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CBC edu‘CAT’ion: Feline hematology Secrets

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Laboratory Retrievers

Animals can’t hide their objective data

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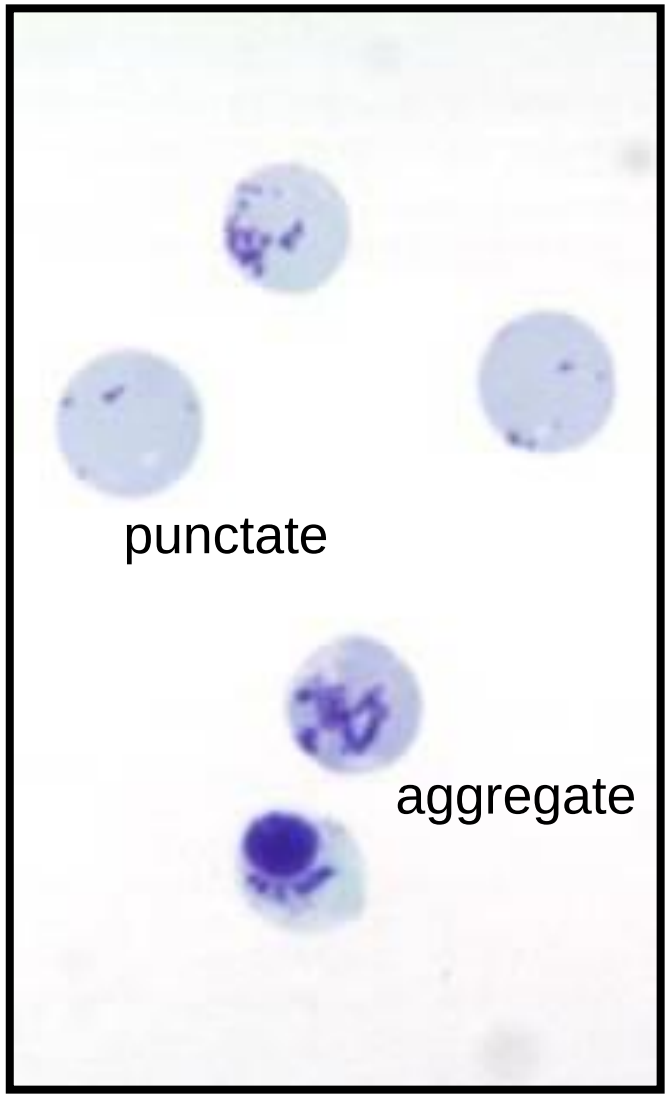
Old dogs, old tricks

- Feline Reticulocytes
- Feline Heinz Bodies
- Identification of band/immature neutrophils-blood film
- Cytograms/dot plots

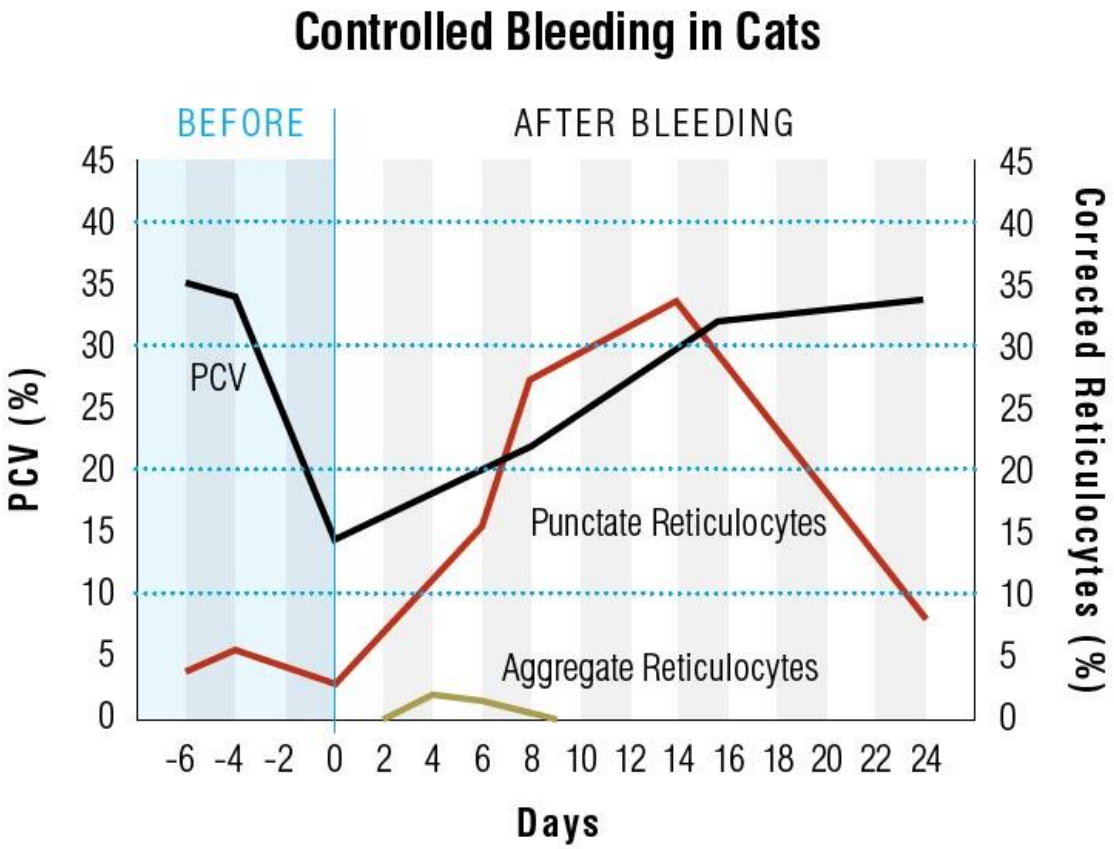
Feline reticulocytes

- 0.4% present in normal health (aggregate)
- Two types of reticulocytes:
  - Aggregate:
    - ↓ ~12–24 hours
  - Punctate:
    - ↓ ~ 10–14 days
  - Mature RBC



Definition of regeneration in cats

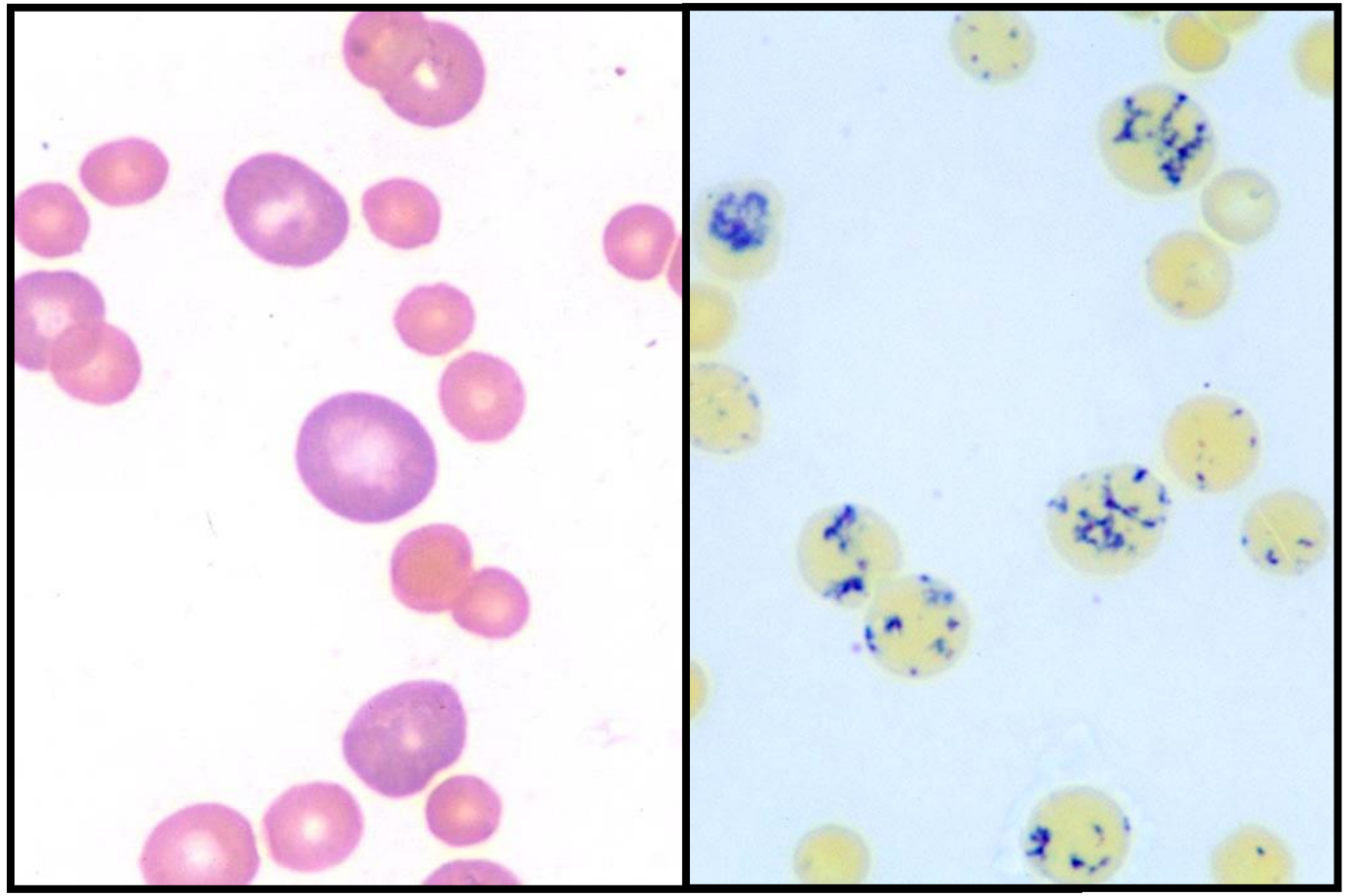
- How many reticulocytes?
- Only aggregate reticulocytes?
- Aggregate and punctate reticulocytes?



