



Chronic kidney disease in cats

What is chronic kidney disease (CKD)?

Chronic kidney disease (CKD) is the name now used to refer to cats with kidney failure (or chronic kidney failure).

CKD is one of the most common conditions affecting older cats, and in most cases is progressive over time so that there is a gradual decline and worsening of the disease. The rate of decline varies considerably between individual cats.

The kidneys are responsible for: helping maintain fluid balance in the body; producing certain hormones; regulating many electrolytes in the body; and excreting waste products (via urine). In CKD, all these regulatory processes can be interfered with, causing a wide range of different signs.

Although CKD is not a curable or reversible disease, appropriate support and treatment can both increase the quality of life, and prolong life by slowing down the progression of the disease.

What causes chronic kidney disease?

CKD occurs where there is long-standing, irreversible damage to the kidneys that impairs their ability to function and remove waste products from the blood. In most cases, the exact cause of CKD is unknown. Samples (biopsies) from affected kidneys often show a mixture of fibrosis and inflammation termed 'chronic interstitial nephritis'. These are non-specific 'end stage' changes though, and do not tell us anything about the underlying cause. Although most cases of CKD are idiopathic (have an unknown underlying cause), some causes are well recognised. These include:

- **Polycystic kidney disease (PKD)**- this is an inherited disease seen mainly in Persian and related cats where normal kidney tissue is gradually replaced by multiple fluid filled cysts
- **Kidney tumours**- for example lymphoma (a solid tumour of white blood cells) can affect the kidneys
- **Infections**- bacterial infection of the kidneys (known as 'pyelonephritis') may lead to sufficient damage to cause CKD
- **Toxins**- certain toxins and drugs can damage the kidneys
- **Glomerulonephritis**- this refers to inflammation of the glomeruli (individual units within the kidneys that filter the blood)- they may become inflamed for various reasons and if prolonged this can lead to CKD

Other conditions such as birth defects affecting the kidneys, trauma, hypokalaemia (low blood potassium), and

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hypercalcaemia (high blood calcium) may also cause CKD, but work is still going on to discover the underlying cause(s) of most cases of this disease.

If an underlying cause can be identified, in some cases this may be treatable and so progression of the condition may be halted. In most cases though, treatment is aimed at management of the disease and complications that arise from it.

How common is CKD?

CKD can be seen in cats of any age, but is most commonly seen in middle to old-aged cats (those over 7 years), and it becomes increasingly common with age. It has been estimated that around 20-50% of cats over 15 years of age will have some degree of CKD present. CKD is seen about three times more frequently in cats than in dogs.

What is the normal role of the kidneys?

Like all mammals, cats have two kidneys located in the abdomen, which perform a wide variety of important roles, including :

- Removing toxins from the blood
- Maintaining water balance
- Maintaining salt balance (and other electrolytes)
- Maintaining the acid balance of the body
- Maintaining normal blood pressure
- Producing hormones

Blood is constantly filtered through the kidneys to remove the toxic waste products of the body's metabolism. Urine is produced in this process. The kidneys also concentrate the urine by returning water to the body, preventing dehydration.

Fortunately, there is considerable 'reserve capacity' in the kidneys. It is well recognised that in healthy animals and humans, it is possible to remove one kidney completely without any adverse consequences. In fact it requires around two thirds to three quarters of the total functioning kidney tissue (of *both* kidneys) to be lost before signs of CKD will develop.

What are the signs of CKD?

In most cases CKD is a progressive disease. Initially, clinical signs are often very subtle and mild, but will gradually get worse over a long period of time. More rarely, signs may appear to develop quite suddenly (often as a result of decompensation or

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sudden worsening of the condition, for example if a cat with CKD is deprived of water).

Many of the signs are vague and non-specific – some arise from the accumulation of toxins in the blood while others may arise as complications from the body trying to adapt to the disease. The most common signs are:

- Weight loss
- Poor appetite (inappetence)
- Lethargy
- Increased thirst (polydipsia)
- Increased urination (polyuria)

The increased production of urine occurs because cats begin to lose the ability to concentrate their urine with CKD, and they begin to drink more to compensate for this.

Other signs may include:

- Poor coat
- Hypertension (high blood pressure)
- Vomiting
- Bad-smelling breath (halitosis)
- Weakness
- Anaemia

How is CKD diagnosed?

A diagnosis of CKD is usually made by collection of blood sample and a urine sample at the same time for analysis.

