# Chronic Kidney Disease

## What do the kidneys do, and what happens if they stop doing it?

In producing urine, the kidneys function to maintain normal fluid balance, maintain normal electrolyte levels in the blood (especially potassium and phosphorus), and clean the blood of waste products (especially from dietary protein). They're supposed to hold good, useful substances (water, potassium, glucose, proteins, etc.) inside the body while getting rid of bad, potentially harmful substances (protein waste products, excessive phosphorus, etc.). They also produce a hormone (Erythropoietin) needed for red blood cell production in the bone marrow, and remove the hormone (Gastrin) which is responsible for telling the stomach to produce acid for the digestion of food. Many geriatric cats suffer a gradual decrease in kidney function, a condition known as Chronic Kidney Disease (CKD). Kidneys may also be damaged or impaired by infections, interruptions in blood flow, trauma, tumors, and toxins (especially lilies, and anti-freeze). And there are congenital kidney problems in certain breeds including polycystic kidney disease in some Persians and Himalayans.

Luckily, there is an overabundance of kidney function in the healthy animal, and so there are really no signs or problems until there is a significant (around 60%) decline in kidney function. This also means, unfortunately, that kidney disease is not detectable until it is well along. When around 60% of kidney function is lost, the ability of the kidneys to concentrate the urine is reduced. The kidneys become sieve-like, making bigger and bigger amounts of urine even if there is a need to hold water in the body because of dehydration. This increasing urine volume makes the cat thirstier and thirstier, because they are losing increasing volumes of water through the "leaky" kidneys. As the kidneys decline further, at around 70% loss they can no longer adequately clean waste products from the blood stream, which leads to other signs including poor appetite, weight loss, nausea and vomiting. Other issues that may arise include anemia, weakness, lethargy, dehydration, and constipation.

Low blood potassium levels are common and cause generalized, sometimes profound weakness and a reluctance to move around, and therefore it can contribute to reduced eating and drinking. High blood phosphorus may develop and can lead to damaging mineral deposits in the kidneys, which further speeds the decline in renal function. High blood pressure is common with kidney disease and may lead to sudden blindness from detached retinas, strokes, heart disease and further damage to the kidneys. The lack of Erythropoietin leads to anemia due to a failure to produce new red blood cells. The failure to clean out the buildup of Gastrin in the blood leads to an overproduction of stomach acid, leading to tummy aches, poor appetite and potentially nausea and vomiting. Ultimately, as protein wastes build up in the blood stream, they can reach extreme levels causing ulcers in the mouth which is evident from drooling, terribly foul breath, dropping of food or a complete refusal to eat. This is a very grave sign and most cats will not recover for long, if at all, at that point.

## How is kidney disease diagnosed?

A suspicion of CKD based on the history and signs must be confirmed with an examination, blood work and a urinalysis. It is important to pursue both blood work and a urinalysis, since CKD is usually detectable in the urine before it's detectable in the blood work. The key lab numbers that are watched are the BUN and creatinine (protein wastes), potassium, phosphorus, hematocrit (for anemia), and the

urine specific gravity (or urine concentration). It's important to remember that because 60% of kidney function must be lost before any abnormalities are apparent in the lab work, normal lab work does not mean normal kidneys. Blood pressure should be measured in cats with kidney disease to detect high blood pressure before it causes serious damage of its own. Sometimes x-rays or ultrasound may be recommended depending on the individual, and urine cultures are indicated if an infection is suspected. Routine baseline lab work starting at 8 to 10 years of age is recommended for early detection of CKD as well as other geriatric issues including Hyperthyroidism.

## How is kidney disease managed?

Changing the cat's diet to a low protein variety (for example: Hill's k/d or Royal Canin Modified LP) can significantly increase both life expectancy and quality of life by reducing the protein wastes and phosphorus in the blood stream. Evidence shows that cats with CKD who eat low protein food from the time of diagnosis will live an average of 50% longer than cats who have regular or high protein levels in their food. Another factor to consider is the form of the low protein food offered. The extra water in canned foods will help with hydration and constipation issues, but dry foods have a higher calorie content which is helpful if cats are tending to lose weight. We can offer samples of the dry foods to help see one which is preferred by your cat. There is an art to compromising when a cat doesn't like any of the low protein foods, and ultimately it may be better for them to eat what they like if they won't enough of the "right" foods. A gradual transition to the new foods might help them to convert, or you may need to maintain a mixture of their favorite foods and low-protein foods. Also, kidney patients often become increasingly finicky as time goes by, so a rotation of a variety of foods is often needed.

Preventing dehydration is an important goal for CKD. In severe episodes of dehydration, cats may need hospitalization for an IV catheter and IV fluids, so it's preferable to prevent those severe episodes with subcutaneous fluids (SCF) on a regular basis. The typical pattern is for CKD cats to need more fluids more often as the disease progresses. Better hydration often leads to better appetite, less weight loss, and less chance of constipation. Owners may choose to have fluids given by their Veterinarian, or they may prefer to learn how to do it at home.

What other treatments are needed will depend on the details of the lab work and the individual's progression. Pepcid (Famotidine) is often helpful to correct the over-production of stomach acid. Other appetite stimulating drugs and anti-nausea meds may also be needed. It may also be necessary to use a potassium supplement to increase blood potassium, and a phosphorus binder may be needed to reduce blood phosphorus levels. High blood pressure, anemia, and infections would all need drug therapy. You have to to pick your battles with CKD cats since they are more sensitive to stress than healthy cats. Too much stress from too having to take too many medications can cause a cat to withdraw from food and water, leading to more dehydration, and then things can spiral downhill for them. So the cats temperament will play a role in dictating just how much can be done for them. In the end, this whole situation should all be about quality of life, and not so much about quantity.

## What follow-up care is needed?

The response to treatment, and the progression of kidney disease is monitored through regular physical exams and lab work. In the beginning, the lab work may only show dilute urine and normal blood work, then come the elevations in the BUN and creatinine, then changes in the potassium and phosphorus, bthen anemia, for example. Repeating blood work allows comparison of these numbers over time, and

will also detect the new issues that weren't there in the beginning. Each case has a different pattern of progression, and therefore a different pattern of treatment. Owners' observation of thirst, urine volumes, appetite, nausea, energy and activity levels, and body weight at home are a big help in assessing progress, and in determining when rechecks are needed.

The typical case of chronic kidney disease in an older cat is progressive and irreversible. The rate of progression varies widely, and some cats may live for many years while others progress rapidly and may only make it a few weeks or months. Often, poor appetite and weight loss eventually become the life limiting factors. Quality of life should be our main goal and the main issue in determining longevity and end-of -life decisions.