Sources:

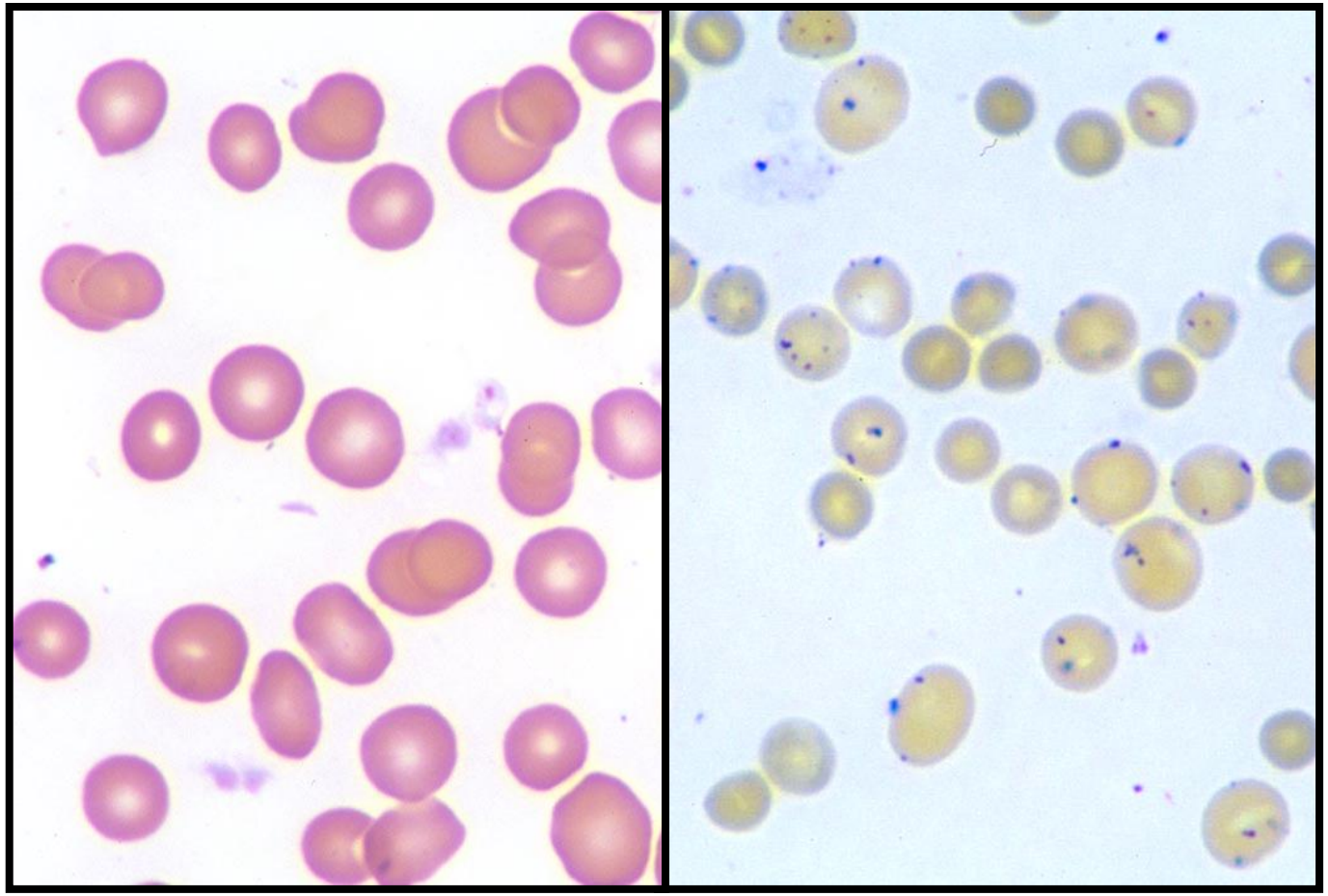
1. Cramer DV, Lewis RM. Reticulocyte response in the cat. *JAVMA*, 1972;160(1):61–67.
2. Alsaker RD, Laber J, Stevens JB, Perman V. A comparison of polychromasia and reticulocyte counts in assessing erythrocytic regenerative response in the cat. *JAVMA*. 1977;170(1):39–41.
3. Fan LC, Dorner JL, Hoffman WE. Reticulocyte response and maturation in experimental acute blood loss anemia in the cat. *J Am Anim Hosp Assoc.* 1978;14:219–224.

Feline *Mycoplasma haemofelis* anemia



Hospital day 2 PCV = 8%

Feline *Mycoplasma haemofelis* anemia



Hospital day 10 PCV = 22%

Heinz Bodies

- **In cats, Heinz bodies are particularly significant for a few reasons:**
- **Cats are more prone to Heinz body formation** than many other species. This is because feline hemoglobin has more sulfhydryl groups, making it more susceptible to oxidative damage.
- **Small numbers of Heinz bodies (up to 5%) can be normal** in healthy cats and may not indicate disease.
- **Increased numbers of Heinz bodies** can be seen with exposure to oxidative agents, such as certain drugs (e.g., acetaminophen), foods (e.g., onions, garlic), or diseases (e.g., diabetes mellitus, lymphoma, hyperthyroidism).
- **Heinz bodies can cause hemolytic anemia** if present in large numbers, as affected red blood cells are more likely to be removed by the spleen.