Two substances in the blood – urea and creatinine – are commonly analysed, as these are by-products of metabolism that are normally excreted by the kidneys. In CKD the blood concentration of these two products will increase. However, as some other conditions can also cause elevation of these substances, a urine sample is usually analysed at the same time. Typically with CKD, there will be increased urea and creatinine concentrations as well as poorly concentrated urine. The urine 'specific gravity' is measured to assess its concentration, and in most cats with renal failure this is less than 1.030.

Blood tests may also show any important complications that have developed as a result of CKD such as hypokalaemia (low

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blood potassium), anaemia, and hyperphosphataemia (high blood phosphate). As hypertension (high blood pressure) is a relatively common complication of CKD, your vet will also want to measure your cat's blood pressure where possible. Sometimes other investigations such as X-rays, ultrasound or even biopsies may be indicated depending on individual circumstances.

Measuring the quantity of protein being lost in urine (usually through a simple urine test called the 'protein to creatinine ratio') can be important in cats with CKD. Increased loss of protein in the urine (proteinuria) may be a marker of progressive CKD. In humans, using drugs to reduce proteinuria may significantly slow down progression of the CKD- it is not certain if the same is true in cats, but it could be.

Early diagnosis of CKD

Because CKD is such a common disease in cats, routine screening of all mature and older cats can help early diagnosis, which in turn may prolong a good quality of life. Yearly or twice yearly routine veterinary check-ups are important, and as your cat begins to get older it is important that urine samples, and body weight, are monitored at each visit. A declining urine concentration or body weight may be early signs that CKD is developing and that further investigations should be done.

How is chronic kidney disease managed?

If a specific cause for the CKD is identified (eg, bacterial infection of the kidneys), treatment may be possible to arrest the progression of the disease. In most cases though, treatment is symptomatic and supportive. Some cats may require initial intravenous fluid therapy to correct dehydration (and perhaps electrolyte abnormalities), but once stable, treatment is aimed at supporting kidney function and minimising the complications of CKD. Despite therapy, CKD cannot be reversed and in most cases will also progress over time.

Optimal management of renal failure usually requires repeat investigations at regular intervals (including blood pressure assessment, blood and urine tests) to identify treatable complications as they arise, eg, anaemia, low potassium, high phosphate, urinary infections, and hypertension. Dietary modification is important in cats with CKD to improve quality of life and slow progression of disease, but a variety of other treatments may be valuable also, depending on individual needs. Sometimes multiple drug therapies may be needed, but if it is difficult to administer medications to your cat, these may need to be prioritised.

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Diet and the management of CKD

Dietary management is critical in cats with CKD, and there are three main aspects to this:

Water intake

Cats with CKD are more likely to become dehydrated (due to the reduced ability of the kidneys to conserve water). Maintaining a good fluid intake is therefore very important, and may help to slow progression of CKD. As cats obtain much of their water intake from their food, whenever possible, cats with CKD should be fed tinned (or sachet) foods rather than dry foods.

Protein content

An ideal diet for a cat with renal failure should have a restricted protein content. Many of the toxic products that accumulate in the blood in CKD are a result of protein breakdown, and feeding a reduced protein diet will help to minimise this and improve quality of life. Protein restriction has to be performed with care though as too little protein can be extremely detrimental to general health.

Low phosphate content

Restricting the phosphate content of the diet appears very beneficial in protecting the kidneys from further damage in cats with CKD. While restricting protein in the diet helps maintain quality of life, restricting phosphate thus appears to prolong the life of cats with CKD. Studies suggest this effect may be quite dramatic in cats. If blood phosphate concentrations remain high despite being on a low phosphate diet, further treatment with drugs known as 'phosphate binders' to reduce the amount of phosphate absorbed from the intestine may also be indicated.

Other dietary measures

Other aspects of the diet may also have an important role to play in helping manage cats with CKD. These include the addition of anti-oxidants to try to protect the kidneys against further damage, essential fatty acids to help maintain blood flow through the kidneys and reduce inflammation, added potassium to prevent hypokalaemia (low blood potassium), and added bicarbonate (or similar) to help prevent acidosis (a build up of acid in the body which can also occur in CKD).

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All these measures may help and have a role to play in keeping cats with CKD as healthy as possible for as long as possible. Because of the exacting nutritional demands in cats with CKD, feeding a specific veterinary therapeutic diet designed to manage all these aspects is strongly recommended. These diets are only available through your vet, but have a vital role to play in managing the disease.

