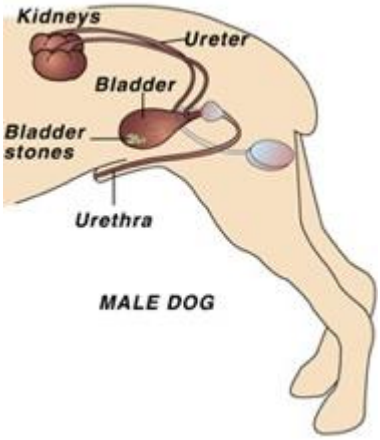
Bladder Stones, Bladder Tumors, Cystotomy	Urinary stones (urolithiasis) are a common condition responsible for lower urinary tract disease in dogs and cats. The formation of bladder stones (calculi) is associated with precipitation and crystal formation of a variety of minerals. Several factors are responsible for the formation of urinary stones. The understanding of these processes is important for the treatment and prevention of urinary stones. In general, conditions that contribute to stone formation include: • a high concentration of salts in urine • retention of these salts and crystals for a certain period of time in the urinary tract • an optimal pH that favors salt crystallization • a scaffold for crystal formation • a decrease in the body's natural inhibitors of crystal formation. The sequence of events that triggers stone formation is not fully understood. High dietary intake of minerals and protein in association with highly concentrated urine may contribute to increased saturation of salts in the urine. Disease conditions such as bacterial infections in the urinary tract can also increase urine salt concentration. Clinical signs will **depend on the location of the urinary stones**. Most urinary stones are located in the urinary bladder or urethra and only a small percentage are lodged in the kidneys or ureters. Urinary stones can damage the lining of the urinary tract causing inflammation. This inflammatory reaction may predispose your pet to bacterial urinary tract infection (UTI).



Signs of bladder stones may include:

- blood in the urine
- straining to urinate
- urinating small amount frequently
- abdominal discomfort
- urinary accidents

Urinary stones may physically block the urine flow causing urinary obstruction that requires immediate emergency treatment.

Signs of urethral stones may include:

- dribbling urine
- straining or posturing to urinate with no urine production

If your pet is showing the above signs of a urinary obstruction, **seek veterinary attention immediately**.

Stones may also become lodged in the ureter (the portion of the urinary tract carrying urine from the kidney to the urinary bladder) causing an obstruction that results in serious kidney damage.

Signs of ureteral stones may include:

	• abdominal discomfort • decreased appetite • lethargy • vomiting • blood in the urine Urinary obstruction caused by stones lodged in the urethra is an urgent or emergency situation. The urinary obstruction must either be relieved to allow the bladder to empty, or the bladder must be drained by cystocentesis (a procedure where a needle is placed into the distended bladder through the abdominal wall, and the urine is removed with a syringe). Stones lodged in the urethra can often be dislodged and forced back into the urinary bladder by flushing the urethra with a urinary catheter, a technique called retrograde urohydropulsion. Surgical treatment: The procedure for the surgical removal of urinary stones depends on where they are located in the urinary tract. The procedure for removing stones in the urinary bladder is called a cystotomy. When stones are in the urethra, the procedure is called a urethrotomy. Occasionally a permanent opening is made to allow any further stones to pass without causing an obstruction. This procedure is called a urethrostomy. A common procedure in male cats that become obstructed is called a perineal urethrostomy (PU). Stones that develop in the kidney may be removed by a nephrotomy, although most do not require surgical removal. Ureteral stones, if causing a blockage to urine flow, may be removed by a ureterotomy. Alternatively to ureterotomy, a ureteral stenting procedure can be performed to allow urine to pass from the kidney to the bladder and bypass an obstruction. More specifically, subcutaneous ureteral bypass (SUB) systems are being used more commonly for this purpose. Postoperative care: The exact aftercare will depend on the location of the stones and the procedure that your pet has undergone. In general, most pets recovering from urinary surgery should have limited activity for the first two weeks of healing. Your pet may need to wear an Elizabethan collar to prevent self-trauma to the surgery site. You should monitor your pet for the appropriate passage of urine after surgery, as well as a return to normal

	appetite and energy levels. It is common for pets to have a small amount of blood in the urine for the first week or two after urinary surgery. Many of these stones have a high recurrence rate. *Prevention* Struvite stones: Specific recommendations for diet as well as frequent monitoring of the urine will be made. The treatment of any urinary tract infections is essential for the success of preventive measures. Calcium oxalate stones: Specific recommendations for diet as well as frequent monitoring of the urine will be made. Cystine stones: Specific recommendations for diet as well as frequent monitoring of the urine will be made. The pH of the urine should be kept above 7.5. A dietary additive to raise the pH of the urine may be made. Urate stones: Specific recommendations for diet as well as frequent monitoring of the urine will be made. Dogs and cats with portosystemic shunts should have this condition addressed via either medical or surgical intervention. Dalmatians may benefit from a medication that modifies liver metabolism. Silicate uroliths: Specific recommendations for diet as well as frequent monitoring of the urine will be made..