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Canine Kidney Disease

The kidney (fig. [normal kidney](#), [ultrasound kidney](#)) are organs which maintain the balance of certain chemicals in your dog's blood while filtering out the body's wastes as urine. The kidneys also help regulate blood pressure, help regulate the production of calcium and phosphorus metabolism, and produce a hormone that stimulates red-blood-cell production called erythropoiten. As you can see, a malfunctioning kidney can cause many problems.

Let us picture the kidneys filtering mechanism. There are tens of thousands of microscopic funnel shaped tubes called nephrons. These tiny structures are responsible for filtering and reabsorbing the fluids that balance the body. These nephrons are susceptible to damage due to many causes such as poisons, aging, infection, trauma, cancer, auto-immune diseases, and genetic predisposition. If any of these occur the entire nephron stops functioning. Fortunately, due to both the reserve capacity of the kidney and the ability of the nephrons to grow larger, the kidney can still function. If damage to nephrons occurs gradually and the surviving nephrons have enough time to hypertrophy, a kidney can continue to function with as few as 25 percent of its original nephrons.

When the number of functioning nephrons drops below 25 percent or when damage occurs too suddenly for the remaining nephrons to compensate, kidney failure occurs. There are two types of kidney failure. Acute kidney failure is a sudden loss of function that is sometimes but not always reversible. Chronic

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kidney failure is an irreversible loss of function that occurs gradually over months or years.

Failing kidneys can't adequately clear the blood of certain toxins. These include urea (a nitrogen-containing byproduct of protein metabolism) and creatinine (a chemical byproduct of muscle exertion). As a result, when the kidneys fail, there is an abnormally high levels of these wastes products. Other blood components normally regulated by the kidneys - such as phosphorus, calcium, sodium, potassium, and chloride - may also rise or fall abnormally. Failing kidneys may also produce extremely dilute urine or urine that contains too much protein. Healthy kidneys produce concentrated urine that is relatively protein-free.

To determine the prognosis of kidney disease, blood and urine tests are performed frequently during treatment to evaluate how well the kidneys are responding. It's a good sign if test results swing back toward normal within the first 48 to 72 hours of therapy.

Initial test results can be remarkably similar for both forms of kidney failure. The diagnostic challenge is to determine whether the dog has acute or chronic kidney failure. Making the distinction between chronic and acute failure is crucial because the prognosis and duration of treatment for the two types of kidney disease are different (although some treatment procedures may be similar). At our practices, we recommend yearly base line lab testing starting at age 3. This protocol allows us to help determine if we are dealing with acute or chronic disease.

Acute kidney failure (fig. [acute kidney failure](#)) occurs so suddenly surviving nephrons don't have time to compensate. This abrupt failure can occur if the kidney is damaged by an infection, or harmful substances such as antifreeze and rat poison; or certain medications, including some antibiotics and chemotherapy drugs.

Many cases of bacterial kidney diseases can be successfully treated. Leptospira is one bacterium that can cause acute renal failure. Other bacteria can also cause kidney infections, invading the urinary tract, the bladder or prostate for example, and ascending up to the kidneys. With proper diagnosis and treatment these infections can be treated effectively with antibiotics and, in most cases, result in complete recovery.

Ingesting as little as a teaspoon of [ethylene glycol](#)-based antifreeze, which forms crystals inside the dog's nephrons and shuts down kidney function is usually fatal. Unfortunately, this product has a sweet taste which attracts pets to drink it. (Propylene-glycol-based antifreeze is a safer way to protect your car and your dog.) Another potentially lethal substance is rat poison. If a dog eats rat poison containing calciferol (a form of vitamin D) the calciferol pushes up the dog's calcium level, causing mineral deposits, inflammation, and other damage within the kidneys.



Ironically, treatments for some nonkidney diseases can jeopardize the kidneys. Although most antibiotics cause no harm to the kidneys, practitioners should closely monitor patients on certain antibiotics - gentamicin, for example - because of potential damage to nephrons. Cisplatin (an anticancer drug) and amphotericin B (a drug for serious fungal infections) can also cause acute kidney damage. In general, before you decide on a course of treatment for any condition, ask your veterinarian about the benefits and risks of all available options.

