



Islands in The Stream - Urine Sediment Analysis

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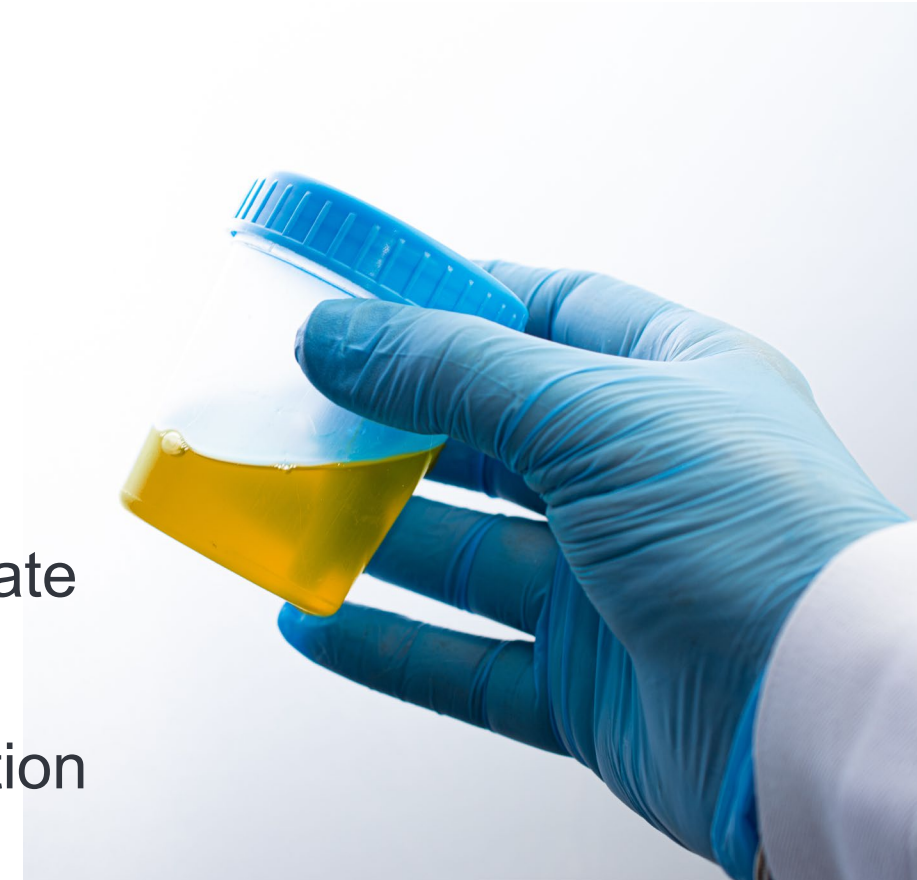
IDEXX

Conflicts of Interest & Disclaimer

- + Yvonne McGrotty is an employee of IDEXX Laboratories UK and also an employee of Anicura France.
- + *The information contained herein is intended to provide general guidance only. As with any diagnosis or treatment, you should use clinical discretion with each patient based on a complete evaluation of the patient, including history, physical presentation, and complete laboratory data. With respect to any drug therapy or monitoring program, you should refer to product inserts for a complete description of dosages, indications, interactions, and cautions. Diagnosis and treatment decisions are the ultimate responsibility of the primary care veterinarian.*

Urine sediment analysis

- To identify crystals, casts, cells and bacteria
- Cells and casts start to break down within 1-2hrs of sample collection at room temperature
- Refrigeration causes amorphous crystals to precipitate
- Ideally performed on fresh sample asap after collection



Albasan H, Lulich JP, Osborne CA, Lekcharoensuk C, Ulrich LK, Carpenter KA. Effects of storage time and temperature on pH, specific gravity, and crystal formation in urine samples from dogs and cats. *J Am Vet Med Assoc.* 2003 Jan 15;222(2):176-9. doi: 10.2460/javma.2003.222.176. PMID: 12555980.

Urinalysis should ideally be a patient-side test!

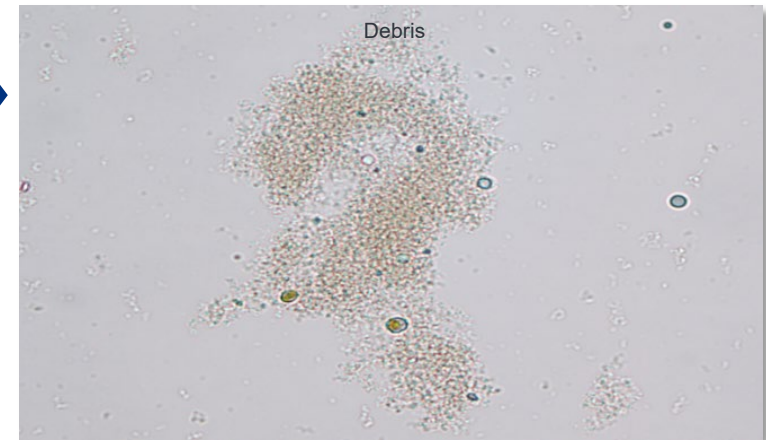
+ Changes associated with delay in analysis:

- Crystals form or dissolve
- Growth or death of bacteria
- Cells or casts can disintegrate
- Increased urine pH
- Lysis of red blood cells
- Leukocytes deteriorate
 - Difficulty with cytological identification

Clinically important



Could this have been something important!