Poikilocytes in cats

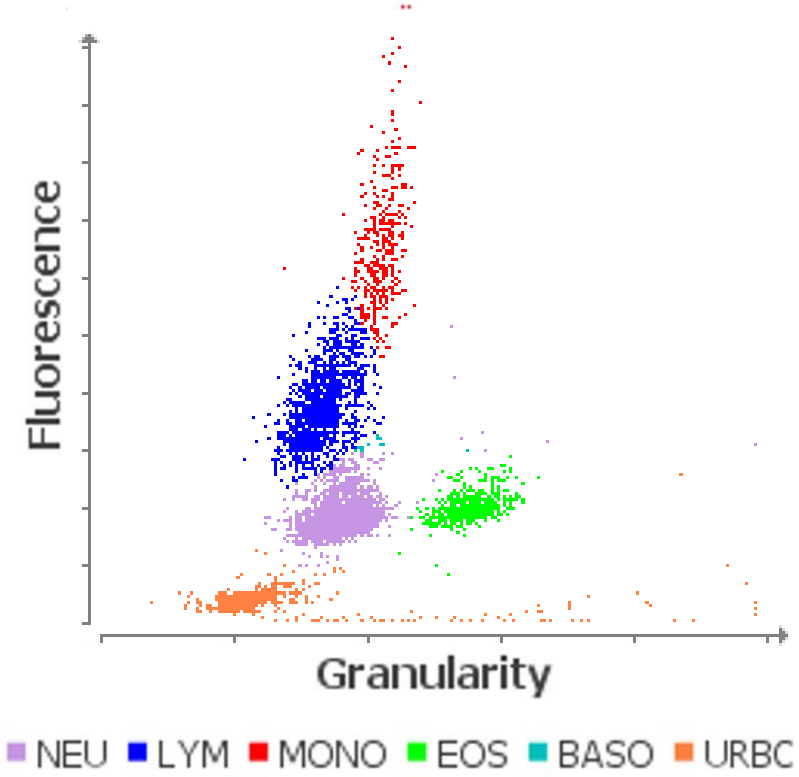
- Spherocytes
- Acanthocytes

Inflammation

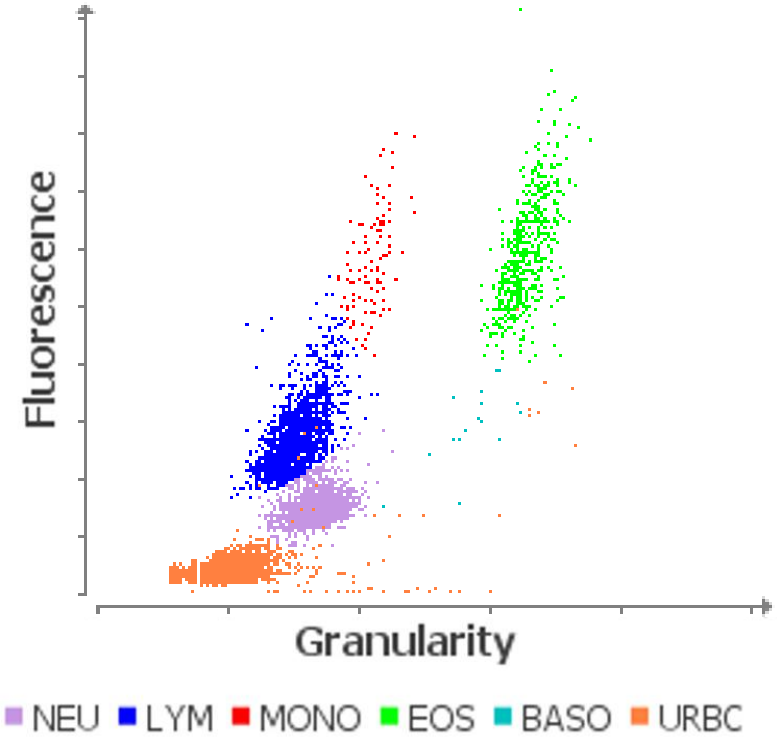
- Dohle bodies
  - Döhle bodies in cats as in other species are cytoplasmic inclusions found in neutrophils, appearing as pale blue, angular structures
  - Often associated with toxic change during inflammation in most species
  - In cats – often identified in neutrophils from healthy cats
    - May be seen during inflammation but difficult to differentiate
    - Need to look for other indicators of toxicity (cytoplasmic basophilia, foamy to vacuolated cytoplasm, etc.

Normal Canine and Feline WBC Dot Plots

Normal WBC Dot Plot (Canine)



Normal WBC Dot Plot (Feline)



New Tricks from Old Dogs

- Reticulocytosis without anemia
- Reticulocyte Hemoglobin
- Feline SAA- Serum Amyloid A
- Red Cell and Platelet Indices
- AI Morphology
- Feline Pancreatic Lipase

Feline acute phase proteins

- Major APP in the cat
  - Serum amyloid A (SAA)
- SAA sample
  - Serum
  - Heparinized and EDTA plasma
  - Body cavity fluids (synovial, peritoneal)
- SAA stability
  - Room temp preferred over refrigerated
    - >24-hour storage freeze sample
  - Frozen 3 months

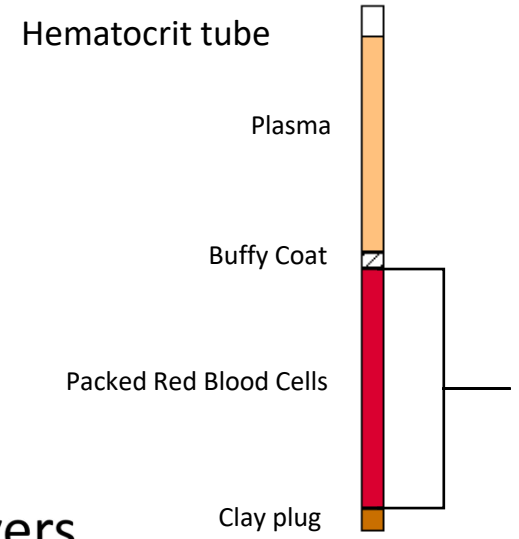
Species	Major APP	Moderate APP	Minor APP
Feline	SAA	AGP	Hp
		CRP	Cp

SAA= Serum Amyloid A; AGP= alpha-1 acid glycoprotein; Hp= Haptoglobin; CRP= C Reactive Protein; Cp= ceruloplasmin

Platelets by the numbers

- Thrombogram
  - PLT / PCT – count / mass

Test	Results	Reference Interval	LOW	NORMAL	HIGH
PLT	225 K/µL	148 - 484			
MPV	12.6 fL	8.7 - 13.2			
PDW	12.3 fL	9.1 - 19.4			
PCT	0.28 %	0.14 - 0.46			



Analogous to HCT

HCT (%) = (RBC x MCV) / 10

Laboratory Retrievers

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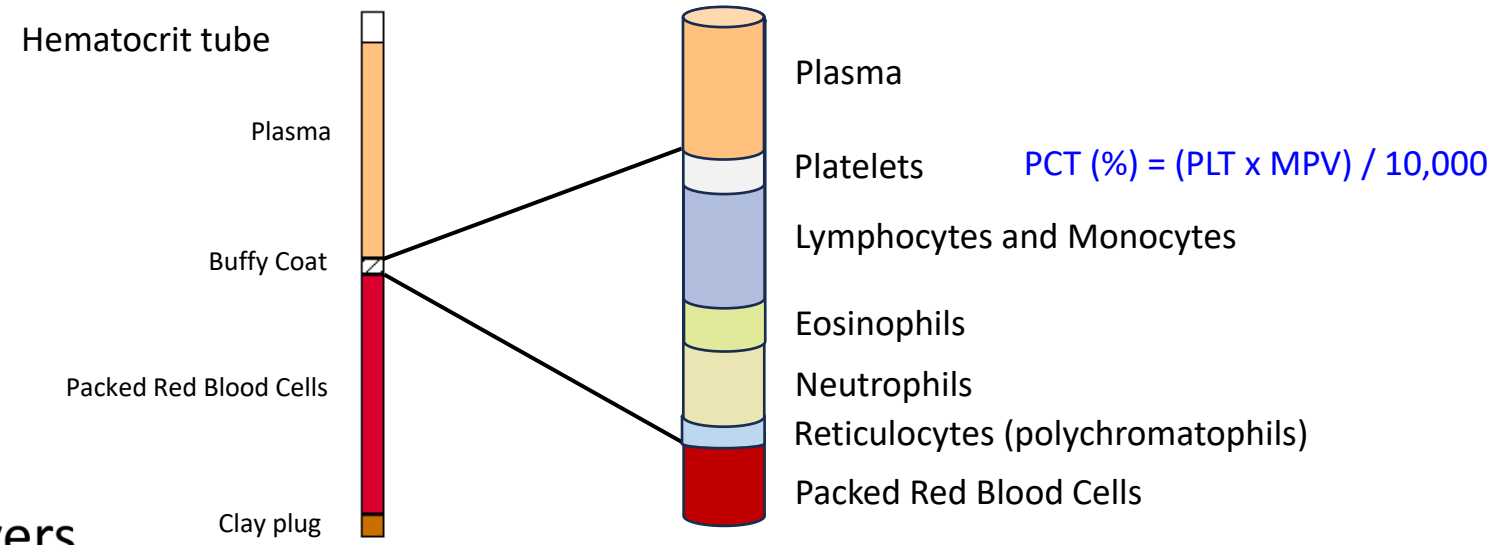
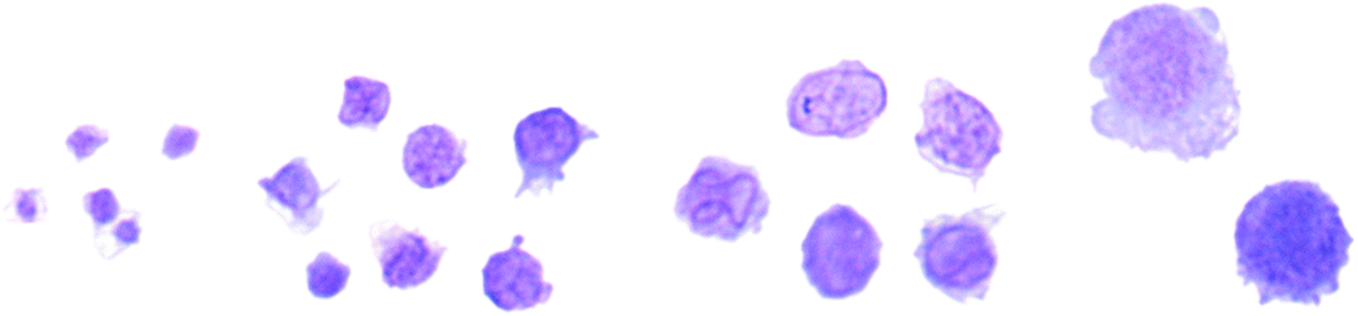


