

LONG-TERM (CHRONIC) KIDNEY FAILURE

BASICS

OVERVIEW

- Long-term (chronic) kidney failure is defined as the pet having an excess level of urea and other nitrogenous waste products in the blood (known as “uremia” or “azotemia”) in combination with a urine specific gravity of less than 1.030 in dogs and less than 1.035 in cats; “urine specific gravity” measures the concentration of substances (such as salt, glucose, protein) in the urine—the higher the specific gravity, the higher the concentration of particles and the lower amount of water in the urine; the kidneys remove water from the urine to maintain hydration levels—as kidney function decreases, the kidney is less able to remove water from the urine and the urine specific gravity drops; urine specific gravity provides information regarding the kidney’s ability to conserve fluid (concentrate urine) or to remove excess fluid from the body (dilute urine); urine specific gravity fluctuates normally based on the amount the pet drinks and the amount of salt in the diet
- Long-term (chronic) kidney failure results from primary kidney disease that has persisted for months to years; characterized by irreversible loss of kidney function, which tends to deteriorate progressively over months to years
- The kidney filters the blood and removes various waste products from the body as it produces urine; the kidney is involved in maintaining the normal fluid volume of the body; each kidney is composed of thousands of nephrons (the functional units of the kidney, each consisting of the glomerulus [a tuft of blood capillaries—the “blood filter”] and a series of tubes and ducts, through which the filtered fluid flows, as urine is produced)

GENETICS

Inherited in the following breeds (mode of inheritance, known or suspected, indicated in parentheses):

- Abyssinian cats (autosomal dominant with incomplete penetrance)
- Persian cats (autosomal dominant)
- Bull terrier (autosomal dominant)
- Cairn terrier (autosomal recessive)
- German shepherd dog (autosomal dominant)
- Samoyed (X-linked dominant)
- English cocker spaniel (autosomal recessive)

SIGNALMENT/DESCRIPTION of ANIMAL

Species

- Dogs and cats

Breed Predislection

- All breeds of dogs and cats are affected
- Familial (runs in certain families or lines of animals) kidney disease resulting in long-term (chronic) kidney failure has been reported in the basenji, beagle, bull terrier, Cairn terrier, chow chow, Doberman pinscher, English cocker spaniel, German shepherd dog, golden retriever, Lhasa apso, miniature schnauzer, Norwegian elkhound, rottweiler, Samoyed, Chinese shar pei, shih tzu, soft-coated wheaten terrier, and standard poodle, and in Abyssinian cats

Mean Age and Range

- Mean age at diagnosis is approximately 7 years in dogs and 9 years in cats
- Animals of any age can be affected, but number of affected animals is higher with increasing age

SIGNS/OBSERVED CHANGES in the ANIMAL

- Clinical signs are related to the severity of kidney dysfunction and the presence or absence of complications (such as high blood pressure [known as “hypertension”])
- Cats with mild, long-term (chronic) kidney failure may not have any clinical signs
- An animal with stable, long-term (chronic) kidney failure may no longer be able to offset the decreased kidney function, resulting in a medical crisis (so called “uremic crisis”)
- Increased urination (known as “polyuria”) and increased thirst (known as “polydipsia”)—less frequent in cats than dogs
- Lack of appetite (known as “anorexia”)
- Sluggishness (lethargy)
- Vomiting
- Weight loss
- Urinating at night (known as “nocturia”)
- Constipation
- Diarrhea
- Degeneration of the retina (back part of the eye) due to high blood pressure (known as “hypertensive retinopathy”) and resulting sudden (acute) blindness
- Seizures or coma—late

- Cats also may have excessive drooling (known as “ptyalism”) and muscle weakness with abnormal position of the head and neck, in which the chin is located near the chest (known as “neck ventroflexion”), because of a muscle disorder caused by low levels of potassium in the blood (known as “hypokalemic myopathy”)
- Small, irregular kidneys (or enlarged kidneys secondary to polycystic kidney disease [disease characterized by multiple fluid-filled sacs or cysts in the kidney] or lymphoma [a type of cancer that develops from lymphoid tissue, including lymphocytes, a type of white-blood cell formed in lymphatic tissues throughout the body])
- Dehydration
- Extreme weight loss with muscle wasting (known as “cachexia”)
- Pale gums and moist tissues of the body
- Ulceration of the mouth
- Abnormal odor to the mouth/ breath due to excessive levels of urea and other nitrogenous waste products in the blood (uremia or azotemia; abnormal odor known as “uremic breath odor”)
- Constipation
- Bone disorder caused by long-term (chronic) kidney failure leading to abnormal levels of calcium and phosphorus in the blood and resulting loss of mineralization of the bones (known as “renal osteodystrophy”)

