pH (Urine)

Interpretive Summary

**Description:** The pH of urine is an index of acid-base balance but is not a reliable indicator of blood pH.

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**Decreased pH (Acidic)**

**Common Causes**

- Metabolic acidosis
  - Ethylene glycol intoxication
  - Diabetic ketoacidosis
  - Renal failure
  - Lactic acidosis
    - Addison’s disease
- High protein or milk-based diet
- Paradoxical aciduria (acid urine pH with metabolic alkalosis) due to severe vomiting

**Uncommon Causes**

- Medications or toxins
  - Carbonic anhydrase inhibitors
  - Salicylate
  - Paraldehyde
  - Methanol
  - Urinary acidifiers
    - Furosemide
- Respiratory acidosis
- Vomiting with chloride depletion or severe diarrhea
- Proximal renal tubular acidosis with bicarbonate depletion
- Fever, starvation, or prolonged exercise
- Decreased serum potassium
- Hydrogen production by bacteria

**Related Findings**

- Metabolic Acidosis
  - Ethylene glycol intoxication
    - Increased BUN, creatinine, phosphorus, anion gap
    - Decreased calcium
    - Calcium oxalate monohydrate crystalluria
  - Diabetic ketoacidosis
    - Increased blood glucose, BUN, creatinine, ALP, ALT
    - Decreased sodium, TCO2, increased or decreased potassium
    - Glucosuria and ketonuria
  - Renal failure
    - Increased BUN, creatinine, phosphorus
    - Decreased TCO2
    - Decreased urine specific gravity
  - Lactic acidosis
    - Increased sodium, chloride and TCO2
    - Increased hematocrit
  - Addison’s Disease
Decreased sodium, albumin, cholesterol
Increased potassium, BUN, creatinine
Low urine specific gravity
Paradoxical aciduria (acid urine pH with metabolic alkalosis)
  - Increased TCO2
  - Decreased chloride, potassium

Increased pH (Alkaline)

Common Causes

- Recent meal (postprandial alkaline tide)
- Artifact
  - Delayed sample analysis (spontaneous degeneration of urea)
  - Pigmenturia
- Urinary tract infection (UTI) with urease-producing bacteria (*Staphylococcus* spp., *Proteus* spp.)

Uncommon Causes

- Metabolic alkalosis
- Respiratory alkalosis
- Proximal renal tubular acidosis (early) or distal renal tubular acidosis
- Diets rich in vegetables and cereals

Related Findings

- Urinary tract infection with urease-producing bacteria
  - Pyuria, hematuria, bacteriuria
  - Positive urine culture with growth of *Staphylococcus* spp. or *Proteus* spp.
  - +/- Struvite crystalluria

Additional Information

**Physiology**

- Urine pH is a measure of the hydrogen ion concentration in urine.
- Urine pH is determined by the kidney’s ability to regulate hydrogen ion and bicarbonate concentrations within the blood.
- Normal urine pH in dogs and cats: 6.0-7.5
- Urine pH is variable based on diet
  - Cats and dogs usually have acidic urine
  - Anorexia can cause an acidic urine
  - Cats and dogs on vegetable-based diet may have an alkaline urine

**References**


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