For best results, analyze within 30-60 minutes of collection.

Manual Microscopy or SediVue?



+



Urine Sediment (Wet Prep)

- Centrifuge 5ml sample - 400G (1000-2000 rpm) for 5 mins (low rpm)
- Aspirate supernatant leaving small amount of urine and pellet in tube
- Resuspend the pellet with small amount of supernatant
- Pipette a drop onto a glass slide and place cover slip
 - + Use low level light with condenser lowered
 - + Start examination at x 10 magnification
 - + Casts identified at this magnification
 - + Most crystals identified at x 10
 - + Scan at least 10 fields
 - + Move to x 40 objective lens over areas of interest
 - + Scan at least 10 fields





Epithelial Cells



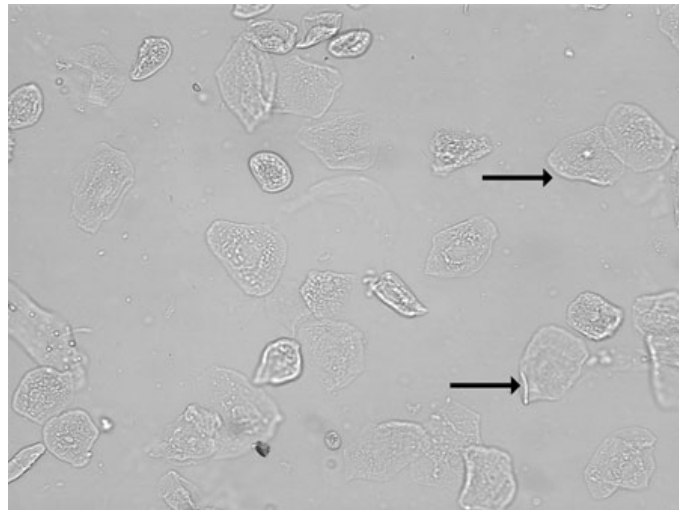
Epithelial cells

- Larger than other urine constituents
- Variable in size
 - + Smallest originate from kidneys, ureter, bladder or prostate
 - + Largest (squamous) originate from distal urogenital tract, e.g., urethra, prostate
- Three main types exist:
 - Squamous (largest)
 - Transitional
 - Renal (smallest)



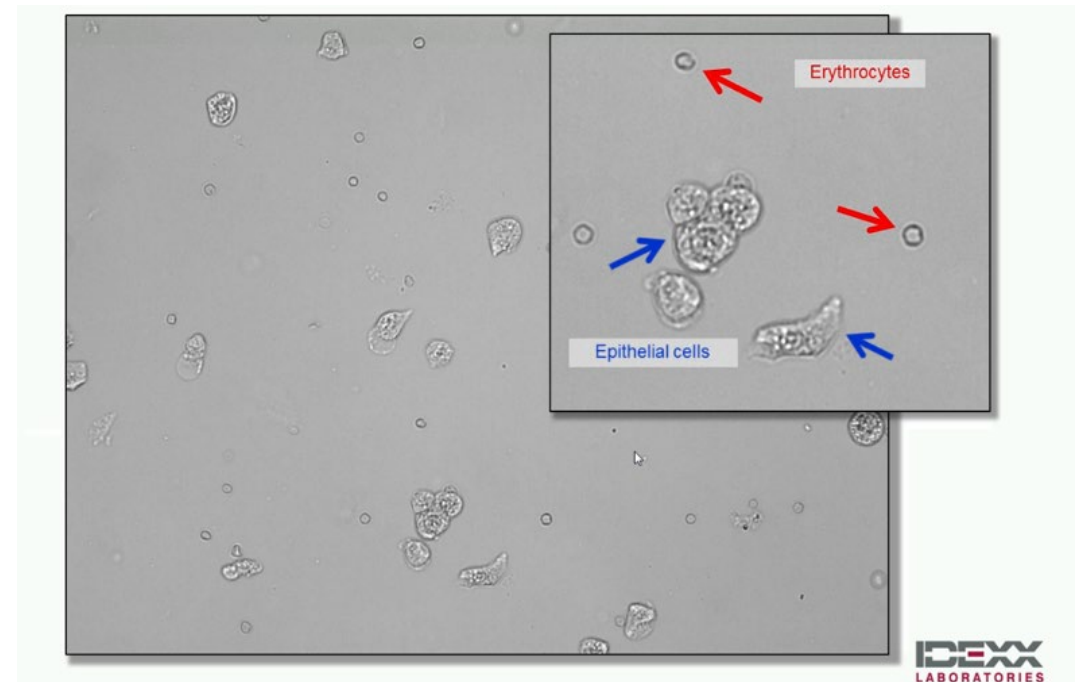
Squamous Epithelial Cells

- Large, thin and angular
- Abundant cytoplasm, small round nucleus
- Originate from vaginal or urethral contamination
- Low numbers common in voided samples
- Higher nos in catheterised samples



Transitional Epithelial Cells

- From renal pelvis to urethra
- Smaller than squamous cells
- Larger than renal cells
- Round to oval
- Round central nucleus





Casts



What is a Cast?