PCT (%) = (PLT x MPV) / 10,000

Platelets by the numbers

- Thrombogram
  - PLT / PCT – count / mass
  - MPV – platelet volume

Normal sized RBC



Normal size | Mildly enlarged | Moderately enlarged | Markedly enlarged

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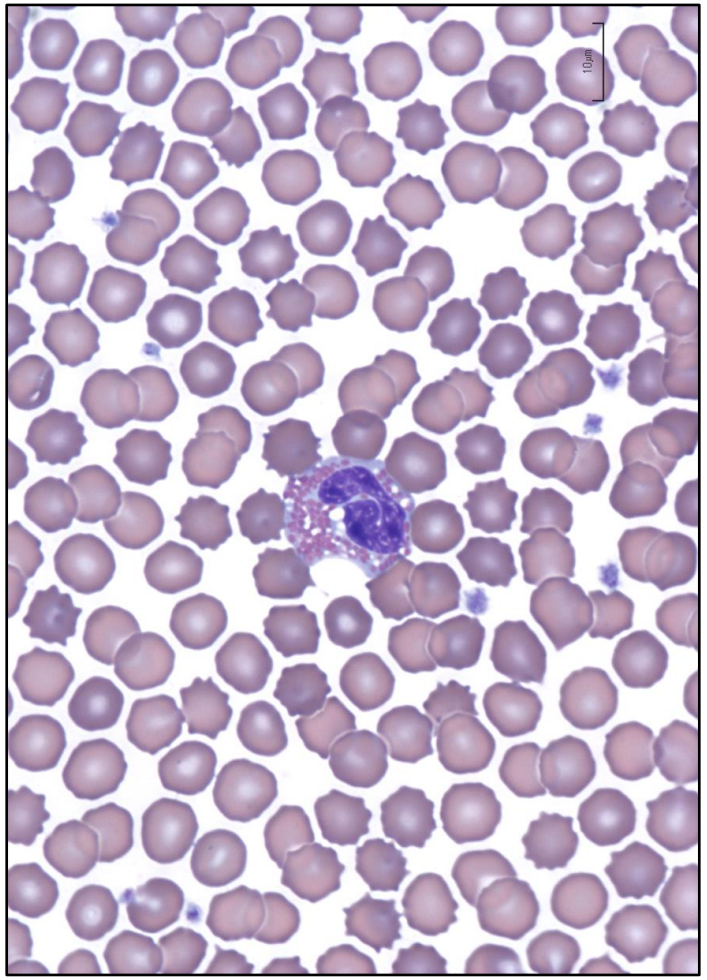
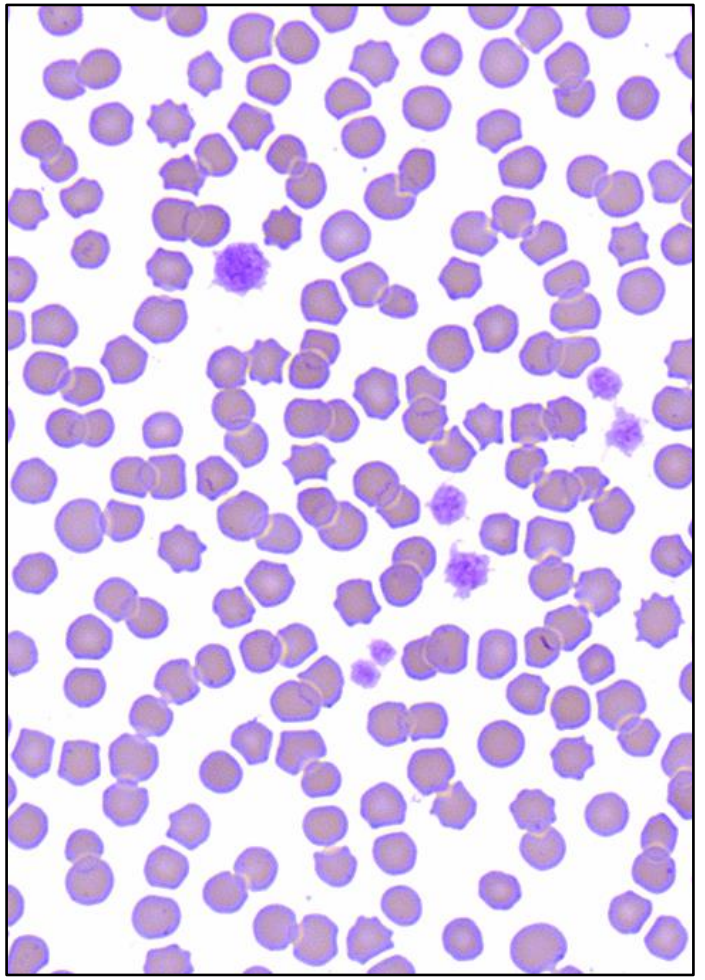
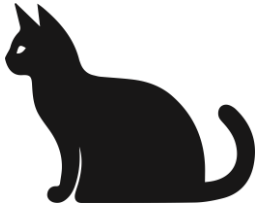
Species variation in platelet size

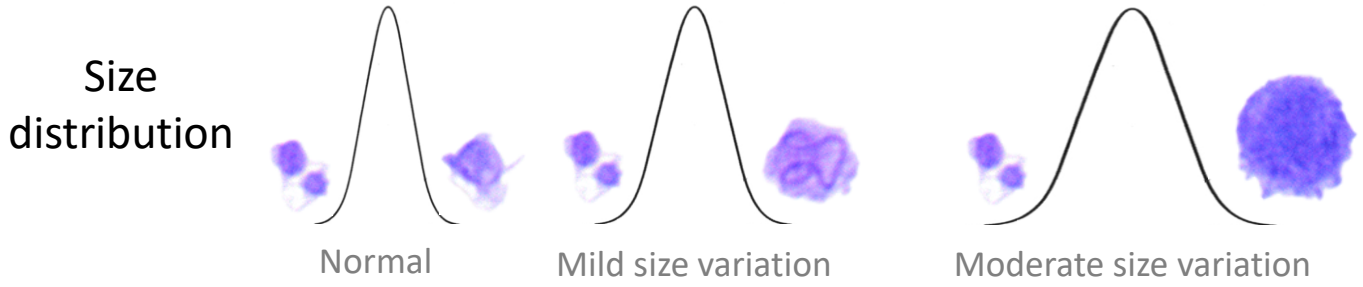






Platelets by the numbers

- Thrombogram
  - PLT / PCT – count / mass
  - MPV – platelet volume
  - PDW – variation in platelet size



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Clinical Case Study

- History/Presentation
  - Adopted 5 months earlier, soon to receive final vaccinations
  - In-door cat since adoption
  - Presented with sudden onset lethargy, anorexia and ataxia
- Physical examination
  - Temp: 102.1^{o} F, Pulse: 220 bpm, Resp: 80
  - Pale pink mucous membranes, CRT < 2 sec
  - Dull mentation / Depressed
  - Walking slowly with ataxia
  - Eventual blindness

Boogeyman

- 7 months old
- Neutered male
- Black and White DSH

Not Boogeyman: only a representation of a black and white Domestic Shorthair cat

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Clinical Case Study

- Initial laboratory evaluation three weeks before present CBC
  - Mild decreased MCV – 33.3 fL (RI; 35.9 – 53.1)
  - Marked decreased PLT – 13 K/µL (RI; 151 – 600)
  - Mild ALP increase – 154 U/L (RI; 14 – 111)
  - Mild PHOS increase – 7.8 mg/dL (RI; 3.1 – 7.5)
  - Marked Ammonia increase – 217 µmol/L (RI; 0 – 95)
- Additional diagnostics
  - Ultrasound / CT scan of abdomen – possible extrahepatic shunt
- Patient management
  - Surgical correction of shunt

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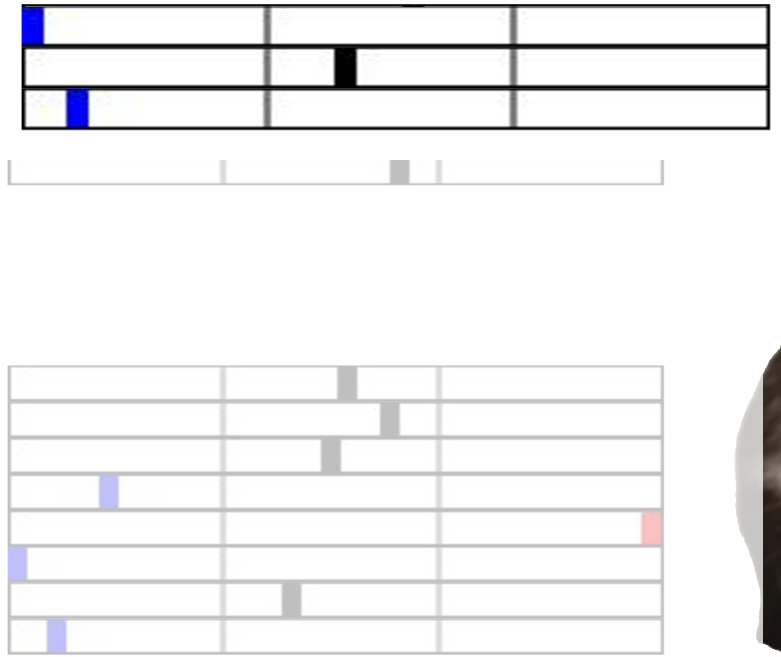
Test	Results	Reference Interval	LOW	NORMAL	HIGH
ProCyte Dx (March 12, 2024 8:19 AM)					
RBC	9.91 M/µL	6.54 - 12.20			
PLT	29 K/µL	151 - 600	LOW		
MPV	14.7 fL	11.4 - 21.6			
PCT	0.04 %	0.17 - 0.86	LOW		
WBC	14.45 K/µL	2.87 - 17.02			
%NEU	48.5 %				
%LYM	38.6 %				
%MONO	2.5 %				
%EOS	0.6 %				
%BASO	9.8 %				
NEU	7.02 K/µL	2.30 - 10.29			
LYM	5.58 K/µL	0.92 - 6.88			
MONO	0.36 K/µL	0.05 - 0.67			
EOS	0.08 K/µL	0.17 - 1.57	LOW		
BASO	1.41 K/µL	0.01 - 0.26	HIGH		
PLT	29 K/µL	151 - 600	LOW		
MPV	14.7 fL	11.4 - 21.6			
PCT	0.04 %	0.17 - 0.86	LOW		



