Chronic Renal Failure

What is chronic renal failure?

Chronic renal failure is a condition characterized by failing kidneys (kidneys that no longer function properly). The normal functions of the kidneys include eliminating waste products from the body (via the urine), helping to maintain normal electrolyte and fluid balance within the body, and producing several important hormones (such as erythropoietin that stimulates production of new red blood cells, and calcitriol which helps regulate calcium and phosphorus balance in the body). With kidney malfunction and failure, waste products that are normally excreted from the body by the kidneys build up in the bloodstream and cause clinical signs. Electrolyte imbalances and hormone deficiencies from failing kidneys may also contribute to clinical signs. Dogs and cats have two kidneys (just like people) and for renal failure to occur, significant disease must be present in both kidneys. Labwork abnormalities that suggest renal (kidney) failure only become evident after 66 percent to 75 percent functional loss of the kidneys. Clinical signs may or may not be present at the time of diagnosis, but typically develop as the disease progresses. Once a patient has been diagnosed with chronic renal failure, kidney function continues to decline, but not all patients are alike in how fast the remaining kidney function declines.

What causes chronic renal failure?

There are many possible causes of chronic renal failure. Most of the time, this condition is diagnosed in the middle-aged to older cat or dog and no specific underlying cause is identified (the term idiopathic is often used to describe conditions of an unknown cause). On biopsy, affected kidneys often exhibit chronic interstitial nephritis, a term used to describe degeneration of the kidneys due to inflammation and fibrosis (scar tissue). In other cases, renal failure may be caused by congenital defects (animals born with maldeveloped kidneys), infection (bacteria, viruses, fungi), toxins, drugs, trauma, kidney stones, tumor, and previous kidney injury due to a variety of causes. Depending on the individual patient, history, clinical signs, geographical location, age, breed and other parameters; diagnostic tests to evaluate for some of these underlying conditions may be recommended.

What are common clinical signs?

The clinical signs of chronic renal failure are quite variable depending on the stage (or severity) of disease as well as the individual dog or cat. Chronic renal failure takes time to develop (over months to years) and clinical signs are often subtle and slowly progressive in the initial stages. Patients in the early stages of chronic renal failure tend to first develop increased thirst (polydipsia) and increased urination (polyuria). Increased water losses occur as the kidneys can no longer effectively concentrate the urine. As more water is lost from the body, the patient drinks more water to compensate. As the disease progresses, loss of appetite, weight loss, and poor body condition develop. The failing kidneys can no longer excrete waste products out in the urine and these wastes build up in the blood. This condition is called “uremia”. These waste products cause loss of appetite, malaise, and in general, a patient that does not feel well. Other clinical signs that may occur include vomiting (from the effects of uremia and increased acid production by the stomach), bad breath and mouth ulcers (from the build up of waste products in the mouth), electrolyte abnormalities, high blood pressure (hypertension), and anemia (due to loss of red blood cells). Hypertension develops due to disturbances in normal electrolyte and blood pressure regulation. Not all patients with hypertension show clinical signs, but some affected cats and dogs develop sudden blindness or neurologic signs (such as behavior changes or seizures). Anemia usually develops later in the disease process as kidney function continues to decline. It is caused by reduced levels of erythropoietin (a hormone made by the kidneys that stimulates the bone marrow

to make new red blood cells) as well as loss of blood into the intestinal tract from increased stomach acid. Anemia, electrolyte abnormalities, and the build-up of waste products in the blood contribute to loss of appetite, weight loss and weakness that develop in the patient with more advanced renal failure.

How is chronic renal failure diagnosed?

The diagnosis of chronic renal failure is made based on blood and urine test results. The findings of elevated BUN and creatinine in the blood in conjunction with isosthenuric (dilute) urine allows for the diagnosis of renal failure. Other findings that may be evident on initial labwork include anemia, and alterations in potassium, phosphorus, and calcium levels. The urine sample may show evidence of a dilute or minimally concentrated urine and in some cases, evidence of protein or infection in the urine. Other diagnostic tests that are helpful in more completely evaluating the patient with kidney failure include abdominal x-rays (to see the size and shape of both kidneys), abdominal ultrasound (to see the interior portions of the kidneys and to evaluate for specific causes of kidney disease), urine culture (to look for evidence of infection in the kidneys), urine protein measurement (to look for excessive protein in the urine), blood pressure assessment (to look for systemic hypertension), special blood tests (to look for very specific causes of renal failure), and more specialized renal (kidney) clearance tests to accurately assess remaining kidney function. Kidney biopsy may also be recommended in selected cases to more clearly determine the cause of renal failure.

Appearance of Kidneys on Ultrasound of Abdomen

How is chronic renal failure treated?

There are a number of different treatments that may be helpful for the patient with chronic renal failure. As a general rule, fewer treatments are needed in the earlier stages of renal failure, while additional treatments become more helpful as the disease progresses. In a general order of progression, the following therapeutics are often recommended:

1. ***Free choice water***: it is very important for the dog and cat in renal failure to have water available at all times. The failing kidneys can no longer adequately conserve water for the body and patients with renal failure are at risk of dehydration if they do not have ready access to water.

