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
    - Increased globulins
    - Positive Bence Jones proteins in urine
    - Hemoglobinuria
        - Anemia
        - Increased bilirubin
    - Myoglobinuria
        - Increased CK, AST
- Renal proteinuria
    - Increased urine protein:creatinine ratio
    - Decreased albumin
    - Secondary systemic hypertension
    - Increased BUN, creatinine, phosphorus with secondary renal tubular damage
    - Increased cholesterol, ascites/pulmonary edema in severe nephrotic syndrome
    - Positive serologic/PCR testing if glomerulonephritis secondary to infectious agents
        - Heartworm, Lyme, leptospirosis, rickettsial, fungal, protozoal, or viral (in some cases)
    - Positive antinuclear antibody titer if associated with systemic immune-mediated disease
    - Consistent renal biopsy and electron microscopy results
- Postrenal proteinuria
    - Active urine sediment exam (RBC, WBC, bacteria, abnormal epithelial cells)
    - Positive urine culture
    - Positive bladder tumor analyte test (canine only)
    - Urinary calculi visualized on radiographs or ultrasound
- Cushing's Disease
    - Increased ALP
    - Decreased urine specific gravity
    - Adrenal function tests consistent with Cushing's disease

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Additional Information

Diagnostic Methodology

- Semiquantitative
    - 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
    - Acid precipitation tests (includes sulfosalicylic acid test - SSA)
        - Detects albumin and nonalbumin proteins, including Bence Jones paraprotein
        - Commonly used to confirm dipstick results
- Quantitative
    - Colorimetric, spectrophotometric
    - Electrophoresis, immunoelectrophoresis

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