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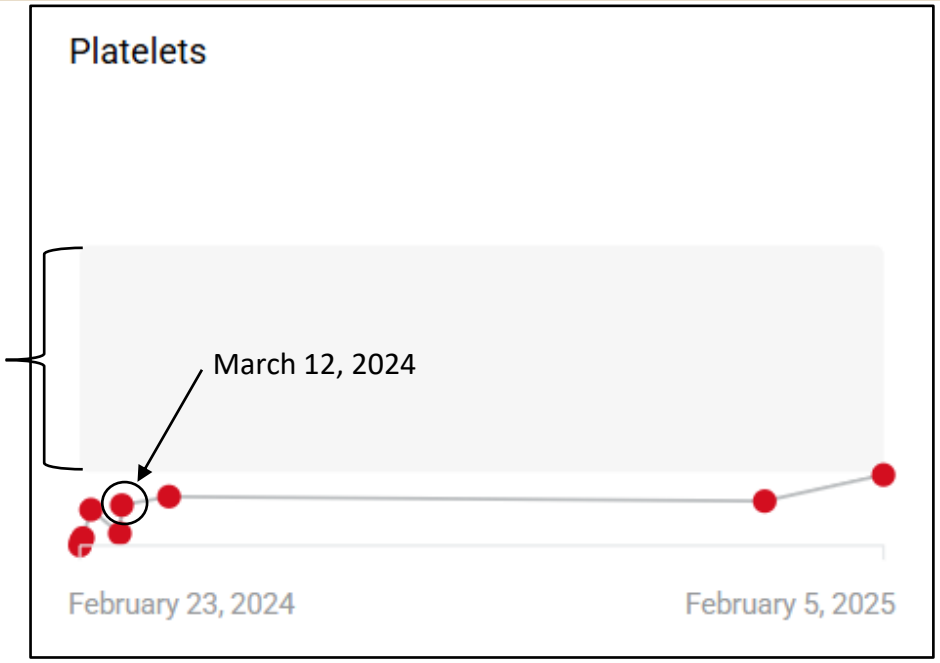

Decreased PLT
Decreased PCT

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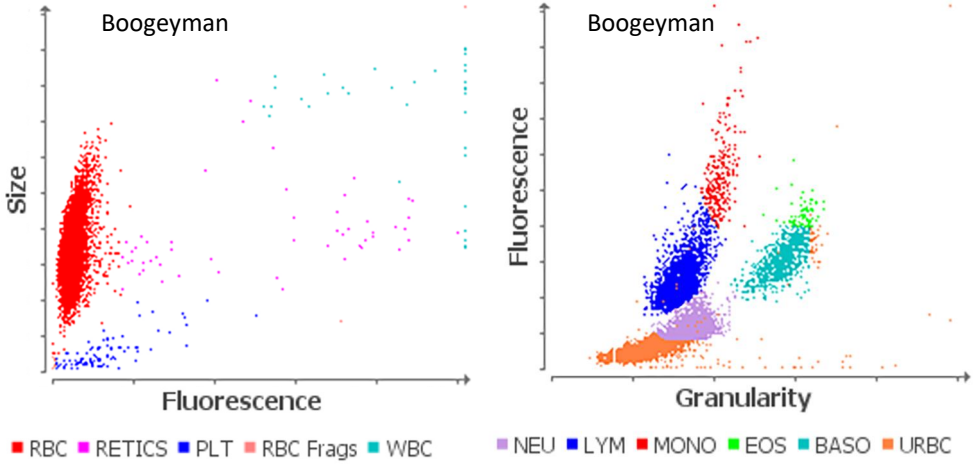
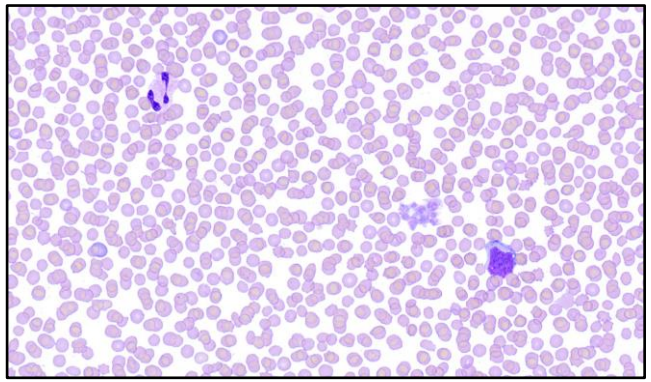
PLT	29 K/µL	151 - 600	LOW		
MPV	14.7 fL	11.4 - 21.6			
PCT	0.04 %	0.17 - 0.86	LOW		

How can we confirm the thrombocytopenia?





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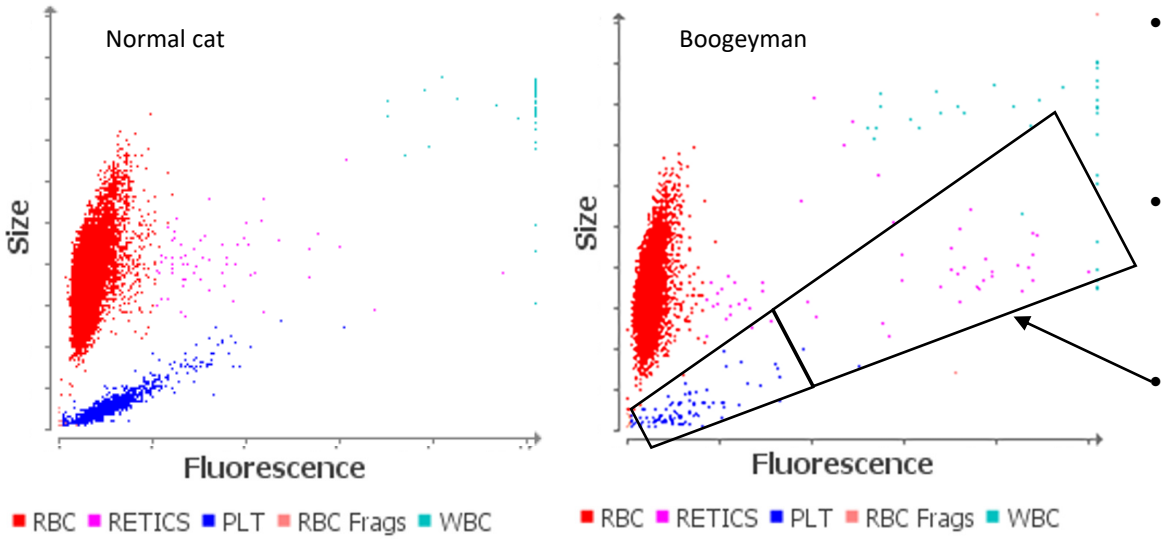

- Overall identification of different cell populations appears good – you can trust the data
- Platelet digitized events are low compared to normal – supports thrombocytopenia
- Continuum of digitized events suggests very large or clumps of platelets

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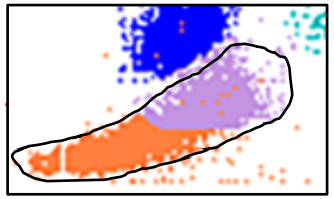
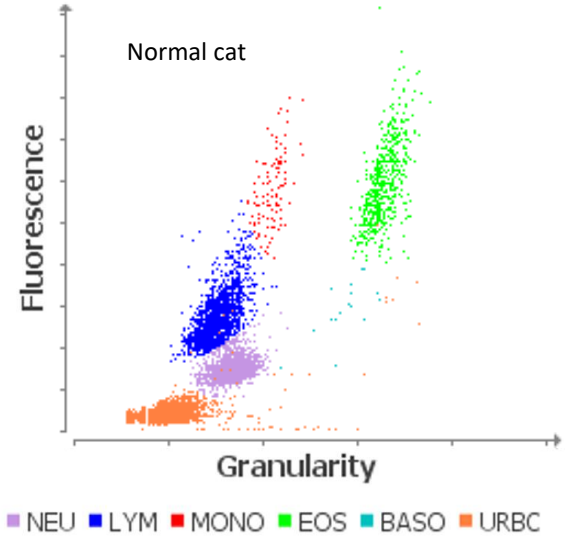
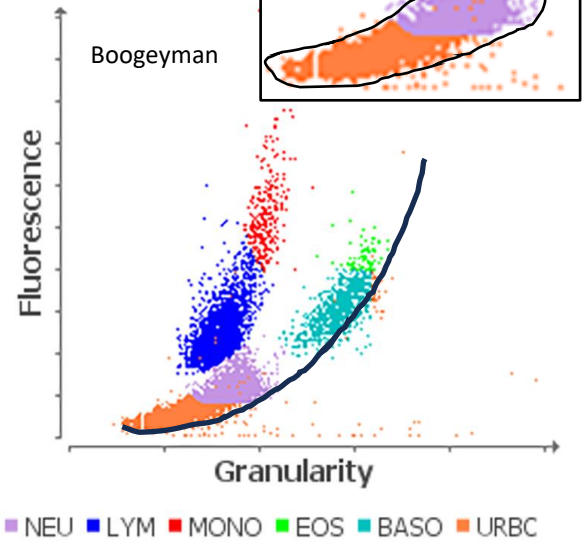
PCT	0.04 %	0.17 - 0.86	LOW		