2. ***Diet:*** Specially designed prescription renal (kidney) diets can help to slow the progression of renal failure and improve the quality of life in patients with chronic renal failure. Kidney diets are protein restricted (as excess proteins in the diet contribute to the build-up of waste products in the blood). The normal kidney excretes such waste products but with progressive kidney failure these waste products build up in the blood making the patient feel poorly. Protein restriction in the diet can help to lessen waste product build up in the blood. Other key features of prescription kidney diets include phosphorus restriction, sodium restriction, supplementation with omega-3 fatty acids, and the appropriate balance of needed vitamins, electrolytes and minerals. Different prescription diets may be recommended based on the stage of the patient's kidney disease. The International Renal Interest Society (IRIS) classifies stages of renal failure as Stage I (pre-failure) to Stage IV (severe failure) and recommends that protein-restricted prescription diets be started in cats at Stage II of disease (creatinine levels > 2.0), and in dogs at Stage III of disease (creatinine levels > 2.1). Diets that are not protein restricted (or minimally protein restricted) are recommended in the earlier stages of kidney disease (before Stage II in the cat and Stage III in the dog). Such diets include Hill's g/d dry and canned in both the dog and cat, and additionally, Royal Canin LP pouch food (for the cat) and Royal Canin MP 14 dry and canned and Iams Renal Early Stage dry (for the dog). Diets that are more significantly protein restricted are

recommended in the later stages of kidney disease (Stage II in the cat, Stage III in the dog). Such diets include Hill's k/d dry and canned, PurinaNF dry and canned, Royal Canin LP dry for the dog and cat and additionally, Iams multistage Renal dry and canned for the cat. If the patient will not eat a prescription diet, then nutritional specialists are available to help with the formulation of a nutritionally balanced homemade kidney diet. A specialized individual homemade diet recipe can be accessed by your veterinarian through www.balanceit.com (requires a licensed veterinarian to access the dietary Web site).

3. ***Phosphorus binders***: this is a powder or liquid supplement mixed in with the food to help lower blood phosphorus levels. This medication is indicated if serum phosphorus levels cannot be controlled with diet alone.

4. ***Famotidine***: this medication inhibits gastric (stomach) acid production and may help to alleviate nausea and loss of appetite.

5. ***Anti-hypertensive medications***: such as enalapril, benazepril or amlodipine may be indicated in patients that develop hypertension secondary to renal failure.

6. ***Appetite stimulants***: such as cyproheptadine or mirtazapine may be indicated as a short term measure to promote appetite.

7. ***Erythropoietin or Darbepoetin*** may be indicated in patients that develop significant anemia. This medication stimulates the bone marrow to make new red blood cells.

8. ***Calcitriol*** may be indicated to help reduce the development of renal secondary hyperparathyroidism that occurs with chronic renal failure. Renal secondary hyperparathyroidism contributes to malaise as well as calcium and phosphorus imbalances in the patient with renal failure.

9. ***Potassium supplementation*** may be indicated in patients that develop significant potassium losses due to renal failure.

10. ***Subcutaneous fluids*** may be helpful in treating clinical signs of weakness, poor appetite and nausea that develop during the later stages of chronic renal failure.

11. ***Hemodialysis***: this method allows for removal of toxic waste substances from the blood by a machine. It is used most often as a temporary measure for patients with acute renal failure, but occasionally in the intermittent treatment of patients with chronic renal failure.

12. ***Renal transplantation*** may be an option in some patients with chronic renal failure. Certain conditions preclude patients from this option (such as prior viral infections or current bacterial infections anywhere in the body). Currently, this surgical technique is more successful in the cat than dog and requires a lifelong commitment to medications as well as follow up veterinary care.

What recheck evaluations are recommended?

Recheck evaluations (physical exam, CBC, profile, urinalysis, urine culture, blood pressure measurements) are recommended every six months early in the disease process and every three to four months later in the

disease process. Recheck evaluations are very important to monitor for progression of disease and to be able to add in additional therapeutic medications as they become indicated. The patient should also be monitored for loss of appetite, vomiting, malaise, weakness and depression. Repeat evaluation is indicated if these signs occur in the dog or cat with chronic renal failure.

What is the prognosis for dogs or cats diagnosed with chronic renal failure?

Once a patient develops chronic renal failure, the condition will continue to progress (chronic renal failure is irreversible and progressive). Early intervention with medical therapy may help to slow the progression of disease in some, and in most if not all cases, medical therapy helps patients with renal failure feel much better. Ultimately, with time, chronic renal failure advances to end-stage renal failure (a condition characterized by severe progressive clinical signs of the failing kidneys). In general (depending on stage of renal failure at time of diagnosis), patients can survive for months to years with a good quality of life using treatment and supportive therapy.