

## Kidney Disease in Dogs

### **What roles do the kidneys normally perform?**

The kidneys have several jobs:

- Filter out waste products from the blood and excrete them from the body in urine.
- Regulate salt and water balance in the body.
- Produce various hormones that help control blood volume and blood pressure.
- Help with red blood cell production.
- Convert vitamin D into an active form which is essential for calcium absorption to keep bones strong.

If the kidneys cannot perform these roles due to damage or disease, waste products build up in the blood, the body becomes dehydrated, blood pressure can become abnormal, anaemia can develop and the bones can become soft.

### **What types of kidney disease occur?**

Acute Kidney Injury (AKI) is a form of kidney disease where the kidneys are rapidly damaged over hours to days. It results in a build-up of waste products in the blood and an inability to produce urine resulting in sudden illness. The kidneys are often painful and enlarged. If caught early, the kidneys may be able to recover to a certain extent but there will always be a certain amount of longstanding damage. If the damage is severe, the kidneys will fail, with life-limiting consequences.

Chronic Kidney Disease (CKD) is a form of kidney disease where the kidneys are slowly damaged over time, it is therefore considered an age-related disease and is the most common type of kidney disease we see. CKD results in a build-up of waste products in the blood. The patient may develop dehydration, weight loss, high blood pressure, anaemia and sometimes weak bones. The kidneys are often small and scarred, and unfortunately the damage is irreversible, which means treatment is aimed at helping your dog cope with the kidney function they have left and slowing the progression of the disease.

Glomerular disease is a form of kidney disease that affects the filtration system within the kidneys. This may occur quickly or slowly over time. The filter becomes leaky leading to loss of protein into the urine (proteinuria). Depending on the cause, this form of kidney disease may be controlled, but the filter will remain leaky.

### **What causes kidney disease?**

The kidneys can be damaged by various insults including infections, drugs, toxins, dehydration, abnormal blood pressure (high/low), trauma, shock, obstruction to urine flow, inflammation, immune-mediated damage and cancer amongst other things. In the case of CKD, the cause is often unknown, as it is usually the result of multiple mild insults over time resulting in scarring within the kidneys.

### **What are the symptoms of kidney disease?**

The earliest signs of kidney disease include the production of more urine (polyuria) and, to avoid becoming dehydrated, drinking more water (polydipsia). As kidney disease progresses, waste products begin to accumulate in the blood stream, leading to symptoms such as reduced appetite, nausea, vomiting, weight loss, lethargy, dehydration, diarrhoea, halitosis (bad breath) and mouth ulcers. If anaemia develops your dog may become tired, weak and breathless. If proteinuria develops your dog may be at increase risk of forming blood clots.

## How is kidney disease diagnosed?

Your vet may suspect kidney disease based on the symptoms and physical examination findings. In some cases, abnormally large or small kidneys can be felt on abdominal palpation, depending on the size and shape of your dog.

A diagnosis of kidney disease is made through blood and urine testing:

- Urine tests allow us to assess the urine concentration. The urine becomes inappropriately dilute once around 60-70% of the kidneys are damaged. The urine can also be assessed for evidence of protein loss, blood loss, infection, crystals and abnormal cells which helps screen for underlying causes of kidney disease. If your dog has protein in the urine, we will need to quantify the amount of protein present using a test called the urine protein creatinine ratio (UPC) to assess the severity of the disease. This is performed on several urine samples to obtain the average as the UPC fluctuates throughout the day. We may ask you to catch 3 urine samples over 3 days, keeping each urine sample in a separate urine pot in the fridge, and dropping them off once the last sample is collected.
- As the kidneys become diseased, waste products build up in the blood, and these can be detected on a blood test. Initial tests check urea and creatinine levels. However, these only tend to rise when around 70% of the kidneys are damaged. If your vet suspects kidney disease but the urea and creatinine are normal, an additional blood test can be run to measure SDMA, which can rise when as little as 25% of the kidneys are damaged. Blood tests also allow us to check the mineral levels (calcium and phosphorus) and potassium levels which can become abnormal with kidney disease.
- Blood pressure will often be measured. High blood pressure can develop because of kidney disease, and this needs to be controlled to prevent further kidney damage.
- These tests are usually repeated over time to monitor for disease progression.