Strongly supports platelet clumping







- Some significant variation from normal pattern – needs blood film review
  - Extremely low numbers of eosinophils
  - Unlysed RBCs and NEUs melding together
- Platelet clumping oftentimes presents as a curvilinear array of digitized events extending from the lower left corner upward to the right

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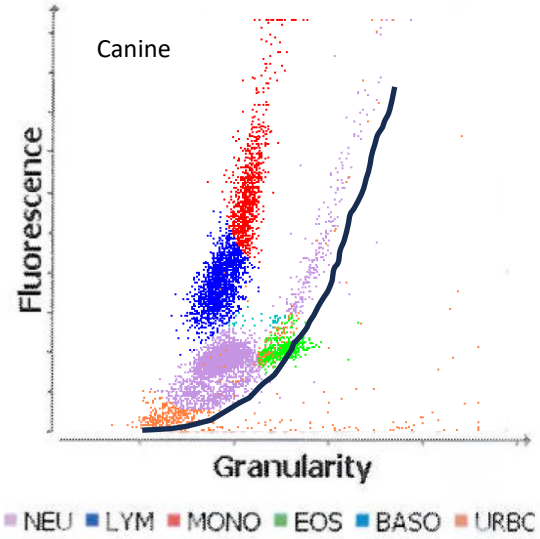
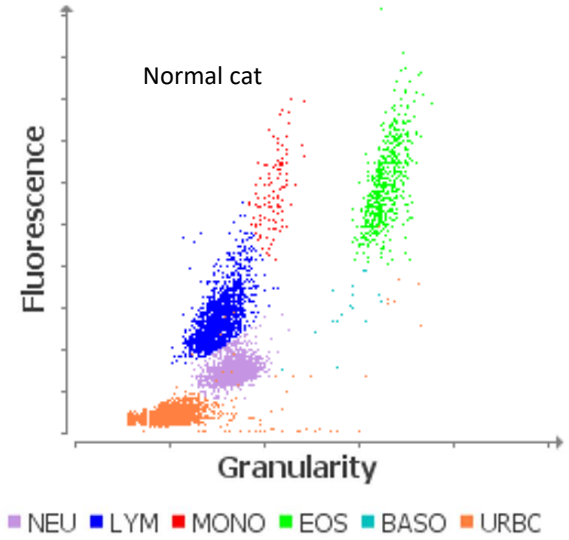
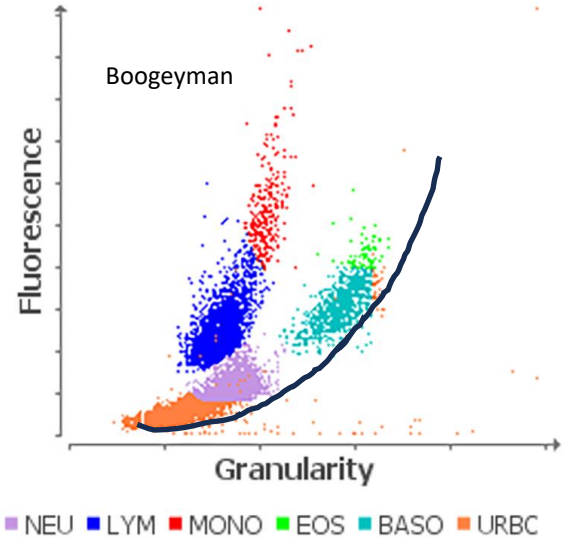
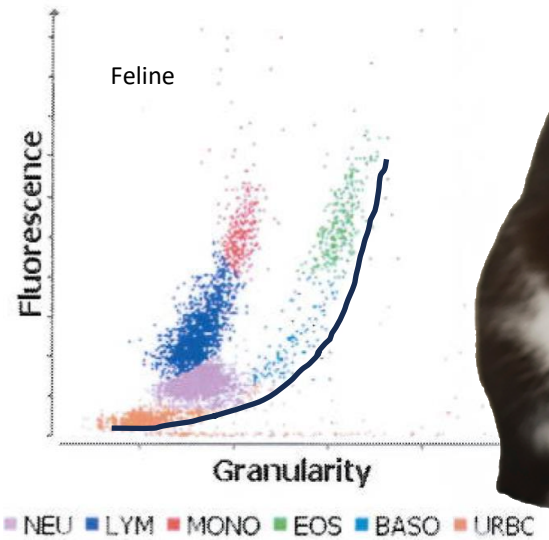
Clinical Case Study

Examples of PLT clumping with the ProCyte Dx









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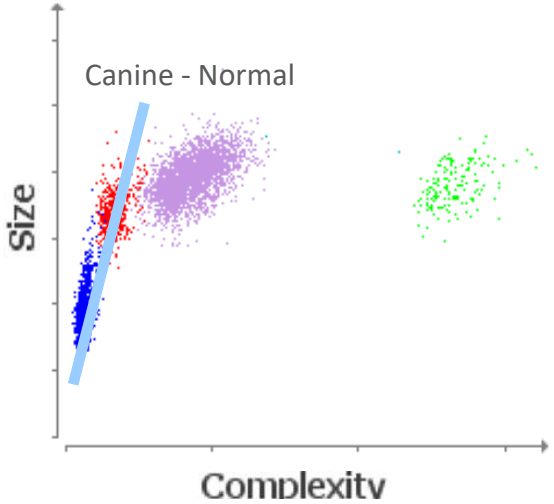
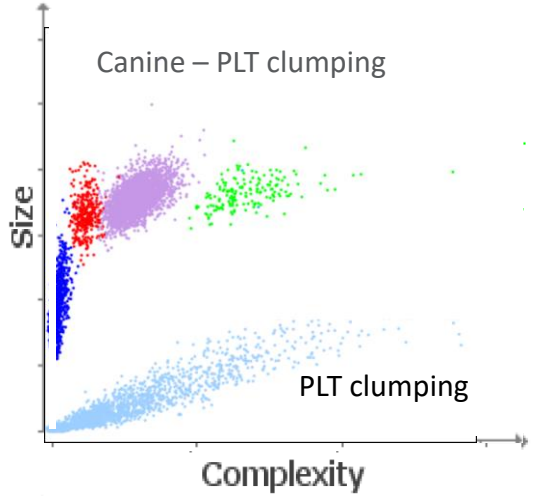
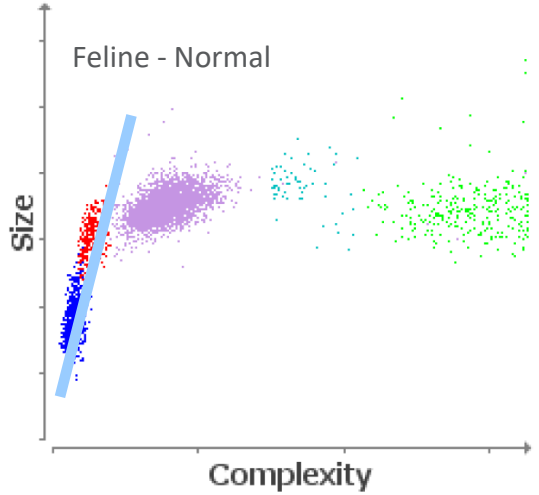
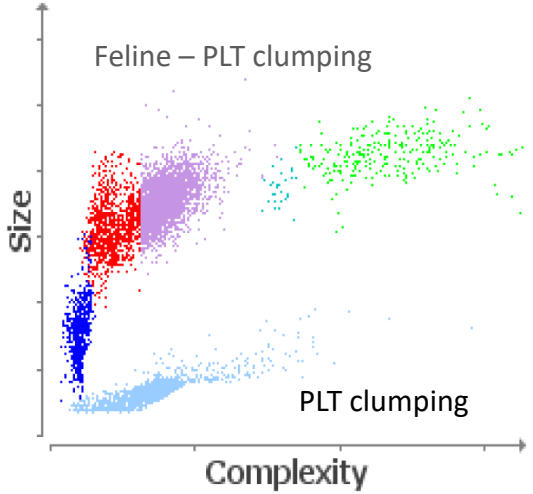
Example of PLT clumping with the ProCyte One