Chronic Failure (fig. [chronic kidney failure](#))

Chronic kidney failure, CIN, is the most common form of kidney disease in dogs and among the most common causes of death in older dogs.

Unfortunately, chronic disease progresses over a period of years and often goes unnoticed by even the most vigilant owners. When signs finally appear, the disease is often well-advanced. But, with proper treatment and monitoring, some dogs with chronic kidney failure live comfortably for years after diagnosis.

Dogs with the chronic disease, CIN, tend to produce large amounts of dilute urine (polyuria), because there aren't enough healthy nephrons to properly filter and reabsorb excess water back into the bloodstream. Consequently, dogs with chronic renal failure drink lots of water (polydypsia) to maintain the right volume of internal fluids.

CIN can lead to the progression of acute kidney failure or result in the destructive diseases that slowly destroy nephrons. One such long-term condition is glomerulonephritis, in which immune-system proteins damage the glomerulus (the tuft of blood vessels at the entrance to the nephron). But, more often than not, it's impossible to identify the exact cause of CIN.

Intravenous fluid therapy can temporarily help dogs that have acute or chronic kidney failure. Other medications may also be used in the treatment of renal disease. When kidney failure occurs, many other organs are affected by the increased toxins not effectively eliminated by the kidney. One major organ is the stomach. The stomach lining becomes inflamed and ulcerated due to the increase in urea nitrogen in the blood stream. H2 blockers, such as cimetidine, assist in reducing the stomach irritation. To help keep levels of phosphorus under control, phosphate binders are given orally. These include aluminum hydroxide, aluminum carbonate, calcium carbonate, and calcium acetate. One product we use is Alternagel, available at most pharmacies located where the antacids are kept.

Renal failure can also cause hypertension or high blood pressure. Sodium restriction is the initial step in the management of this disease. Drugs may be incorporated if hypertension is not controlled by dietary management.

We also recommend B-complex and vitamin C to help the well being of your dog and also replenish the vitamins lost due to the inability of the kidneys to recycle and retain the nutrients in the body properly. Sodium bicarbonate may also be of use to aid in controlling the changes in the acidity of the blood. If hypertension or heart failure are present, we avoid the use of this medication.

Other medications that may be used are androgens or erythropoiten (hormones to help reduce the anemia associated with kidney disease), and calcitriol, a substance which helps regulate the levels of calcium and phosphorus. Some urologists are now recommending treating with calcitriol as soon as kidney disease is diagnosed. The dose is 2.5ug/kg every day. If phosphorus levels are above 6, this drug should not be administered. ACE inhibitors, such as enalapril are also recommended in early stages of kidney disease as long as renal functions are monitored. Additional vitamins or nutritional supplements for slowing the progression of CIN may be beneficial. These products are fish oils containing the Omega 3 fatty acids in conjunction with vitamin E which may help reduce kidney inflammation. Omega 3 oils slow may slow the progression of renal failure. Vitamin E acts synergistically with the Omega 3's. Also, omega 3 fatty acids may deplete vitamin E in the body, another reason to supplement this vitamin. Veterinarians sometimes resort to more intensive treatments. For example, veterinary specialists can perform dialysis (artificial blood filtering) and kidney transplants. However, dialysis and transplants are labor- and technology-intensive - and therefore very expensive. Dialysis requires several hours of treatment several times a week - on an ongoing basis. And canine kidney transplants have produced few long-term survivors, probably because the genetic diversity among dogs increases the risk of organ rejection or some other factor that we do not understand at this time. Future advances in anti-rejection drugs may make kidney transplants a more viable option for dogs, although cost considerations may still limit this practice.

The key to ongoing CIN treatment takes place at home, where owners can take several steps to help their dogs. Make sure a dog with CIN always has access to fresh water. To encourage the dog to drink and eat, maintain a steady, stress-free daily routine. (Stressed-out dogs often stop drinking and eating, further jeopardizing kidney function.)

Dietary management can also help your dog. This consists primarily of restricting the amount of protein, phosphorus, and sodium in the diet, while providing adequate amounts of non protein calories, vitamins, and minerals. But not every dog with kidney disease needs such a diet.