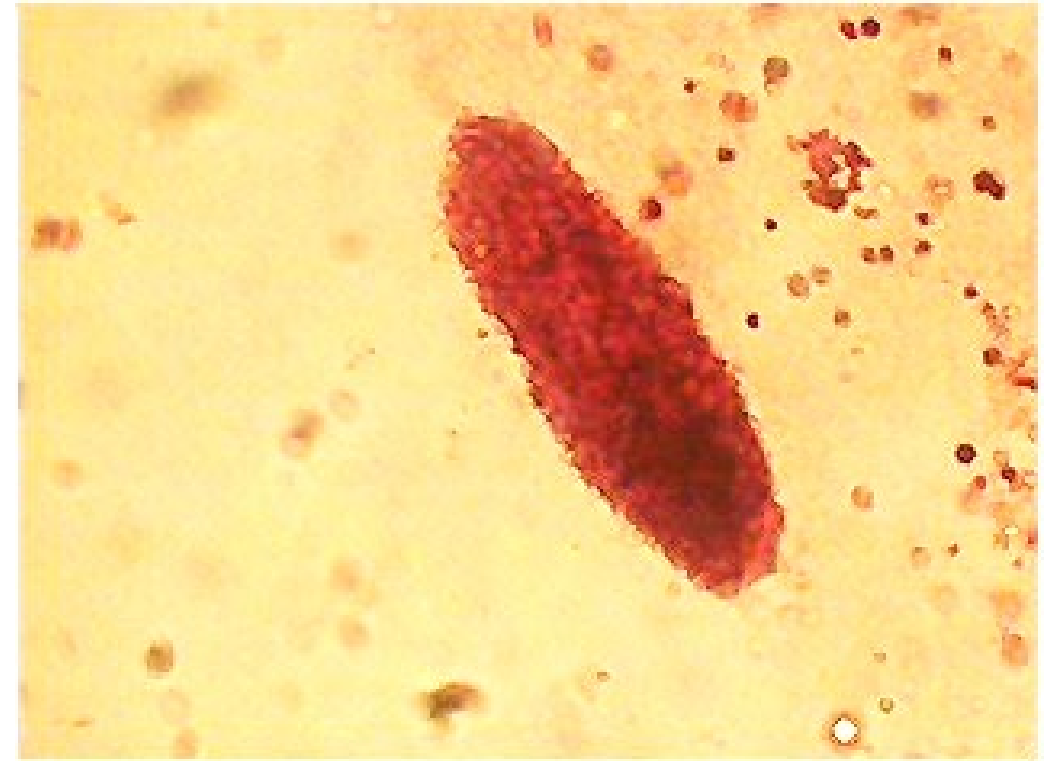
- Mucoprotein or cell debris
 - Tamm Horsfall
- Formed in renal tubules
 - + Proximal, distal, convoluted
- Cylindrical (parallel sides)
- Longer than they are wide
- Ends rounded or tapered
- Indicate renal pathology



SediVue Dx Image- granular cast

Problems Identifying Casts

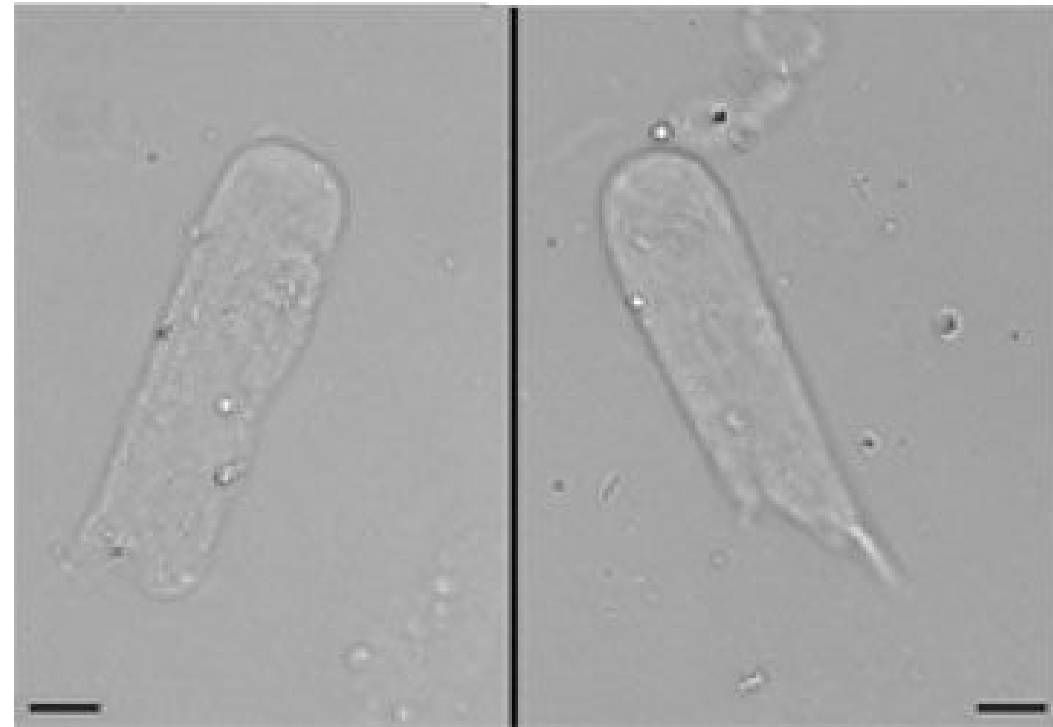
- Shed intermittently in urine
- Fragile
 - + Deteriorate in alkaline, dilute, or stored urine
- Immediate analysis essential <1hr
- High variability in operator ability to identify casts
 - + Must turn light settings down



