



## What is Feline Kidney Disease?

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There are two kinds of kidney disease: acute and chronic. Acute kidney (renal) disease requires emergency veterinary care. Chronic kidney disease in cats will be diagnosed by your veterinarian. At this point, your veterinarian will most likely provide you with a medical management plan that is tailored to your cat.

The signs of chronic renal disease (CRD) usually occur when at least 70% of the kidney cells are no longer working properly. In some cases, it might be inherited, yet in other cases we may not know exactly why the kidneys are failing to work properly. There can be many reasons why the cat's kidneys may decrease in efficiency over time. This condition is seen most often in older cats and at least half of the cats over the age of 15 years of age will be diagnosed with CRD.

In some cases, your veterinarian may diagnose CRD during routine examination and testing (blood and urine). Often an owner notices that her cat is drinking more water and producing more urine than usual. This may be a gradual increase, and at some point, the litter box will contain much more urine than you have seen previously. This should alert you to the fact that your cat should see a veterinarian as soon as possible for evaluation.

### What Do the Kidneys Do?

The kidneys are responsible for removing waste products from the bloodstream. Proteins consumed by the cat are broken down and converted into urea nitrogen, which is then excreted by the kidneys, along with other waste products. Once the kidneys no longer effectively remove waste products efficiently, a cat will compensate by drinking more water, thus producing more urine.

The kidneys are powerful chemical factories that also perform many other functions in addition to removing waste products from the body. The kidneys also remove certain drugs from the body, balance the body's fluids, release hormones that regulate blood pressure, produce an active form of vitamin D3 that is necessary for strong, healthy bones and finally, the kidneys also control the production of red blood cells.

### Causes of Renal Disease

Type 2 diabetes is one of the diseases that may be responsible for CRD. High blood pressure may also cause CRD. Many overweight cats are hypertensive, and prone to CRF. Kidney stones may also be involved with the death of kidney cells and over time, this may result

in the signs of chronic renal disease. If a bladder infection involving bacteria ascends up the tubes (called ureters) and into the kidneys, this can also result in the death of renal cells. Toxins, parasites and pesticides can all result in renal damage. Glomerulonephritis (inflammation of the microscopic tubes called glomeruli) can occur after an infection or the inflammation may occur slowly over time, eventually resulting in enough damage to the kidneys to cause CRD.

Overweight cats are more likely to develop hypertension (high blood pressure) and cardiomyopathy (a type of heart disease). Hypertension will also predispose a cat to CRD.

### Signs of Renal Disease

If you suspect that your cat is drinking more water than usual, or is urinating a larger volume, you should have your cat examined by your veterinarian who will perform blood tests, especially BUN (blood urea nitrogen), creatinine, calcium and phosphorus levels, along with a concurrent urinalysis. It is important to attempt to get the blood tests and urinalysis at the same time, if at all possible, which will give your veterinarian the most specific information regarding your cat's kidney health.

The specific gravity of the urine may be low, indicating dilute urine, as the kidneys will usually no longer be able to concentrate the urine efficiently. Urine that has a specific gravity (SG) of 1.010 is neither concentrated nor dilute; it is the same SG as the fluids going through the kidneys. The kidneys are supposed to concentrate the urine (normal SG is 1.015-1.050). The protein levels in the urine are usually elevated in cases of CRD, as protein is leaked into the urine. Other tests performed on the urine include the microalbumin test, and also the protein:creatinine ratio.

In addition to increased thirst and urine volume (often called PU/PD, meaning polyuria and polydipsia) over time a cat with CRD may become anemic, since the kidneys produce a hormone that stimulates the bone marrow to produce red blood cells. Another sign which is not as common is edema, or fluid retention in the tissues. If the toxins in the blood build up the cat will develop a decreased appetite. Some cats will also become nauseous and may vomit. Vomiting may be caused by increased gastric acidity or even ulceration of the stomach lining. Cats may also become very lethargic and depressed without treatment.

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## The Importance of Phosphorus (Phosphate) with CRD

When the blood is tested, another sign of CRD is an increase in the phosphate level in the plasma or serum. This is called hyperphosphatemia (HPT). The phosphorus level will increase with CRD. It is very important to control the phosphorus level in patients with renal disease, and unfortunately dietary restriction is usually inadequate for controlling serum levels of phosphorus.

The phosphorus level in your cat's blood is an important value to watch in cats with CRD. The goal is to keep the phosphate level in the blood to under 4.5 mg/DL. It is known that 68% of phosphorus is excreted by the kidneys. When the blood phosphorus level increases, the parathyroid glands release extra parathyroid hormone (parathormone or PTH) to increase the excretion of phosphorus. This hormone also works to enhance the active reabsorption of calcium and magnesium from the kidneys. Over time, the soft tissues may become calcified due to the excess calcium in the bloodstream. During CRF, the parathyroid hormone remains elevated, and the PTH is a uremic toxin (poisons the kidneys).

With CRD, in addition to elevated phosphate levels in the blood and the risk of soft tissue becoming calcified, this disease also will begin interfering with the conversion of vitamin D precursors in the kidneys to the active form of vitamin D3, which is vital for proper uptake and utilization of calcium.

Once diagnosed, you will need to work closely with your cat's vet to manage CRD. Early diagnosis, nutritional and appropriate drug therapy, along with support at-home care will provide your cat with the best prognosis.

### Treatment of CRF

As far as management and treatment goes for cats with CRF, supplementation with B vitamins can help with anemia problems, as can an iron supplement. Vitamin A is necessary for proper renal health. Omega fatty acids are also important for kidneys, and specific combinations may help prevent inflammation in the kidney tissue.

Once your cat has been diagnosed with CRD, your veterinarian may prescribe one of several phosphate binders to help lower

the phosphate level in your cat's bloodstream. There are several available that may work well to help your cat in the long run to help prevent cardiovascular calcification, when dietary restriction is not maintaining the phosphorus level below 4.5 mg/DL. These include Azodyl that helps bind renal toxins in the GI tract that are the by-products of renal disease and Epakitin, derived from the shells of certain crustaceans, that is a safe phosphate binder. Aluminum hydroxide is another phosphate binder that is given orally and can be useful to bring down phosphorus levels.

Your cat's veterinarian will most likely calculate the solubility index (SI), which is the sum of the calcium x the phosphorus levels. Preferably, this level should be less than 63. If the SI is greater than 63, then a cat is more likely to suffer from soft tissue calcification and this may indicate that the cat will have more difficulty converting precursors to active vitamin D3 in the kidneys.

At some point, a cat's kidneys will not be able to flush out renal toxins and the levels will build up in the bloodstream, resulting in a cat that is nauseous and unwilling to eat or drink enough to sustain itself. Veterinarians can provide fluids under the skin (called subcutaneous fluids, SQ) or by inserting a catheter in a vein to administer fluids right into the bloodstream.

Some owners are willing to be trained to be able to give SQ fluids to their cat at home; others prefer to bring their cat to the vet for this procedure periodically. This will help flush out the toxins. In advanced stages, humans are put on renal dialysis or peritoneal dialysis to flush out the toxins in the bloodstream, but this is rarely performed in our feline patients.

When the kidneys are no longer functioning, in humans, kidney transplantation would be the next step. While some advanced referral veterinary facilities and veterinary universities offer feline renal transplants, this is not a procedure that many owners can choose for a variety of reasons.

CRD cannot be cured, but it CAN be managed to provide a cat with a longer lifespan. Periodic blood testing for BUN and creatinine, and concurrently checking a urine specific gravity are important for monitoring how a cat's kidneys are functioning. Many cats with CRD can live a quality life for extended periods, often for years.



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