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State of the Art Care, In the Heart of the State

Protein Losing Nephropathy -- Glomerular disease

What do kidneys normally do and what is the glomerulus?

The kidneys function on many levels to maintain *homeostasis* (internal balance) in the body by making and concentrating urine, regulating water, electrolyte, and pH (acid/base) balance. The glomerulus is the part of the kidney that filters the blood to make urine. There are millions of glomeruli in each kidney. Among other functions, the glomeruli act to keep protein from leaking into the urine.

What is protein losing nephropathy (PLN)?

PLN is a broad term that describes diseases of the glomerulus (or rarely other parts of the kidney) that cause protein loss into the urine. Unfortunately this protein is toxic to the kidneys and if the losses can not be controlled, PLN ultimately leads to chronic renal disease (CRD, see CRD handout at www.scvetspecialists.com). Ultimately, patients may die or require humane euthanasia due to signs of CRD.

What causes PLN?

PLN commonly results from two primary diseases: *glomerulonephritis* and *amyloidosis*. While amyloid is generally considered a genetic disease with certain breed predispositions, glomerulonephritis can be caused by a number of underlying diseases. These diseases can be primarily associated with the kidneys or systemic in nature (such as infections, immune-mediated, or cancerous conditions).

What clinical signs does PLN cause?

PLN causes no clinical signs in the initial stages and is simply a laboratory diagnosis. As the disease progresses, however, there are many signs that may arise. These signs arise not only because of the loss of kidney function, but because of the secondary internal effects that this has.

Common signs include:

- Nausea
- Vomiting
- Anorexia
- Effusion or edema
- Melena
- Polydipsia
- Polyuria
- Dehydration
- Weight loss
- Lethargy



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Less common clinical signs include:

- Blindness
- Seizures
- Bleeding disorders
- Oral ulceration

- *Uremia* is the cluster of clinical signs resulting from progressive kidney disease
- *Melena* is a dark, tarry stool indicative of gastrointestinal bleeding
- *Polyuria (PU)* is the increased urination that results when the kidney loses the ability to concentrate urine
- *Polydipsia (PD)* is the increased drinking that results secondary to the polyuria of kidney disease
- *Blood pressure* increase is common with PLN and can result in damage to the brain, eyes, kidneys and heart
- *Effusion* and *edema* are the inappropriate accumulation of fluid in tissues or body cavities

What laboratory changes does PLN cause?

PLN can cause many changes on laboratory tests. In early disease, the only change noted is increased protein levels in the urine. Other classic later stage changes include decreased albumin (*hypoalbuminemia*) and increased cholesterol (*hypercholesterolemia*). Other changes develop later in the disease process.

Common laboratory changes include:

- Proteinuria
- Dilute urine
- Azotemia
- Hypoalbuminemia
- Hypercholesterolemia
- Urinary infection

- *Azotemia* is the increase in BUN and creatinine, two specific blood parameters measured on the chemistry panel
- *Isosthenuria* is the production of dilute urine most common in kidney disease
- *Proteinuria* is protein in the urine
- *Nephrotic syndrome* is the combination of clinical signs and laboratory change seen in progressive PLN



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What testing is recommended for PLN patients?

A urinalysis and urine protein: creatinine ratio is essential for confirming the diagnosis and quantifying the severity of disease. In addition, a urine culture is recommended to assess for urinary infection. Even with no signs of infection on the urinalysis, a urinary infection is still possible. Complete bloodwork is essential to disease staging. Because elevated blood pressure is common in PLN and can both worsen disease and cause other clinical signs, blood pressure is checked. Abdominal ultrasound will aid in evaluation of the kidney and bladder structure, measurement of kidney size, and screening for other underlying diseases. In certain cases, kidney biopsy is also considered.

Most patients evaluated for PLN will need the following tests:

- | | | |
|---------------------|------------------------------|------------------------|
| ■ UPC | ■ Complete Blood Count (CBC) | ■ Blood pressure |
| ■ Chemistry profile | ■ Urinalysis | ■ ANA |
| ■ Urine culture | ■ Infectious disease titers | ■ Abdominal ultrasound |
| ■ Chest x-rays | | |

- *UPC (urine protein: creatinine ratio)* is the preferred urine protein quantification test
- *Abdominal ultrasound* is a non-invasive test that uses sound waves to create images of internal organs and structures
- ANA is a test for lupus, a systemic immune-system illness
- Various infectious diseases can cause glomerulonephritis
- Kidney biopsy is useful in certain cases to diagnose and stage the disease
- By evaluating all these tests *together*, we can confirm the diagnosis, provide an indication of severity of disease and prognosis, and help develop a treatment and monitoring plan

What treatment options are available for PLN patients?

The treatments options available for PLN are multiple and depend on what clinical and laboratory abnormalities are present. The ultimate goal of therapy is to reduce protein loss from the kidneys and improve quality of life.

Therapy typically involves a combination of medications and dietary changes.



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What sort of long-term monitoring is recommended for PLN patients?

General recommendations for patients with PLN include frequent blood pressure and labwork monitoring. Urinalysis and urine culture may also need to be repeated in certain cases. Monitoring is often patient-specific and unique recommendations may be made.

What is the prognosis with PLN?

The prognosis with PLN is highly dependent on the stage of disease, clinical signs present, and effectiveness of medical therapy. Some patients may live for years with this disease, while others may not thrive for long after the time of diagnosis. Of course, we will strive to maintain the maximum quality of life and longevity of your pet.