Manual Microscopy- granular cast

Hyaline Casts

- Colourless/semi transparent
- Gelatinous mucoprotein
- Contain no cells
- Structural basis of all other casts
- < 1 hyaline cast/ lpf is normal in concentrated urine
- Increased numbers with
 - + Glomerular proteinuria or pre-renal proteinuria



SediVue – Hyaline cast



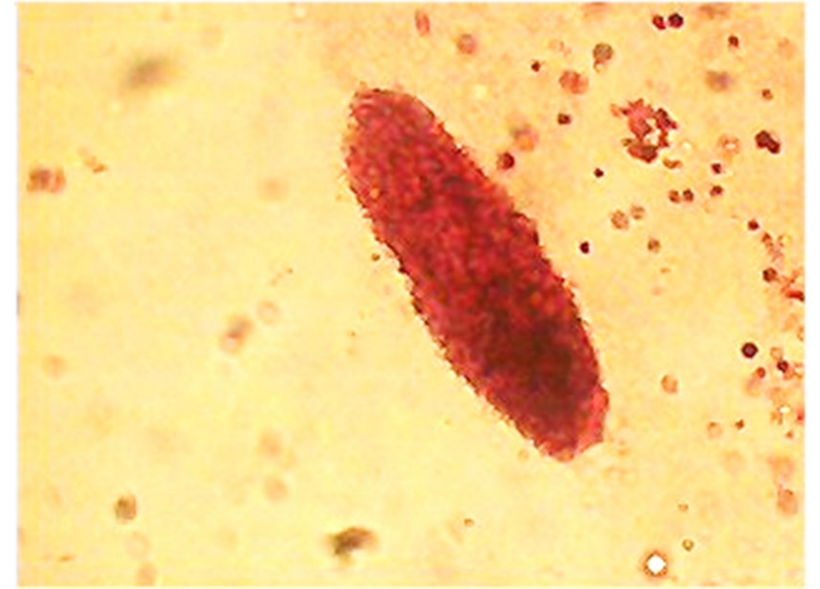
Evaluation of the IDEXX SediVue Dx™
Urine Sediment Analyzer

By Jeremy Hammond, PhD; Graham Bilbrough, MA, VetMB, CertVA, MRCVS; Donald J. McCrann, PhD;
Celine L. Myrick, BS, MLT(ASCP), MT(AMT); and Dennis B. DeNicola, DVM, PhD, DACVP

Granular Casts (Non-Hyaline)

- + Hyaline casts with granules
- + Fine to coarse (textured)
- + < 1/ lpf is normal in concentrated urin

- + Increased numbers:
 - + Tubulointerstitial disorder
 - + Pyelonephritis
 - + Acute renal injury



SediVue imaged- granular cast





Waxy Casts

- Colourless
- Broader than hyaline casts
- Broken off, squared ends
- Formed when urine flow is decreased
- Chronic tubular injury
- Always pathologic



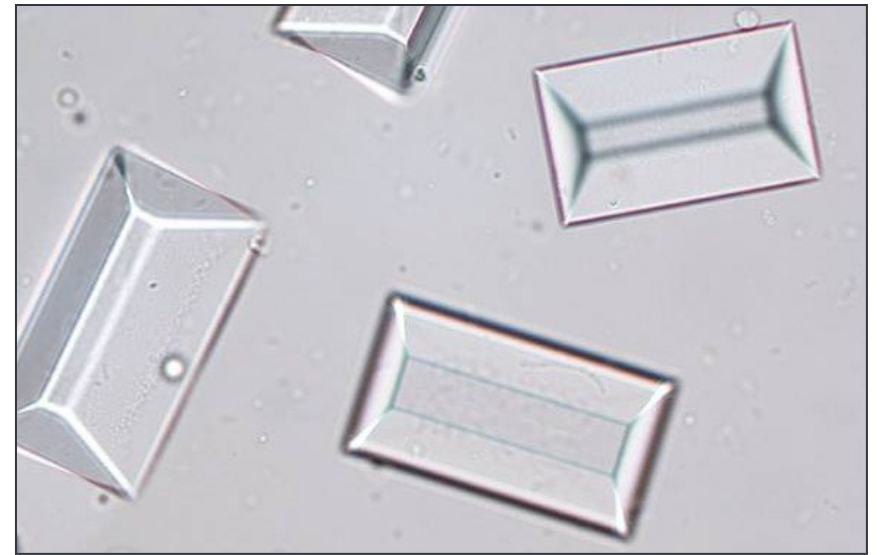


Crystals



Crystalluria Significance

- Crystals can be identified in healthy animals
- Not every animal with crystalluria needs intervention!
- Presence does not equal significance



SediVue Dx Image- Struvite

Crystals

+Dependent on:

- +Urine pH
- +Urine SG
- +Temperature
- +Diet
- +Time from collection to analysis
- +Bacterial contaminants





When are crystals significant?