CAUSES

- Most cases are of unknown cause (so called “idiopathic disease”), and the disease is termed “chronic generalized nephropathy” (“nephropathy” is any disease of the kidney)
- Causes include familial (runs in certain families or lines of animals) and congenital (present at birth) kidney disease; exposure to products that are toxic to the kidneys; increased levels of calcium in the blood (known as “hypercalcemia”); low levels of potassium in the blood (known as “hypokalemia,” condition known as “hypokalemic nephropathy”); inflammation and accompanying dysfunction of glomeruli (plural of glomerulus) of the kidney (known as “glomerulonephritis”); amyloidosis (a group of conditions in which insoluble proteins [known as “amyloid”] are deposited outside the cells in the kidney, compromising normal function); infection/inflammation of the kidney (known as “pyelonephritis”); polycystic kidney disease (multiple fluid-filled sacs or cysts in the kidney); kidney stones (known as “nephroliths”); long-term (chronic) urinary blockage or obstruction; drugs; cancer that develops from lymphoid tissue, including lymphocytes, a type of white-blood cell formed in lymphatic tissues throughout the body (lymphoma); leptospirosis (following sudden [acute] kidney failure), feline infectious peritonitis (FIP) in cats; and, possibly, diabetes mellitus (“sugar diabetes”)

RISK FACTORS

- Aging, increased levels of calcium in the blood (hypercalcemia), low levels of potassium in the blood (hypokalemia) in cats, high blood pressure (known as “hypertension”), urinary tract infection, diabetes mellitus (“sugar diabetes”)

TREATMENT

HEALTH CARE

- Patients that are able to offset the loss of function of the kidneys may be managed as outpatients
- Patients in uremic crisis (vomiting, dehydrated, “sick”) should be managed as inpatients—correct fluid and electrolyte deficits with intravenous fluid therapy (such as administration of lactated Ringer’s solution); correct dehydration over 6 to 12 hours to prevent additional kidney injury from poor or diminished blood flow (known as “ischemia”)
- Subcutaneous fluid therapy (daily or every other day) may benefit patients with moderate-to-severe long-term (chronic) kidney failure
- Hemodialysis (procedure to remove waste products from the blood) and kidney transplantation are available at selected veterinary referral hospitals

ACTIVITY

- Unrestricted

DIET

- Reduced dietary protein, phosphorus, and sodium with adequate buffering capacity (alkalinizing diet)
- Supplemental n-3 fatty acids may be beneficial
- Recent studies in dogs and cats indicate that compared to maintenance diets, feeding kidney diets delays onset of uremic crisis (signs of vomiting, dehydration, being “sick”) and kidney-related death
- Free access to fresh water at all times

SURGERY

- Avoid low blood pressure (known as “hypotension”) during anesthesia, to prevent additional kidney injury
- Kidney transplants have been performed successfully in dogs and cats with advanced disease

MEDICATIONS

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive.

Uremic Crisis (signs of vomiting, dehydration, and being “sick”)

- Famotidine to minimize nausea and vomiting
- Potassium chloride in intravenous fluids or potassium gluconate administered by mouth, as needed to correct low levels of potassium in the blood (hypokalemia)

Compensated Long-Term (Chronic) Kidney Failure (in which pet is able to offset loss of kidney function)

- Famotidine to minimize nausea
- Potassium gluconate administered by mouth, as needed to correct low levels of potassium in the blood (hypokalemia)
- Intestinal phosphate binders (such as aluminum carbonate, administered by mouth with meals), as needed to correct increased levels of phosphate in the blood (known as “hyperphosphatemia”)
- Calcitriol
- Erythropoietin (the hormone that stimulates the bone marrow to produce red-blood cells)
- Amlodipine or angiotensin-converting enzyme (ACE) inhibitors (such as enalapril or benazepril), as needed to treat high blood pressure (hypertension); amlodipine is more effective than ACE inhibitors in cats with long-term (chronic) kidney failure-induced hypertension; if pet does not respond to one drug, consider combination of amlodipine and ACE inhibitor with frequent monitoring of blood pressure

Other Drugs

- Metoclopramide can be used in addition to H₂-blockers (such as famotidine) to treat vomiting caused by excessive level of urea and other nitrogenous waste products in the blood (uremia or azotemia)
- H₂-blockers (ranitidine or cimetidine) may be used instead of famotidine for inflammation of the stomach caused by excess level of urea and other nitrogenous waste products in the blood (condition known as “uremic gastritis”)
- Ondansetron for cases that have nausea and vomiting that do not respond to other medical treatment

FOLLOW-UP CARE

PATIENT MONITORING

- Dogs and cats with long-term (chronic) kidney failure should be monitored at regular intervals, depending on therapy and severity of disease; initially weekly for patients receiving calcitriol or erythropoietin; re-evaluate patients with mild-to-moderate chronic kidney failure every 1 to 3 months

PREVENTIONS AND AVOIDANCE

- Do not breed animals with familial (runs in certain families or lines of animals) kidney disease

POSSIBLE COMPLICATIONS

- Generalized (systemic) high blood pressure (hypertension), inflammation of the mouth caused by excess level of urea and other nitrogenous waste products in the blood (condition known as “uremic stomatitis”), inflammation of the stomach and intestines (known as “gastroenteritis”), low levels of red-blood cells (known as “anemia”), secondary urinary tract infection

EXPECTED COURSE AND PROGNOSIS

- Short-term—depends on severity
- Long-term—guarded to poor because long-term (chronic) kidney failure tends to be progressive over months to years
- Tends to progress to terminal, long-term (chronic) kidney failure over months to years

KEY POINTS

- Tends to progress to terminal, long-term (chronic) kidney failure over months to years
- Carefully consider use of animals in breeding programs due to the genetic basis of familial (runs in certain families or lines of animals) kidney diseases; do not breed animals with familial kidney disease