Protein (Urine)

Interpretive Summary

Description: Protein in the urine can be an indicator of renal disease (interpret in conjunction with urine concentration) or lower urinary tract disease, when pre-renal causes of proteinuria have been ruled out.

Negative Protein

Common Causes

- Clinically normal animal
- False negatives:
  - Bence Jones protein unreliable
  - Highly buffered alkaline urine

Increased Protein

Common Causes

- Small amounts of protein (50 mg/dL or less) can be normal in urine, especially if urine is concentrated
  - Interpret results in conjunction with urine specific gravity
  - Further evaluation by urine protein:creatinine ratio to determine clinical significance of observed proteinuria.
- Prerenal proteinuria
  - Overflow/overload pre-glomerular proteinuria
    - Bence Jones proteins, hyperglobulinemia
    - Post-colostral proteinuria
    - Hemoglobinuria, myoglobinuria
  - Systemic hypertension
- Renal proteinuria
  - Glomerular proteinuria
    - Glomerulonephritis
    - Amyloidosis
  - Tubular proteinuria
    - Acute renal disease
    - Defects in proximal renal tubular function
    - Congenital disorders
  - Functional – transient
    - Fever, shock, cardiac disease, exercise (horse), seizures
- Postrenal Proteinuria
  - Inflammation or infection of the upper or lower urinary tract (or reproductive tract in voided specimen)
  - Hemorrhage into the urinary tract or reproductive tract
  - Neoplasia of the urinary tract
- Cushing’s disease
- False positives
  - Dipstick
    - Prolonged contact of dipstick reagent pad with alkaline urine
    - Quaternary ammonium or chlorhexidine contamination
    - Pigmenturia
      - Myoglobin
      - Hemoglobin
      - Recent administration of certain blood substitutes (e.g. Oxyglobin)
  - Sulfosalicylic acid test
    - Radiographic contrast media
    - High doses of antibiotics (penicillin, cephaloridin, sulfisoxazole)
• Co-precipitation of urinary crystals due to low pH of reagent

Related Findings

• Prerenal proteinuria
  o Increased globulins
  o Positive Bence Jones proteins in urine
  o Hemoglobinuria
    ▪ Anemia
    ▪ Increased bilirubin
  o Myoglobinuria
    ▪ Increased CK, AST

• Renal proteinuria
  o Increased urine protein:creatinine ratio
  o Decreased albumin
  o Secondary systemic hypertension
  o Increased BUN, creatinine, phosphorus with secondary renal tubular damage
  o Increased cholesterol, ascites/pulmonary edema in severe nephrotic syndrome
  o Positive serologic/PCR testing if glomerulonephritis secondary to infectious agents
    ▪ Heartworm, Lyme, leptospirosis, rickettsial, fungal, protozoal, or viral (in some cases)
  o Positive antinuclear antibody titer if associated with systemic immune-mediated disease
  o Consistent renal biopsy and electron microscopy results

• Postrenal proteinuria
  o Active urine sediment exam (RBC, WBC, bacteria, abnormal epithelial cells)
  o Positive urine culture
  o Positive bladder tumor analyte test (canine only)
  o Urinary calculi visualized on radiographs or ultrasound

• Cushing’s Disease
  o Increased ALP
  o Decreased urine specific gravity
  o Adrenal function tests consistent with Cushing’s disease

Additional Information

Diagnostic Methodology

• Semiquantitative
  o Colorimetric/dipstick (reagent strip)
    ▪ Used as a screening test
    ▪ Primarily detects albumin; does not reliably detect globulins or Bence Jones proteins associated with multiple myeloma.
    ▪ Reported as negative, trace, 1+ to 3+ reaction that correlates to 100, 300, or 500 mg/dL protein
  o Acid precipitation tests (includes sulfosalicylic acid test - SSA)
    ▪ Detects albumin and nonalbumin proteins, including Bence Jones paraprotein
    ▪ Commonly used to confirm dipstick results

• Quantitative
  o Colorimetric, spectrophotometric
  o Electrophoresis, immunoelectrophoresis

References


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