- When identified in very fresh room temp urine
- When urine is dilute
- When there is concurrent haematuria
- When crystalluria is persistent on repeated samples
- When there are clinical signs that are related
 - + Stranguria, dysuria



To chill or not to chill?

Chilled urine

- Increased chance of crystals forming
- Higher SG than room temperature urine

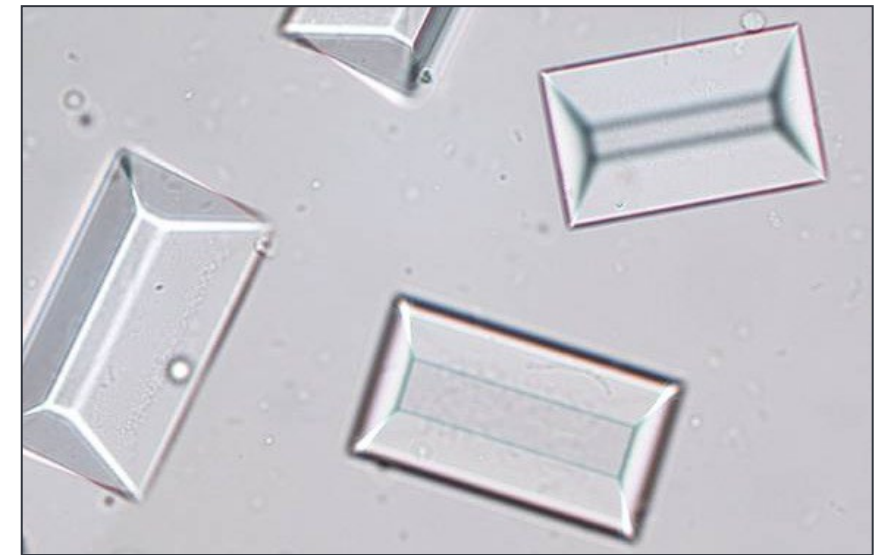
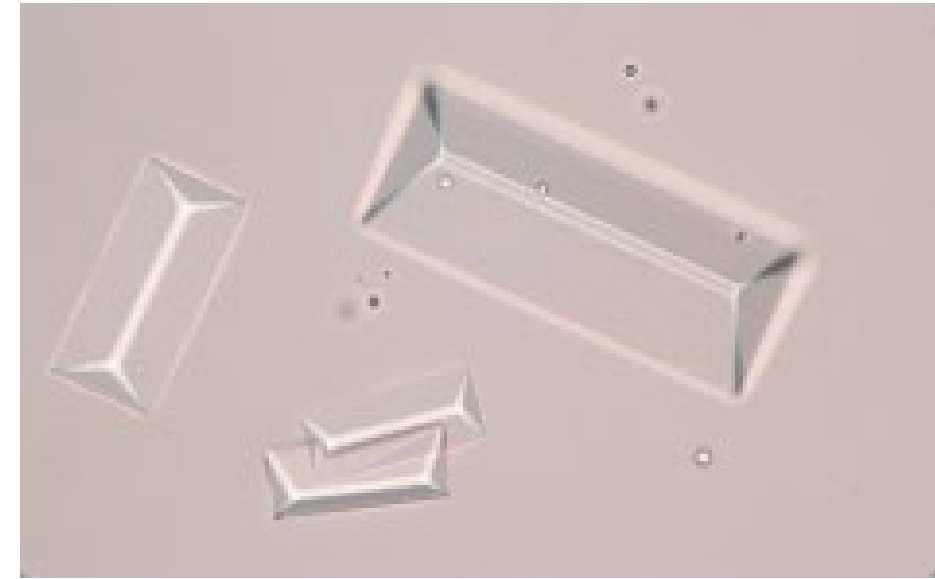
Room Temp Urine

- Increased pH due to escape of CO₂ and bacterial overgrowth
- Increased risk of struvite precipitation



Struvite (triple phosphate)

- Neutral to alkaline urine
- Colourless
- 3- 6 sided
- Coffin lids
- May be seen in healthy animals
- Also associated with bacterial UTIs- consider culture