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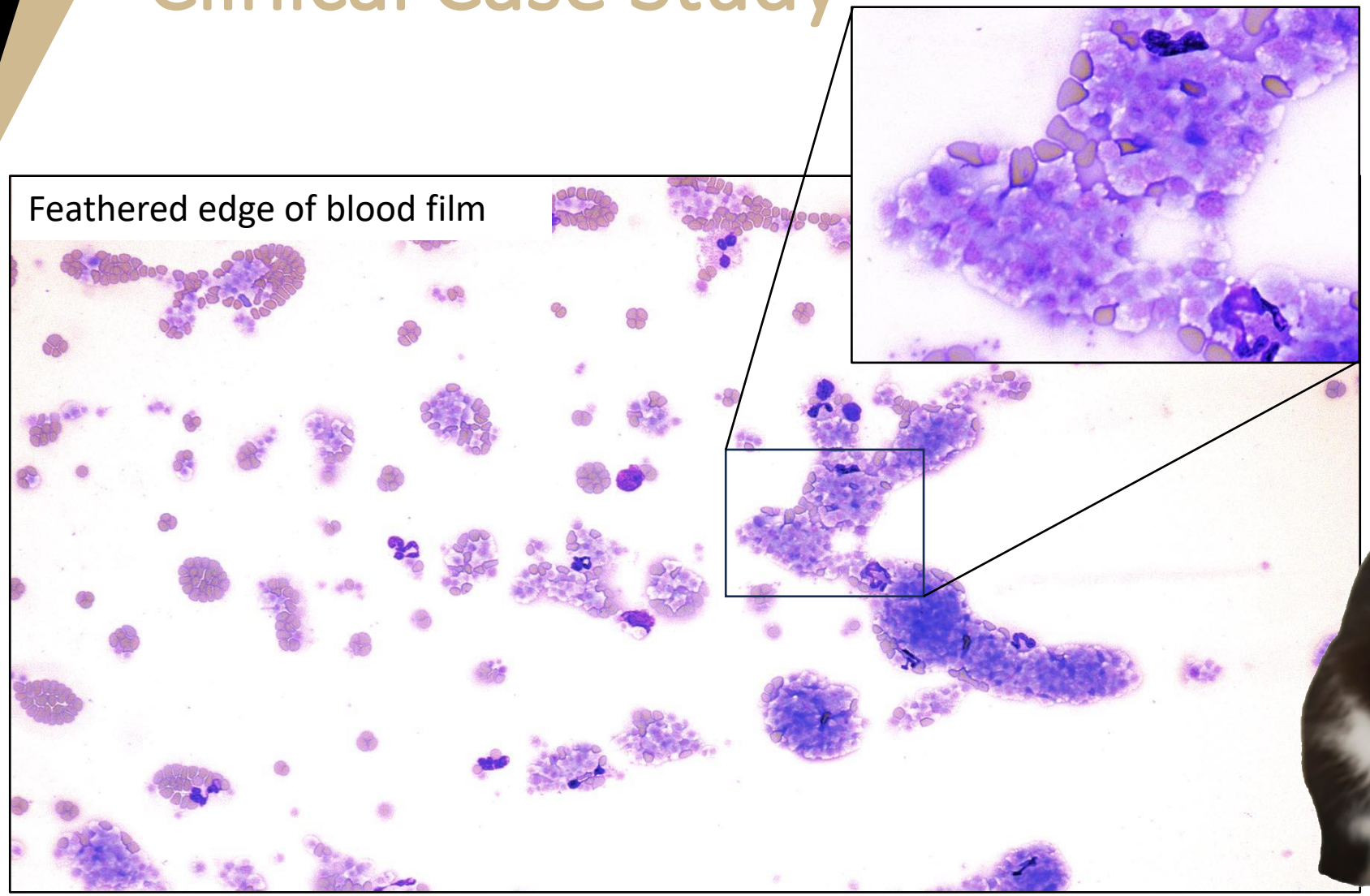

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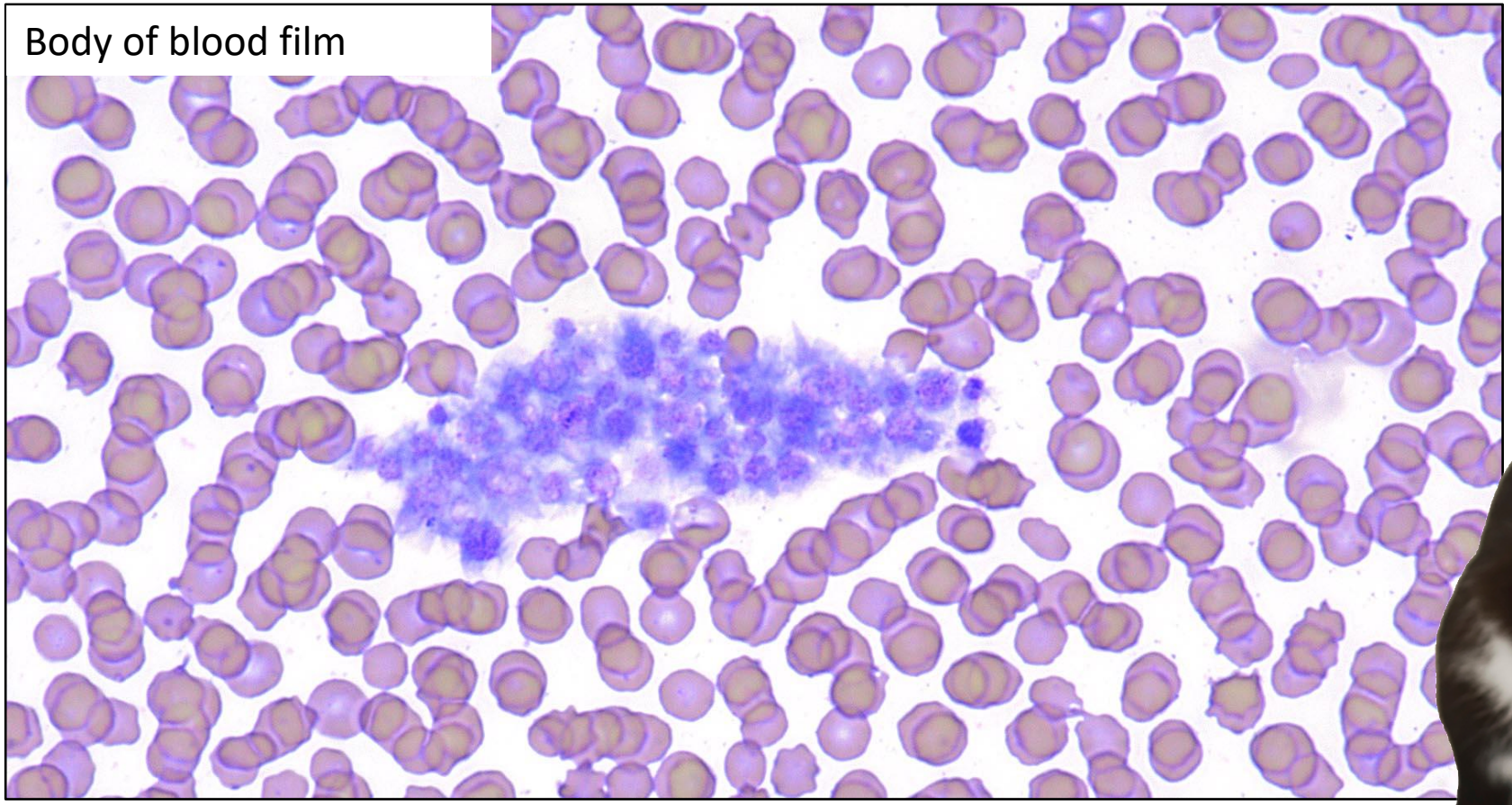

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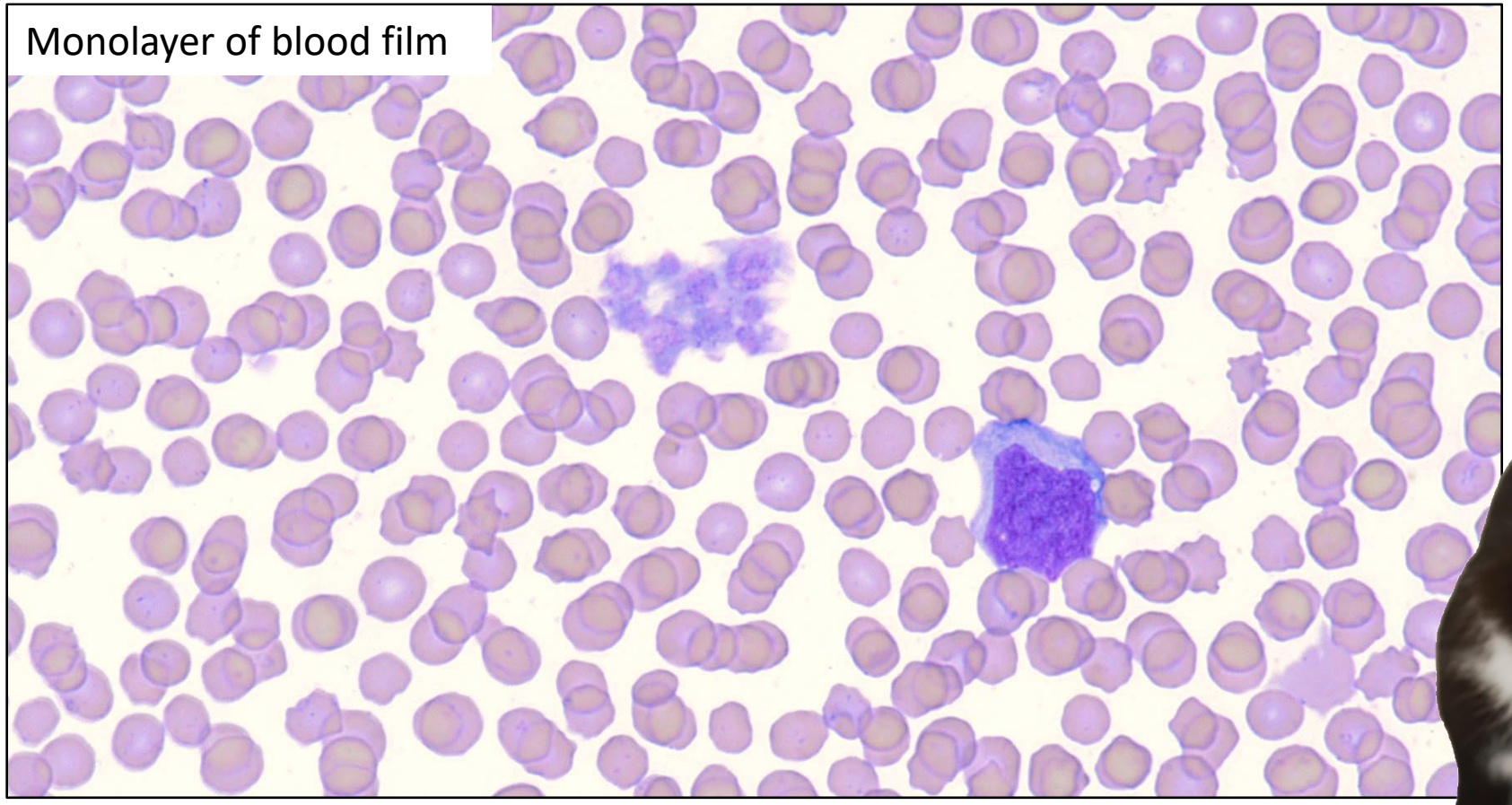