Managing the change to a new diet

Cats will often develop a strong preference for particular diets, and low protein diets tend to be less palatable. This means that changing cats with CKD to an appropriate therapeutic diet can sometimes be difficult. These tips may help:

- Always make a change in diet gradual- per several days at least and sometimes over a few weeks if your cat is quite fussy
- Start by mixing a *very* small amount of the new food with your cats old food, and make sure it is well mixed
- Only increase the amount of the new food slowly, once your cat is happy to eat the old mixture. Make each step where you replace old food with a greater amount of new food slow
- Warming the food to body temperature (around 30C) may help increase the palatability
- If necessary, talk to your vet about using drugs to increase the appetite to make the transition easier

In most cases with sufficient care and time, cats can be very successfully transitioned to a new diet, and as this is such an important part of managing CKD it is worth taking the time to do this properly. If cats absolutely refuse to eat any of a new diet, it is important that they eat something, so keep offering their old diet in this situation and contact your vet for further advice.

Managing dehydration

Using a wet rather than dry diet is important to increase water intake in cats with CKD, but they still sometimes do not consume enough water to compensate for what is being lost in the urine. In these cases, additional measures may need to be taken. These may include:

- Making sure a good supply of fresh water is always available, and cats should be encouraged to drink by offering water from different bowls, etc.
- Using flavoured waters (chicken or tuna, for example) or water fountains to encourage drinking
- Adding further water to the food (if tolerated without affecting the appetite)

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- Using intermittent intravenous fluid therapy at your vet clinic
- Using intermittent sub-cutaneous fluid therapy which can be given at your vet clinic or sometime in the home environment

Phosphate binders

If, despite using a low phosphate diet, blood phosphate levels remain high, using a phosphate binder added to the diet (such as lanthanum or calcium acetate) may be valuable. This is important as controlling blood phosphate levels appears to have a good protective effect on the kidneys in cats with CKD.

Potassium supplementation

Some cats with CKD develop low blood potassium levels. This can cause muscle weakness, can contribute to inappetence, and itself can worsen CKD. Where this is identified, potassium supplementation (usually potassium gluconate in the form of tablets, gel or powder added to the diet) is important.

Controlling blood pressure

Cats with CKD are at risk of developing high blood pressure (hypertension). This can have a number of damaging effects, potentially including blindness and worsening of the CKD. Blood pressure should ideally be monitored in all cats with CKD and where hypertension is found it should be treated. This is usually achieved with a group of drugs known as 'vasodilators'. In cats a drug called amlodipine is particularly effective, but other drugs may also be used.

Treatment of anaemia

In advanced CKD in particular, anaemia is quite common. This may be due to lack of production of a hormone by the kidneys (erythropoietin or EPO) that stimulates production of red blood cells in the bone marrow, but can also be due to other factors (such as loss of blood in the intestines). More severe anaemia can cause lethargy and weakness and a poor quality of life. Depending on its cause and severity, a number of treatment options may be available to manage anaemia including anabolic steroids, iron supplementation, management of any gastrointestinal ulcers and in some cases supplementation with EPO.

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Treatment of nausea and vomiting

Nausea and vomiting are more common in advanced CKD and can cause inappetence and significantly affect the quality of life. Various drugs can be used to control these signs including maropitant, famotidine and ranitidine.

Use of 'ACE inhibitors' and ARBs

Blocking activation of a hormone known as angiotensin may be of benefit in CKD. This can be achieved by using so called 'ACE-inhibitors' (angiotensin converting enzyme inhibitors) such as benazepril or enalapril, or using angiotensin receptor blockers (ARBs) such as telmisartan.

These drugs are vasodilators (dilate blood vessels) and help to support blood flow through the kidneys, and may help to lower blood pressure in cats, and also significantly reduce protein loss through the kidneys. Elevated loss of protein through the kidneys in CKD is a risk factor for progression of CKD, and it is possible that lowering protein loss (with ACE-inhibitors or ARBs) may improve survival in some cats with CKD.

What is the prognosis for cats with CKD?

Once sufficient damage has been done to the kidneys to cause CKD, the compensatory changes and adaptations that occur to try to maintain normal kidney function usually eventually fail and progressive kidney damage occurs. The disease is usually therefore progressive over time and will eventually lead to the need for euthanasia. However the rate of progression of renal disease varies considerably between individuals and appropriate support and treatment can both increase the quality of life of affected cats and also potentially slow down the progression of the disease.

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