Potassium

Interpretive Summary

Description: Potassium is an intracellular ion that is responsible for maintenance of fluid and electrolyte balance. Potassium is essential for muscle and nerve function.

Decreased Potassium

Common Causes

- Chronic kidney disease (cats)
- Alimentary loss
  - Vomiting especially with obstruction
  - Diarrhea
  - Choke (horses)
- Renal loss
  - Diuretics
  - Post-obstructive or prolonged diuresis
- Decreased intake
  - Potassium-deficient fluid therapy
  - Potassium deficient diets
- Potassium translocation from extracellular to intracellular fluids
  - Insulin and glucose therapy
  - Bicarbonate infusion
  - Alkalemia

Uncommon Causes

- Renal tubular acidosis
- Hyperaldosteronism
- Cushing's disease
- Hypokalemic myopathy of Burmese kittens

Related Findings

- Chronic kidney disease (cats)
  - Increased BUN, creatinine and phosphorus
  - Decreased urine specific gravity
- Alimentary loss
  - Evidence of gastrointestinal obstruction on abdominal radiographs or ultrasound
  - Often also have decreased chloride and increased TCO2
- Potassium translocation from extracellular to intracellular fluids
  - Increased TCO2

Increased Potassium

Common Causes

- Acute renal failure (anuric or oliguric)
- Urinary obstruction/rupture
- Addison's disease
- Pseudohyperkalemia (factitious) due to translocation of potassium from cells post-collection
  - Delayed serum separation

    - Asian dog breeds (Akita, Shiba Inu, Jindo, Chow Chow, and Shar Pei)
    - English Springer Spaniels
    - Leukocytosis (>100,000/μL)
    - Thrombocytosis (>1,000,000/μL)
    - Hemolysis

Uncommon Causes

- Selected gastrointestinal diseases
    - Whipworms
    - Salmonellosis
    - Perforated duodenal ulcer
- Medications
    - Angiotensin-converting enzyme (ACE) inhibitors
    - Trimethoprim
    - Prostaglandin inhibitors
    - Potassium sparing diuretics (spironolactone)
- Potassium translocation from intracellular fluid to extracellular fluid
    - Metabolic acidosis due to increased organic acids (ketones, lactate)
    - Massive tissue necrosis
        - Acute tumor lysis syndrome
        - Aortic thromboembolism
        - Rhabdomyolysis/muscle necrosis
            - Post-seizure
            - Strenuous exercise
    - Post-exercise in hypothyroid dogs (mild increase)
- Administration of potassium rich fluids
- Third space accumulation
    - Repeated drainage of fluid in chylothorax
- Sampling error
    - Collection from IV line where potassium administered
    - Contamination of serum with EDTA

Related Findings

- Acute Renal Failure
    - Increased BUN, creatinine and phosphorus
    - Isosthenuria (urine specific gravity 1.008-1.012) with decreased urine production
    - Positive PCR or serology for *Leptospira* spp., Lyme or other infectious agents
    - Urinary casts, pyuria, hematuria, proteinuria, glucosuria, and bacteriuria
    - Positive urine culture with pyelonephritis
- Urinary obstruction or rupture
    - Increased BUN and creatinine
    - Urine sediment can show crystals, blood, white blood cells with obstructive disease or blood with rupture
    - Uroabdomen
        - Abdominal fluid has higher creatinine concentrations than serum
        - Contrast radiographs for urinary tract rupture and leakage
    - Abdominal ultrasound for masses, stones, other causes of obstruction in the urinary tract
- Addison's disease
    - Decreased sodium, chloride, and Na:K ratio
    - Albumin and cholesterol may be low normal
    - Lack of a stress leukogram (normal or increased lymphocytes and/or eosinophils)
    - Failure to stimulate on an ACTH stimulation test

Additional Information

Physiology

- Major intracellular cation
- Serum concentration does not accurately reflect total body concentration, but is nearly equivalent to the amount of potassium in the extracellular fluid compartment.
- Serum concentrations change with acidoses and alkaloses.
- Responsible for maintenance of intracellular volume and determining cellular membrane potential

References

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Last updated 11/1/2013