Further tests may be considered to identify the cause of the kidney disease:

- Ultrasound scans allow us to check the size and shape of the kidneys and look for structural changes like cysts or tumours in the kidneys.
- We may test for infectious diseases through blood and/or urine tests. This requires a urine sample obtained in a sterile manner using a needle and syringe to remove urine directly from the bladder (cystocentesis) to avoid contamination from the skin.
- We can test for evidence of acute or active kidney injury with a urine test for a molecule called cystatin B, which is released from damaged kidney cells.
- Biopsy of the kidneys involving obtaining a sample of tissue from the kidneys allows us to look for evidence of inflammation, infection, immune-mediated damage or cancer. It is rarely performed because it requires a general anaesthetic and there is a risk of complications. However, it may be the only way to identify the underlying cause of kidney disease and can be useful in complex or rapidly progressive cases.

There are international systems set up to standardise the way that vets monitor and manage dogs with kidney disease. These systems are produced by the International Renal Interest Society (IRIS) and further information is available at [www.iris-kidney.com](http://www.iris-kidney.com). For chronic kidney disease, the IRIS staging system allows us to stage your dog's kidney disease and develop an individual package of recommendations and treatments to make your dog feel as well as possible for as long as possible. The IRIS stage is based on the blood test results with stage 1 being the earliest or mildest form of disease and stage 4 the most advanced. Sub-staging requires blood pressure and UPC measurement. For acute kidney injury, the IRIS grading system informs us about prognosis. It is based on the blood test results, urine results and the volume of urine produced over set time periods. There are also guidelines for the investigation and treatment of proteinuria.

## How is kidney disease managed?

If there is an underlying cause for the kidney disease (like infection, toxicity or cancer), it may be possible to reverse the kidney damage by treating the underlying cause. However, for dogs with slowly progressive chronic kidney disease, it is not possible to reverse or cure the condition. Instead, we need to focus on slowing down the rate of kidney damage and treating any problems caused by the reduced kidney function.

### Diets:

- Prescription kidney or renal diets are recommended to reduce the workload of the kidneys. These have been shown to slow disease progression, reduce clinical signs and improve life expectancy.
- These diets are moderately protein restricted, preventing the build-up of waste products in the blood stream, and reducing clinical signs.
- They contain higher fat levels to increase calorie intake and help maintain an appropriate body weight and body condition.
- They are phosphate restricted to help maintain the calcium balance and prevent secondary issues like soft bones.
- They are higher in antioxidants and fatty acids to minimise cell damage.

### Water:

- It is also important to make sure your dog drinks plenty of water since they are at higher risk of becoming dehydrated.
- Water should never be restricted, and your dog can be encouraged to drink by having more water bowls around the house or outside, using water fountains, or using flavoured water.
- Feeding a wet diet or adding water to meals can also increase water intake.

### Supplements:

- Phosphate binders might be recommended if diet alone fails to control the phosphate levels.
- Potassium supplements may be required if the potassium levels are low.
- Omega-3 and omega-6 fatty acids may be used to reduce cell damage.
- There are lots of supplement options available and many are designed to be highly palatable or mixed with the food to make administration easy.
- These supplements should only be started if recommended by your vet as starting them too early in the disease process can be detrimental.

### Medicine:

- We may prescribe medications to control blood pressure or reduce protein loss from the kidneys. These medications can slow the progression of kidney disease, prevent damage to other organs such as the eyes, heart and brain and reduce the risk of blood clot formation.
- If your dog becomes anaemic due to CKD we may use medications to correct this.
- We can also use supportive medications such as appetite stimulants and anti-sickness drugs to help ease the symptoms of the disease.

## How can we monitor for kidney disease progression?

Kidney disease is monitored through regular weight checks, physical examination, blood tests, urine tests and blood pressure assessment. This will allow us to check the progression of the kidney disease and address any additional issues that develop.

## How can kidney disease be monitored at home?

It is important that you monitor your dog closely at home, taking particular note of how much food and water they consume. Dogs with CKD are prone to dehydration so early intervention if appetite decreases can be vital in preventing worsening of disease. Other signs such as vomiting, lethargy or pungent odour from the mouth should prompt further veterinary attention.