

Kidney Failure: Where to Begin

The Pet Health Care Library

The Vocabulary of this Disease

Chronic means long term. **Renal** means kidney. **Failure** means inability to perform a task adequately. Chronic renal failure, also called **chronic kidney failure**, refers to the situation where the kidneys have not been able to perform at least one of their many tasks adequately for some time (months to years). Because the word failure evokes such a sense of doom, many clinicians opt for the term **chronic renal insufficiency**, as many cases can be treated successfully and can look forward to months or often years of quality life.



The terms renal failure or renal insufficiency imply that a condition called azotemia is present. Azotemia is the condition where toxins have built up in the bloodstream and lab tests are definitely abnormal. It does not necessarily mean the patient is experiencing reduced life quality as a result of these abnormal lab findings. The term **uremia** means that the patient is experiencing uremic poisoning. In other words, not only are the tests abnormal but the patient is feeling the effects of the toxic build up. Our goal in treatment is to prevent, postpone, or resolve uremia. Resolving azotemia may not be realistic.

In most cases, by the time the diagnosis of kidney failure has been made, the initial disease that started the kidneys on their path to failure is long gone, leaving a progressive loss of function to march unrelentingly onward. Our goal is to stop that march, and get to a stage where the patient does not feel the consequences of the disease. We cannot make failed kidneys become normal again, but we may be able to re-balance our patient's metabolism so that he or she feels as though we did. What makes a case hopeless or hopeful depends on the patient's ability to respond to therapy nearly as much as it depends on the stage at which the condition is discovered.

Many people have no idea what our kidneys do for us beyond that they have something to do with urine production. In fact, the kidneys are involved in conservation of water, stimulating red blood cell production, regulating blood pressure, balancing salts, activating Vitamin D, and more. Any of these functions may be failing in the renal failure patient.

The kidneys remove toxic wastes from our bodies and when these substances cannot be adequately removed, we develop excess thirst, nausea, pain, weakness, appetite loss, intestinal bleeding, even seizures. Our goal in early stage patients is to postpone or even fully prevent the development of uremia. Our goal in later stage patients is to resolve the uremia and bring the patient back to an earlier stage of disease.

Let's begin with some of the relevant lab values that come up in the course of screening a pet's kidney function. It is helpful to become familiar with these terms so you can understand what your veterinarian is tracking:

Urine Specific Gravity

One of the kidney's most important jobs is the conservation of the body's water. The kidney must excrete the toxic by-products created by the body's metabolism but it will want to do so in the least amount of water possible. The healthy kidney is able to make very concentrated urine. When we analyze a urine sample, one of the most important parameters is the specific gravity. This is a measure of how concentrated a urine sample is. Water has a specific gravity of 1.000. A dilute urine sample has a specific



gravity less than 1.020 (often less than 1.010). A concentrated urine sample would have a specific gravity over 1.030 or 1.040. A failing kidney by definition cannot make concentrated urine and the patient must drink excessively to get enough water to excrete the day's toxic load.

Blood Urea Nitrogen (BUN)

This is a protein metabolite excreted by the kidney (it is one of the toxins we are concerned about, though it may be more of a marker for other toxins that are less easily measured). In a normal animal, the BUN is 25 mg/dl (milligram per deciliter) or so. Often at the time of diagnosis, BUN is well over 150, 200, or even 300. We'd like to keep the BUN no more than 60 to 80 mg/dl. BUN is influenced by dietary protein (including the patient's own blood that has bled into the intestine), something which becomes important in certain situations.

Creatinine

This is another protein metabolite (though this one is less dependent on dietary protein intake than is BUN). A normal creatinine is less than 1.4 mg/dl, certainly less than 2.0. Patients begin to feel sick when values meet or exceed 5.0 so we try to keep the value at 4.5 or less. BUN and creatinine will be tracked (as will several other parameters) over time and in response to different treatments.

Phosphorus

The calcium/phosphorus balance becomes deranged in kidney failure due to hormone changes as well as the inability of the failing kidney to excrete phosphorus. If calcium and phosphorus levels become too high, the soft tissues of the animal's body will develop mineralized deposits that are inflammatory, uncomfortable, and often cause intestinal bleeding. The bones will weaken as well, in some cases actually becoming rubbery. Keeping phosphorus levels in the low normal range has been correlated with improved survival.

Potassium

The failing kidney is unable to conserve potassium efficiently and supplementation may be needed. The sign of hypokalemia (the scientific name for low blood potassium) is weakness, especially drooping of the head and neck.

Packed Cell Volume / Hematocrit

This is a measure of red blood cell amount. More literally it represents the percentage of the blood made up by red blood cells. The hormone which stimulates the production of red blood cells is made by the kidney. The failing kidney does not make this hormone in normal amounts leading to a reduction in red blood cells, in turn leading to weakness, poor appetite, and overall poor life quality.

Blood Pressure

Blood pressure is not something measured off a laboratory result sheet but it is important to monitor this parameter in kidney patients as there is a tendency for hypertension to develop in kidney failure. Special medications may be needed to manage this problem should it arise.

Urinary Protein

One of the functions of the kidney is to prevent loss of the body's proteins, in particular the blood proteins. The kidney's filtering mechanism that enables it to remove toxins is designed to leave larger molecules (such as proteins) inside the body where they belong. But if holes develop in the filter, protein can be lost. If this complication cannot be controlled, survival time is dramatically shortened.

If you are a hands-on kind of pet owner, it is a good idea to request copies of monitoring lab work so you can make a chart of these parameters. In this way you can see how the disease is progressing or improving and what the problem areas are.

IRIS Staging

The International Renal Interest Society (IRIS) has posed the following staging criteria for pets

with kidney failure based on creatinine value in mg/dl.

	Stage I (pre-failure)	Stage II (mild failure)	Stage III (moderate failure)	Stage IV (severe failure)
Dog	<1.4	1.4-2.0	2.1 - 5	>5
Cat	<1.6	1.6-2.8	2.8 - 5	>5

Most of what we discuss here will pertain to treating patients in Stage III and Stage IV but there is also a great deal of room to help patients still in Stage II.

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