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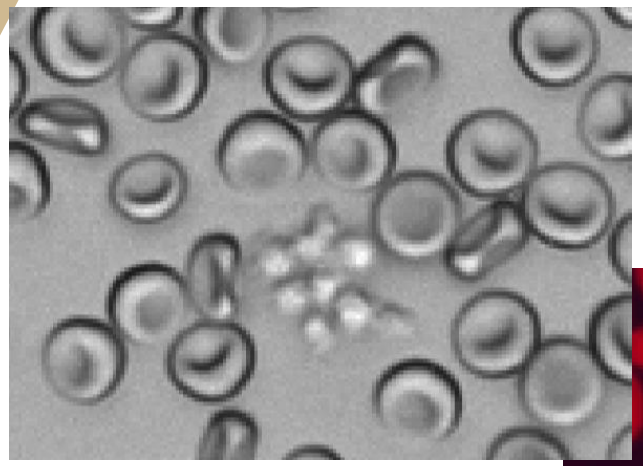
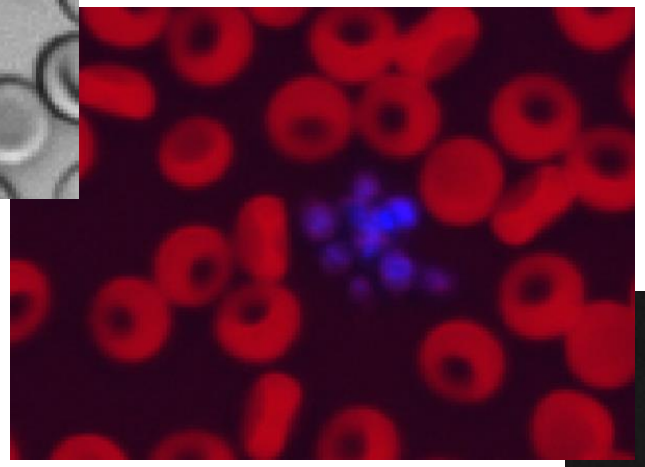
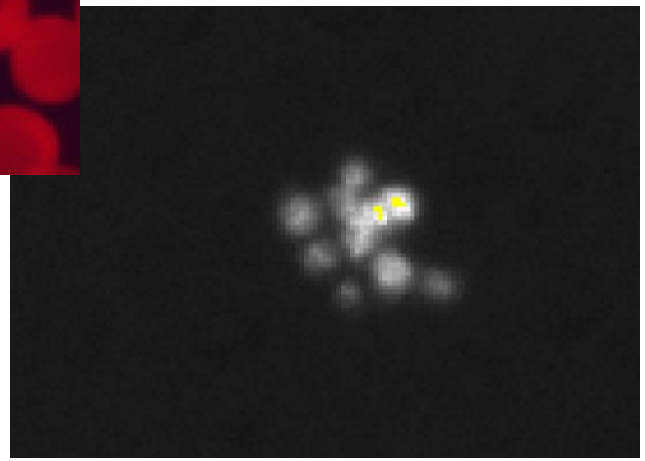
IDEXX inVue Dx™ Cellular Analyzer



Platelet Clumping

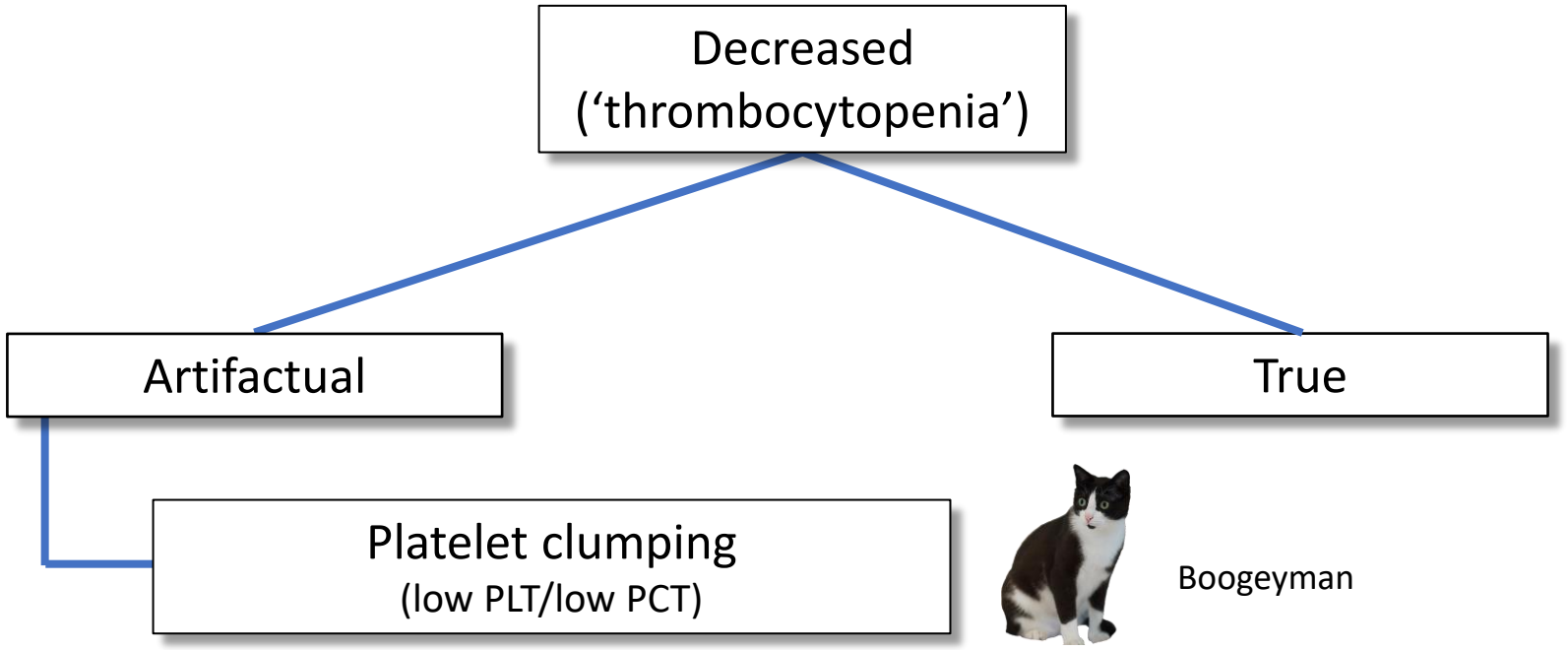




PCT (%) = (PLT x MPV) / 10,000

Laboratory Retrievers
Animals can't hide their objective data

Approach to the evaluation of platelets



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% of **U.S. Catalyst** customers **adopted in the first year of launch***

>65%	>55%	>50%	>50%
			
Catalyst® **Lyte 4 CLIP**	Catalyst® **Total T4 Test**	Catalyst® **SDMA**	Catalyst® **Pancreatic Lipase**
Launched December 2008	*Launched February 2015*	*Launched January 2018*	*Launched September 2024*

*Customers who adopted in first year of launch had run at least one consumable slide on Catalyst Dx® Chemistry Analyzer or Catalyst One® Chemistry Analyzer in the last 30 days of 12 months post-launch for Lyte 4 CLIP, Total T4 and SDMA, and at least one

consumable slide on Catalyst Dx® Chemistry Analyzer or Catalyst One® Chemistry Analyzer in the last 30 days as of 7/30/25 for Pancreatic Lipase.

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