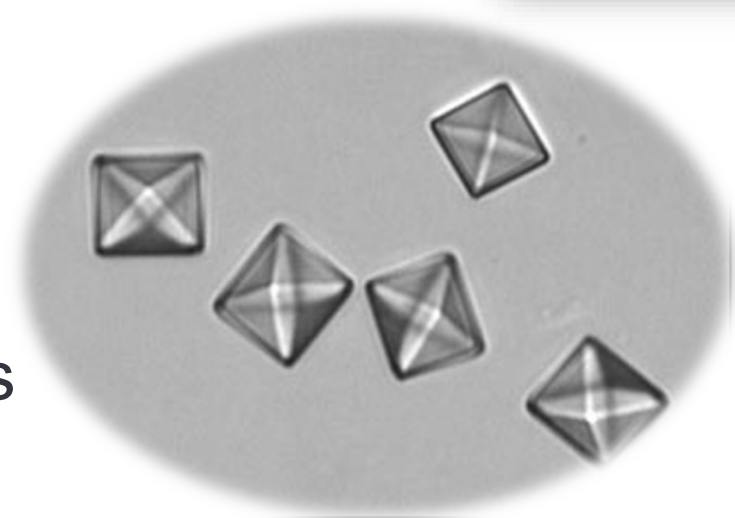
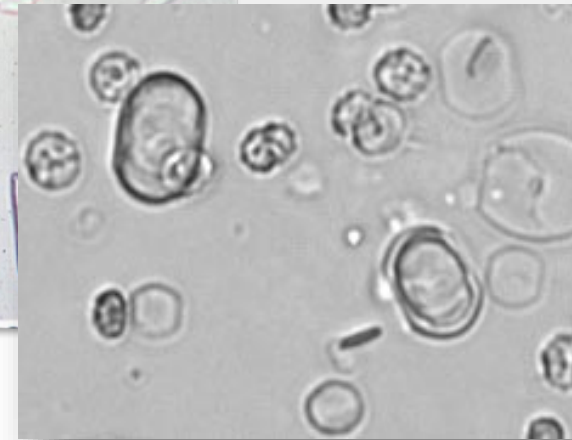
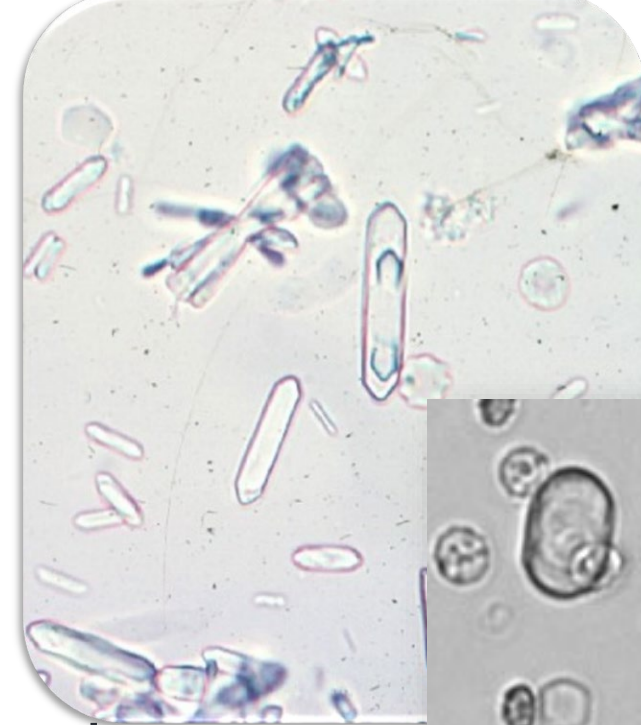
All images from the SediVue Dx® Urine Sediment Analyzer

Calcium oxalate

- Found in acidic urine, (neutral or alkaline)
- x40
- Colourless
- Two forms

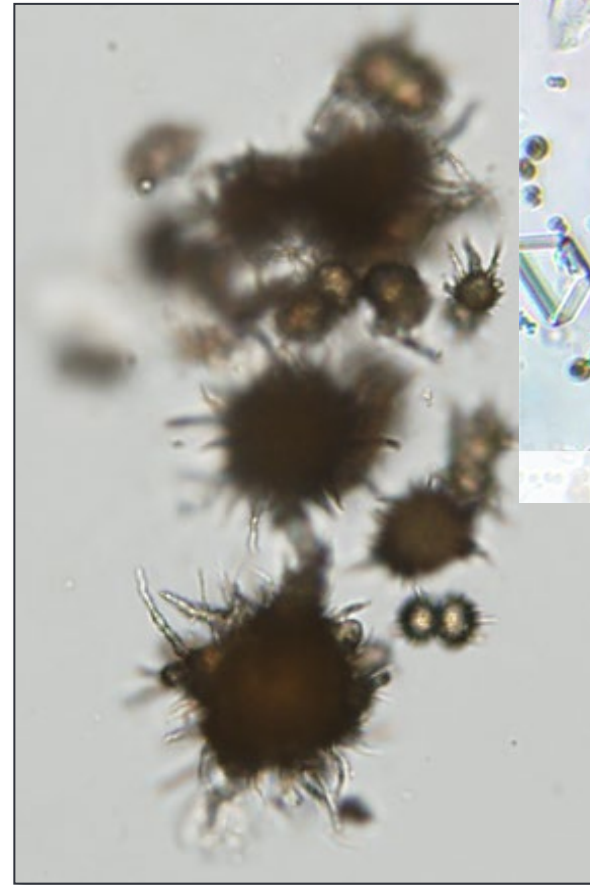
+ Monohydrate = picket fence or rubber dinghy
+ Associated with ethylene glycol ingestion!!!!

