

## In-Practice Urinalysis



Urinalysis consists of assessment of

- the sample's physical features
- specific gravity (USG)
- dipstick (chemical) features
- sediment examination for casts, cells, crystals and organisms

### Collection of urine

Urine may be collected by catheterisation, cystocentesis or free catch

#### Catheterisation

- may contain contaminants but usually in lower amounts than free catch
- iatrogenic haemorrhage can occur
- epithelial cell numbers can be high
- iatrogenic introduction of infection is possible

#### Cystocentesis

- minimal to no contamination
- iatrogenic haemorrhage is common
- collection method of choice when the sample is to be cultured

#### Free-catch

- least invasive
- mid-stream sample is ideal
- contamination by bacteria, leukocytes, epithelial cells and protein from the lower urogenital tract is common

### Examination

Ideally urine is evaluated within 30 minutes of collection, otherwise it can be refrigerated to minimise artifacts. Refrigeration may increase crystal numbers but doesn't alter urine pH, USG or dipstick parameters.

## Physical features

- colour and clarity - typically transparent and yellow

Urine colour and clarity	Causes
YELLOW	<ul style="list-style-type: none"><li>• Intensity of colour is related to USG, but 20% of dogs with USG&lt;1.030 (no bilirubin) have dark urine*</li><li>• Bilirubinuria gives a deeper colour</li></ul>
RED	<ul style="list-style-type: none"><li>• Haemoglobinuria</li><li>• Haematuria</li></ul>
BROWN	<ul style="list-style-type: none"><li>• Myoglobinuria</li><li>• Occasionally haematuria</li></ul>
CLOUDY	<ul style="list-style-type: none"><li>• Increases in cells, crystals, lipid droplets, mucus and/or bacteria</li></ul>

\* H Cridge, RW Wills, P Lathan Correlation between urine color and urine specific gravity in dogs: Can urine color be used to identify concentrated urine?. Can Vet J 59;178-80, 2018

## Specific gravity

- interpretation depends on history and hydration status. Dogs should be able to concentrate to 1.030, cats to 1.035-1.040 if renal function is adequate
- glucosuria can increase USG despite PUPD
- refractometers should be calibrated to 1.000 with distilled water
- the dipstick urine specific gravity pad is unreliable. It should not be used

## Dipstick analysis

- dipsticks must be stored appropriately in regards temperature and moisture and discarded at the end of their shelf life to ensure accurate results
- pH
  - pH depends on diet, medications and disease
  - UTI with urease splitting bacteria cause alkaline urine
  - affects crystal formation e.g. struvite forms in alkaline urine
  - urinary pH increases with storage
- Protein
  - protein is present in normal urine (below the level of detection to 0.3 g/L)
  - pre-renal causes for proteinuria
    - fever, strenuous exercise, seizures, extreme environmental temperature
  - renal causes for proteinuria
    - primarily glomerular, infrequently renal tubular disease
  - post-renal causes for proteinuria
    - urogenital tract inflammation/infection, haemorrhage
  - a sediment exam is needed to rule out post-renal causes

- Glucose
  - occurs when blood glucose exceeds the renal threshold for reabsorption which is about 10 mmol/L in dogs and about 15 mmol/L in cats
  - pre-renal causes for glucosuria
    - diabetes mellitus
    - stress (cats)
    - infusion of dextrose containing solutions
  - renal causes for glucosuria
    - Fanconi syndrome
    - acute renal failure
    - primary renal glucosuria
  - artifactual causes for glucosuria
    - damaged dipsticks/inaccurate timing
    - contaminated container
  
- Ketones
  - dipsticks detect acetoacetate and acetone but not beta hydroxy-butyrate
  - most often due to diabetes mellitus, occasionally secondary to starvation
  
- Bilirubin
  - bilirubin is found in the urine of normal dogs, but not cats
  - can reflect pre-hepatic (haemolysis), hepatic (decreased function) or post-hepatic (biliary obstruction) causes
  - will often precede hyperbilirubinaemia in liver disease
  
- Blood/haemoglobin/myoglobin
  - the pad cannot differentiate haemoglobin from myoglobin
  - interpret with sediment exam to look for RBC which may lyse at dilute or concentrated urine
  
- Urobilinogen, nitrates, leukocytes
  - **ignore** these parameters. They are unreliable in cats and dogs
  - assess for WBC by sediment examination

### Sediment exam

- Should be part of every urinalysis
- Slow speed centrifugation is needed and therefore is often carried out at a diagnostic laboratory