stone.

Struvite and calcium oxalate crystals and stones are by far the most common precipitates seen in cat urine today. Struvite uroliths are very uncommon when feeding any of

the Young Again foods and I have yet to receive a reported case. To date I have only received five reported cases of cats with crystals or stones: three were calcium oxalate and two were unidentified crystals. All five cats had a previous history of crystaluria prior to using Young Again foods. Based on the numbers, Young Again foods will likely result in a cat having a very low incidence of crystal formation. There are dozens of variables and considerations that would be impossible to cover in this article, so feel free to call us and we can discuss your cat's specific needs.

New research in humans and several animal species has shown that there is a specific good bacterium, called *Oxalobacter formigenes* that lives in the intestinal tract and is involved with normal calcium oxalate metabolism and oxalate-degradation. This bacterium is in a group called anaerobic bacteria, meaning that they live in the absence of oxygen and they colonize the healthy colon of mammals. Without this particular bacterium in the GI tract, it is possible that blood calcium levels may rise and calcium oxalate may precipitate out in the urine, resulting in sludging from calcium oxalate crystals and eventually resulting in calcium oxalate stones. There is much research being performed regarding this organism (or lack thereof) in the colon of humans that will prove to be applicable in other species, such as felines, lagomorphs and rodents.

It may one day be as simple as replacing active *Oxalobacter* organisms in the colon of animals with calcium oxalate crystals or stones as a treatment for these types of precipitates. Much work needs to be done regarding this bacterium and its role in calcium oxalate metabolism.

Unfortunately, one group of antibiotics, called fluoroquinolones, is often responsible for the loss of *Oxalobacter* in the GI tract. These include enrofloxacin (Baytril™, ciprofloxacin, marbofloxacin, Zenaquin™, norfloxacin, orbifloxacin, Orbax™ and others. These antibiotics are often very helpful

in treating many different bacterial infections in cats, so while they are often very useful, and may prove lifesaving, they may also be responsible for eliminating *Oxalobacter* from the gut of many mammalian species.

Recommendations for your cat:

Feed any one of the age-appropriate Young Again formulas to your cats. We have a great track record when it comes to crystals and uroliths and I would not try to modify the diet further, unless testing by a veterinarian indicates that a problem might be developing. If you are taking your cat in to see your veterinarian for a wellness check, always see about asking your veterinarian about urine testing, especially for urine pH and specific gravity. Blood panels are great, and I specifically encourage you to ask your veterinarian about serum testing for total protein, albumin, BUN, creatinine, calcium, ionized calcium, phosphorus and magnesium. Most standard blood panels will include all of these except for the ionized calcium.

If your cat is consuming one of our age-appropriate foods and a laboratory test comes back that is out of the normal reference range (meaning either too high or too low), in our experience, it generally will not be beneficial to your cat to switch to a prescription diet. Chances are that any anomaly is more specific to your cat's physiology than it is specific to the food. If the pH or SG is off then it may be possible to provide a supplement to bring it to a level that suits your individual cat's condition. Please discuss any supplements you may be considering offering to your cat with your veterinarian prior to making any other dietary changes.

If the serum calcium was high, then I would want to review the diet to make sure excess calcium or vitamin D3 were not the cause (treats and health supplements may contain too much of a good thing) and I would want to raise the urine pH to a level where calcium oxalates are less likely to form.



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