+ Dihydrate = envelopes
+ Can be present in healthy animals
+ Also with hypercalcaemia
+ Diseases/drugs promoting calciuresis

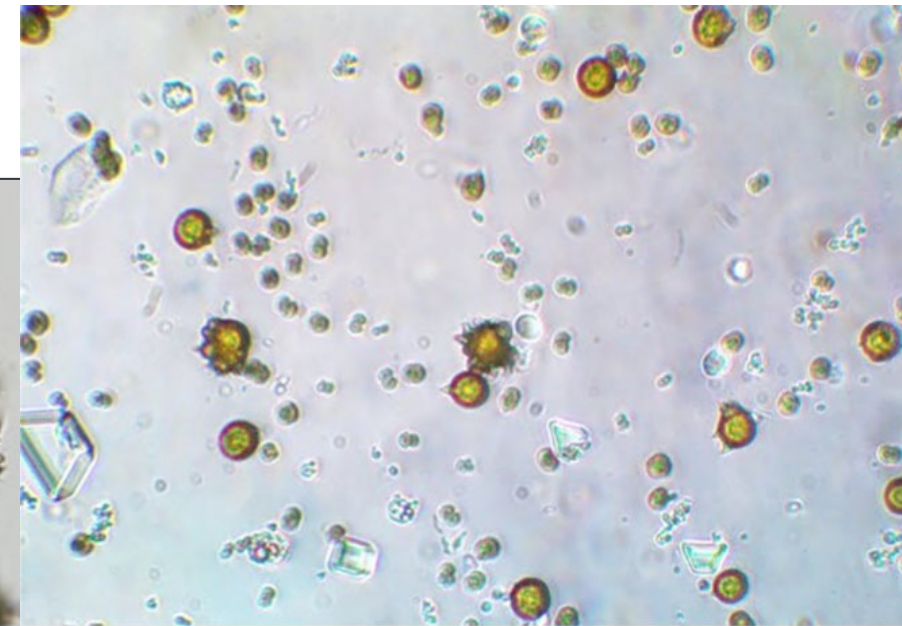


Ammonium Urate

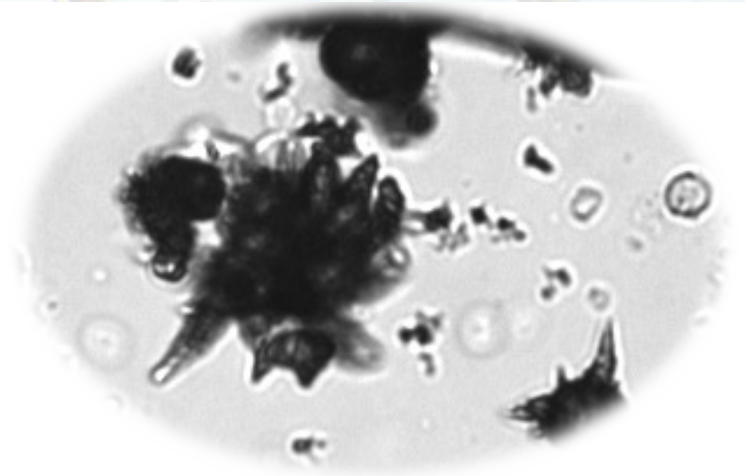
- Brown/yellow
- Thorn apple appearance
- Neutral to acidic pH
- Not usually found in normal animals
- Portal vascular anomalies
- Genetic disorder
 - Dalmatians
 - Young cats- Egyptian Mau/Siamese



Microscopy image



Ammonium Urate, pH 7.5, SG 1.058, 40x Standard Light, Canine



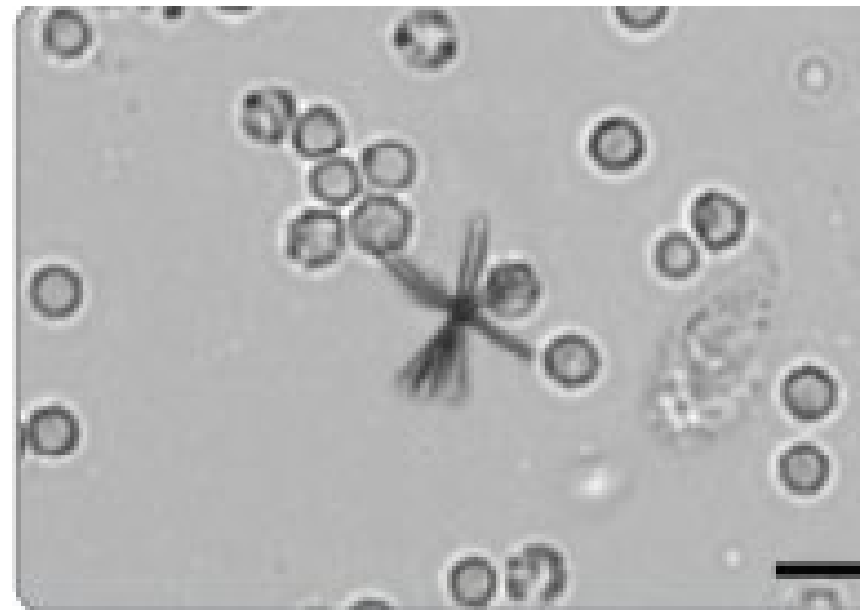
SediVue Image

Ling GV, Franti CE, Ruby AL, Johnson DL. Urolithiasis in dogs. II. Breed prevalence, and interrelations of breed, sex, age, and mineral composition. *Am J Vet Res.* 1998;59:630-642.