Renal Failure Diets

(these are some suggestions-but your veterinarian may have others)

Diet	KCAL	Protein
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HILLS	350KCAL/CUP 612KCAL/CAN	12.7% 13.2%
SELECT-CARE	362KCAL/CUP 525KCAL/CAN	12% 13%
CNM-NF	415KCAL/CUP 516KCAL/CAN	12% 11.7%
CNM-CV	638KCAL/CAN	12.3%
	791KCAL/CUP 662KCAL/CUP	8% 7.9%
WALTHAM	390KCAL/CUP 650KCAL/CAN	

[Click here](#) for an excellent source for dietary tables-from Ohio State University

Homemade diets:

Cooking instructions:

Mix the rice, calcium carbonate, corn oil and salt. Cook according to instructions for the rice. Add remaining ingredients except the vitamins . Simmer 10 minutes and cool. Add vitamins before feeding.

7% Diet: 1068 KCAL	12% Diet: 1145 KCAL	16% Diet: 1119 KCAL
<ul style="list-style-type: none"> ■ 3/4 cup raw rice 1 large egg 1 oz. liver 3 Tb sp. bacon fat 1 tsp. corn oil 3/4 tsp. calcium carbonate (Tums) ■ 1/4 tsp. iodized salt 	<ul style="list-style-type: none"> ■ 2/3 cup raw rice 2 large eggs 1/3 cup low-fat cottage cheese 1 oz. liver 3 Tb sp. bacon fat 1 tsp. corn oil 3/4 tsp. calcium carbonate (Tums) ■ 1/4 tsp. iodized salt 	<ul style="list-style-type: none"> ■ 2/3 cup raw rice ■ 1/2 cup diced poultry ■ 1/3 cup low-fat cottage cheese ■ 1 oz. liver ■ 3 Tbsp. bacon fat ■ 1 tsp. corn oil ■ 3/4 tsp. calcium carbonate (Tums) ■ 1/4 tsp. iodized salt

Approximate feeding recommendations: Please check with your veterinarian

Body weight (LB) Approx.	KCAL/Dy	Can - Dry
5	230	1/3 - 3/4
10	390	2/3 - 1 1/4
20	650	1 - 2

30	885	1 1/3 - 2 3/4
40	1090	1 2/3 - 3 1/2
50	1300	2 - 3 1/2
60	1480	2 1/4 - 4 3/4
70	1675	2 1/2 - 5 1/2
80	1850	2 3/4 - 6
90	2020	3 - 6 1/2
100	2185	3 1/3 - 7
110	2350	3 1/2 - 7 1/2
120	2505	3 3/4 - 8
130	2660	4 - 8 1/2
140	2815	4 1/2 - 9
150	2965	5 - 9 1/2

Studies suggest that feeding your dog a diet low in phosphorus may help slow the progression of kidney failure by reducing mineral deposits in the kidneys. And while there's no conclusive proof that low-protein diets slow CRF in dogs, your pet may feel better on such a diet. Low-protein diets generate fewer nitrogenous wastes - high levels of which can cause nausea and vomiting in dogs with kidney disease. A cautionary note: low-protein diets, if not carefully managed, can lead to malnutrition. So be sure to consult your veterinarian before making any such dietary changes.

Above all, keep a watchful eye. Report any changes in your dog's eating, drinking, and elimination habits to your veterinarian. Such changes may alert your veterinarian to the possibility of kidney disease - or help your practitioner adjust treatment if therapy has already begun.

With kidney disease, your dog becomes less alert, loses its appetite, and may vomit. Take your dog to your veterinarian if it shows any of the following signs that sometimes (but not always) point to kidney disease:

Chronic Failure

1. **Increased thirst and urine volume**
2. **Weight loss**
3. **Weakness and exercise intolerance**
4. **Tendency to bleed or bruise easily**

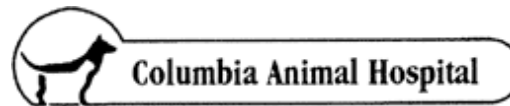
Acute Failure

1. **Dehydration (To test for this, gently pull the skin away from your dog's middle. If the skin does not immediately spring back, the dog may be dehydrated.)**
2. **Stiff-legged gait and arched back (a sign of painful kidneys)**
3. **Little or no urine production**

Thanks to Hill's Prescription Diets for illustrations

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