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## **URINARY STONES: Cause, Treatment, Prevention**

### ***Does your dog or cat have urinary stones?***

Perhaps you know them by the name kidney stones or bladder stones. They form in the urinary tract of all kinds of animals and in humans. Urinary stones are rock hard structures. Stones in the urinary tract cause problems because this system is designed to eliminate wastes in liquid form, whereas the intestinal tract is designed to eliminate wastes in solid form. In animals and in humans, urinary stones are often called "calculi," from the Latin word for stone. It is the same Latin word used in the mathematical term calculus, as stones were once used for counting. The word "lith" as in "urolith" is from the Greek word for stone. The prefix "uro" is a Greek term referring to the urinary tract. Thus, urolith is a urinary tract stone that may be located in the kidneys, ureters, bladder, or urethra.

Have you ever wondered why stones form in the urinary tract? The process is a complicated one, but basically stones form because certain waste products present in urine increase in concentration to a point at which they precipitate as microscopic crystals. If these crystals remain in the urinary tract and grow, they become large enough to see with the unaided eye. With time, the stones may fill the space in the urinary tract normally occupied by urine.

All urinary stones contain two major components – minerals (which typically constitute about 95 % of a stone) and non-mineral matrix. The matrix can be thought of as a kind of mortar that may help cement minerals together. Because stones are composed primarily of minerals, their number, location, and size can usually be detected by x-ray studies or ultrasound studies.

### ***Do all urinary stones have the same mineral composition?***

The answer is no. The most common types of minerals in urinary stones formed by dogs and cats are magnesium ammonium phosphate ( also called struvite ), calcium oxalate, calcium phosphate, ammonium urate, cystine and silica. Sometimes stones contain more than one type of mineral. On occasion, the center of a urolith may be composed of one type of mineral; whereas outer layers are composed of a different mineral.

Determining the types of minerals in stones is important because different mineral types occur as a result of fundamentally different causes. Therefore, urinary stones should not be considered a single disease but rather a potential consequence of several underlying risk factors. Treatment and/or prevention of stone formation depend on identifying their mineral composition. In addition, evaluation of your pet's diet, blood analysis and urine composition analysis are important steps in formulating recommendations for stone treatment and prevention.

### ***How can urinary stones be effectively treated?***

Options include various types of surgery and various types of nonsurgical therapy designed to dissolve stones in the urinary tract. Which treatment is best? The risks and benefits of medical versus surgical therapy must be considered for each pet. Complete obstruction of the flow of urine through the urinary tract should be regarded as an emergency.

Although surgical removal is an effective method that may immediately eliminate uroliths, surgery alone is associated with several limitations, including persistence of the underlying causes of stones and therefore a high rate of recurrence of uroliths after surgery, risks inherent in general anesthesia and the type of surgery performed, and inability to remove all uroliths during surgery. For these and other reasons medical dissolution of some types of uroliths may be considered.

The objectives of medical dissolution of uroliths are to stop further stone growth and/or promote stone dissolution by correcting or controlling underlying abnormalities. For medical dissolution therapy to be effective, it must reduce the urine concentration of minerals that have precipitated to form the stone. This usually involves a change in diet and in addition often includes administration of specific drug.

The size and number of uroliths as such do not dictate the likelihood of response to dissolution therapy. There has been success in dissolving uroliths that are small and large, single and multiple. However, the rate of dissolution is related to the size and surface area of the urolith exposed to urine. Just as one large ice cube dissolves more slowly than an equal volume of crushed ice, one large urolith dissolves more slowly than an equal volume of many smaller uroliths.

Uroliths tend to recur. Prevention of recurrent uroliths that reduces the need for medical therapy and/or surgery is therefore cost effective. In general, prevention strategies are designed to eliminate or control the underlying causes of various types of uroliths. When causes cannot be identified, preventative therapy is usually designed to minimize risk factors associated with formation of all stones. Recommendations commonly include dietary modifications and sometimes administration of drugs.