Appel SL, Houston DM, Moore AE, Weese JS. Feline urate urolithiasis. *Can Vet J.* 2010 May;51(5):493-6. PMID: 20676290; PMCID: PMC2857427.

Bilirubin Crystals

- Golden brown to yellow
- Needle-like
- Can be normal in dogs with very concentrated urine
- **Always** abnormal in the cat
 - + Check for cholestasis



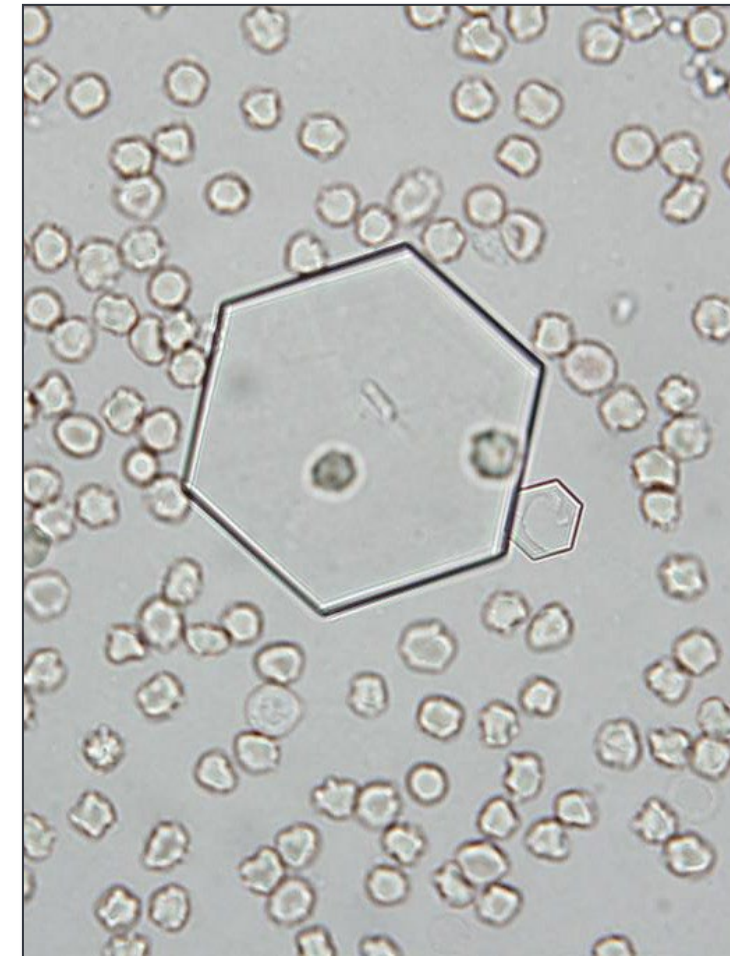
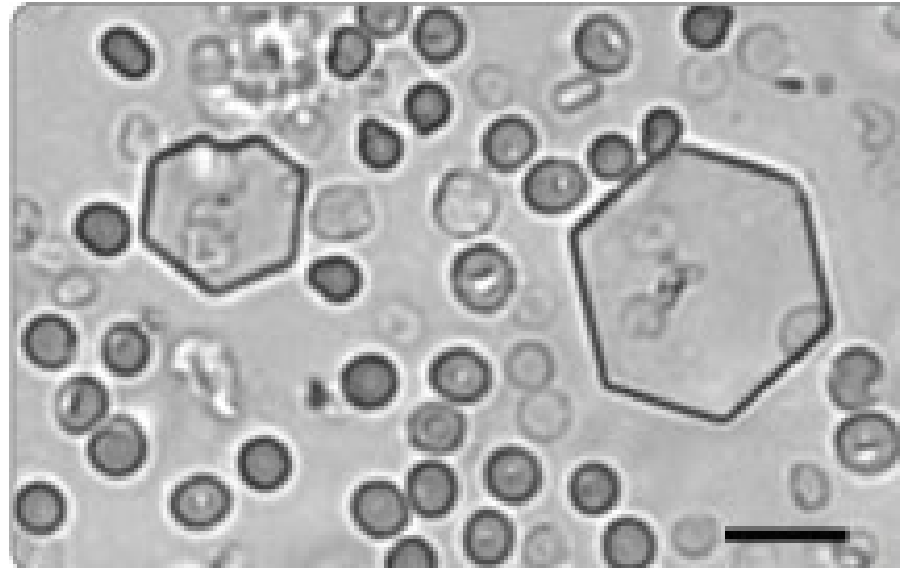
SediVue Dx image



Microscopy image

Cystine

- Colourless
- Hexagonal plates
- Acidic urine
- Metabolic defect of tubular reabsorption of cystine
- Found in English and French Bulldogs, Dachshunds, Mastiffs, Newfoundlands
- Rare in cats



The moral of the story.....
The fresher the better!

