

PROTEINURIA (PROTEIN IN THE URINE)

BASICS

OVERVIEW

- “Proteinuria” is the medical term for protein in the urine
- Proteinuria is a subjective increase in urinary protein as detected by urine dipstick analysis, urinary protein: creatinine ratio (UP:C of 0.5 or higher) or a 24-hour urine protein content over 20 mg/kg body weight
- “Microalbuminuria” is a type of proteinuria in which a low, yet abnormal, concentration of albumin (a type of protein) is present in the urine
- Proteinuria can be caused by changes or diseases involving the body, changes involving the kidney itself, or changes after the urine leaves the kidneys (such as inflammation of the bladder [known as “cystitis”])
- 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)

SIGNALMENT/DESCRIPTION of ANIMAL

Species

- Dogs and cats (less common)

Breed Predispositions

- Protein in the urine originating from the glomerulus of the kidney (known as “glomerular proteinuria”) may be the initial manifestation of familial (runs in certain families or lines of animals) kidney disease in soft-coated wheaten terriers, bull terriers, English cocker spaniels, Dalmatians, Samoyeds, beagles, Bernese mountain dogs, and Chinese shar peis

SIGNS/OBSERVED CHANGES in the ANIMAL

- Vary with underlying cause and severity of protein in the urine (proteinuria)
- None directly attributed to the presence of protein in the urine (proteinuria)

CAUSES

Prerenal Proteinuria (protein in the urine originates from changes or disease in the body, before the kidney)

- Functional proteinuria—strenuous exercise, fever, low body temperature (known as “hypothermia”), seizures, or accumulation of an increased volume of blood in the veins (known as “venous congestion”); poorly documented as a cause of proteinuria in dogs and cats
- Overload proteinuria—large amounts of low molecular-weight plasma proteins in the glomerular filtrate (such as from excessive breakdown of red-blood cells [known as “hemolysis”] or destruction of skeletal muscles [known as “rhabdomyolysis”], production of abnormal proteins or Bence-Jones proteins secondary to cancer) overwhelms the ability of the kidneys to resorb the protein

Renal Proteinuria (protein in the urine originates from changes or disease in the kidney itself)

- “Glomerulonephritis” is inflammation and accompanying dysfunction of glomeruli (plural of glomerulus) of the kidney; inflammation most commonly is due to the presence of immune complexes in the glomerulus; examples are membranoproliferative glomerulonephritis and proliferative glomerulonephritis
- Glomerular disease of any type (known as “glomerulonephropathy,” such as membranous nephropathy)
- Inherited inflammation of the kidney (known as “hereditary nephritis”)
- A group of conditions of differing cause in which insoluble proteins (amyloid) are deposited outside cells in the kidneys and various other organs, compromising the normal function of the kidney and other organs (condition known as “amyloidosis”)
- Scar tissue involving the blood vessels (capillaries) of the glomerulus (known as “glomerulosclerosis”); scar tissue develops following some type of injury to the glomerulus
- In general, amyloidosis results in the heaviest amount of protein in the urine (proteinuria), although dogs with other glomerular diseases also can have very heavy proteinuria
- Tubular dysfunction resulting in failure of tubular protein reabsorption can cause mild-to-moderate proteinuria

Postrenal Proteinuria (protein in the urine originates from changes or disease after the urine leaves the kidneys)

- Bleeding or inflammation of the urinary bladder, urethra (the tube from the bladder to the outside, through which urine flows out of the body), and reproductive organs (such as the vagina, penis, prostate)

RISK FACTORS

- Long-term (chronic) inflammatory disease (such as infectious and immune-mediated disease) and cancer can lead to development of glomerulonephritis (inflammation of the glomerulus, usually due to the presence of immune complexes) or amyloidosis (condition in which insoluble proteins [amyloid] are deposited outside cells in the kidneys)

- High blood pressure (known as “hypertension”)
- Long-term (chronic) high levels of lipid (a group of compounds that contain fats or oils) in the blood (known as “hyperlipidemia”); for example, as seen in miniature schnauzers
- Blood in the urine (known as “hematuria”) and pus in the urine (known as “pyuria”)
- Multiple myelomas can produce Bence-Jones proteins, which may be found in the urine

TREATMENT

HEALTH CARE

- Most dogs and cats with protein in their urine (proteinuria) can be managed as outpatients
- Inpatient care may be required during diagnostic evaluation (such as kidney biopsy) or when complications are associated with kidney failure

ACTIVITY

- Maintain normal activity if protein in the urine (proteinuria) is the only laboratory abnormality
- Physical therapy and exercise may limit formation or assist in the mobilization of fluid build-up (known as “edema”) in patients with protein in their urine from the glomeruli of the kidney (glomerular proteinuria) and low levels of albumin in their blood (known as “hypoalbuminemia”)—cage confinement should be avoided for these patients

DIET

- If glomerular disease is suspected, feed a diet moderately reduced in protein, reduced in sodium and rich in omega-3 fatty acids
- Diets formulated for kidney failure are appropriate

SURGERY

- Kidney biopsy is needed to diagnose the glomerular disease specifically, when an underlying disease cannot be identified or protein in the urine (proteinuria) has persisted for several months following treatment of the underlying 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.

- Angiotensin-converting enzyme (ACE) inhibitors should be given to dogs, and possibly cats, with protein in their urine from the glomeruli of the kidney (glomerular proteinuria)
- The use of aldosterone antagonists in the management of protein in the urine (proteinuria) is being investigated
- Antibiotics may be indicated, depending on the underlying cause of the protein in the urine (proteinuria)

FOLLOW-UP CARE

PATIENT MONITORING

- The urine protein:creatinine ratio (UP:C) or urine albumin content should be used to assess progression of glomerular disease and response to treatment and should be evaluated for months after resolution of any treatable underlying disease
- Monitor serum creatinine; reduced levels of protein in the urine (proteinuria) or reduced levels of albumin (a protein) in the urine (known as “albuminuria”) may reflect deteriorating kidney function

PREVENTIONS AND AVOIDANCE

- All adult dogs and cats should have annual urinalyses, which should include determination of urine protein and/or albumin; if protein in the urine (proteinuria) or albumin (a protein) in the urine (albuminuria) is detected, the tests should be repeated in 2 to 4 weeks
- Dogs or cats with persistent protein in the urine (proteinuria) or low levels of albumin in the urine (microalbuminuria) of glomerular origin should be evaluated more thoroughly for underlying causes of glomerular injury

POSSIBLE COMPLICATIONS

- Fluid build-up (edema)
- Blood clots (known as “thromboembolism”)
- High blood pressure (hypertension)
- Progressive kidney disease
- Poor wound healing

EXPECTED COURSE AND PROGNOSIS

- Vary with the cause of protein in the urine (proteinuria)

- Postrenal and prerenal proteinuria should resolve following resolution of the inciting cause
- Most diseases associated with renal tubular proteinuria will be progressive
- Although glomerular diseases often are progressive, the rate of progression varies and spontaneous remissions have been reported
- Animals with persistent protein in their urine from the glomeruli of the kidney (glomerular proteinuria) may develop kidney tubular damage, resulting in kidney failure and eventual death
- Some dogs die shortly after the initial detection of protein in the urine (proteinuria), while others remain alive for years

KEY POINTS

- Kidney biopsy is needed to diagnose the glomerular disease specifically, when an underlying disease cannot be identified or protein in the urine (proteinuria) has persisted for several months following treatment of the underlying disease
- Some dogs die shortly after the initial detection of protein in the urine (proteinuria), while others remain alive for years

