

Haematology and biochemistry

euvg

	Result	Reference		Result	Reference
WBC	17.25	6.00 - 15.00 x10e9/l	Total Protein	68.2	58.00 - 73.00 g/l
Neutrophils	14.793	3.60 - 12.00 x10e9	Albumin	23.3	26.00 - 35.00 g/l
Neut. bands	0.302	0.00 - 0.10 x10e9/l	Globulin	44.9	18.00 - 37.00 g/l
Lymphocytes	0.420	0.70 - 4.80 x10e9/l	ALT	131	21.00 - 102.00 U/l
Monocytes	1.715	0.00 - 1.50 x10e9/l	ALP	77	20.00 - 60.00 U/l
Eosinophils	0.120	0.20 - 1.00 x10e9/l	GGT	8	0.00 - 10.00 U/l
Basophils	0.000	0.00 - 0.20 x10e9/l	Bilirubin	13.5	0.00 - 6.80 umol/l
RBC	2.59	5.50 - 8.50 x10e12/l	Bile acids	20.4	0.00 - 10.50 umol/l
PCV	0.21	0.39 - 0.55 l/l	Glucose	6	3.00 - 5.00 mmol/l
Hb	6.3	12.00 - 18.00 g/dl	Cholesterol	8.1	3.80 - 7.00 mmol/l
MCV	80.4	60.00 - 77.00 fl	Triglycerides	1.1	0.57 - 1.14 mmol/l
MCHC	28.4	32.00 - 36.00 g/dl	CK	598	50.00 - 200.00 U/l
Reticulocytes	120	0.00 - 60.00 x10e9/l	Urea	9.0	1.70 - 7.40 mmol/l
Platelets	170	200.00 - 500.00 x10e9/l	Creatinine	89	22.00 - 115.00 umol/l
			Total calcium	2.42	2.30 - 3.00 mmol/l
			Phosphate	1.2	0.90 - 2.00 mmol/l



Everything is red!!

- 1) Write a problem list & DD for each clinical sign and each abnormal lab result
- 2) Highlight the diseases written more than once

eclinpath.com

Stress leukogram

Caused by illness. The stress of a car journey does not cause a stress leukogram!

<i>Mature</i> neutrophilia	Stress
Lymphopenia	Stress, viral
Monocytosis	Stress, need to <u>clear debris</u> (eg panleukopenia virus, neoplasia)
Eosinopenia	Stress

<i>Band</i> neutrophilia	<u>Severe</u> inflammation or infection. Not part of stress leukogram.
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Neutropenia



- High demand in tissues (eg pyometra, panleukopenia virus)
- Reduced production by BM
- Sepsis

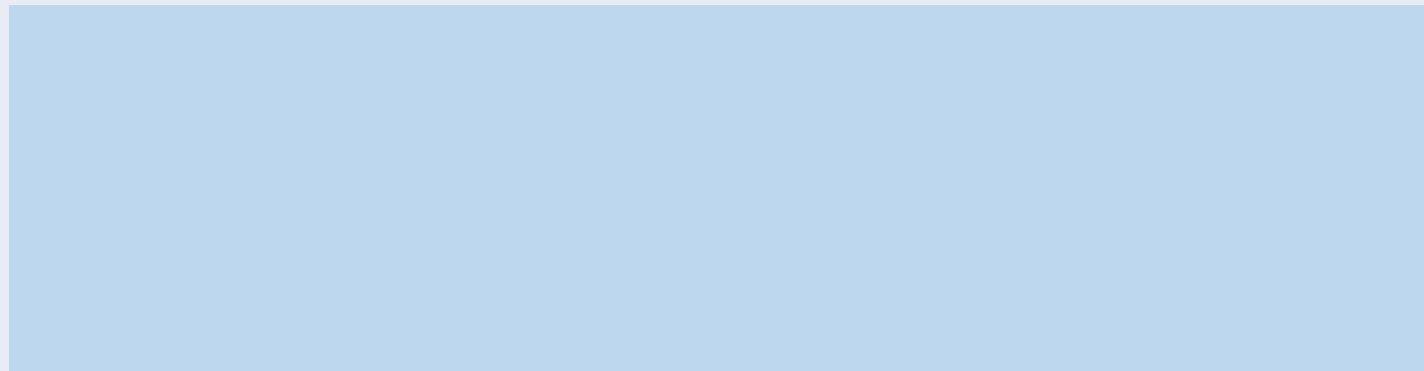
Rare in cats/cats: Immune-mediated neutropenia

Lymphocytosis

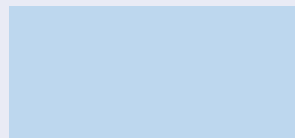
- Fear
- < 6 months old
- Infection
- Lymphoma / lymphocytic leukaemia

Rare in cats: Addison's

Eosinophilia



Basophilia



ANAEMIA

Regenerative

Non-Regenerative (reticulocytes <90,000 cat, 60,000 dog)

Only 3 DD:

1. Haemolysis (yellow serum)
2. Haemorrhage (↓TS)
3. Haemophagocytic histiocytic sarcoma (rare in cats, common in Flat Coat, Bernese Mountain Dog, Min Schnauzer)

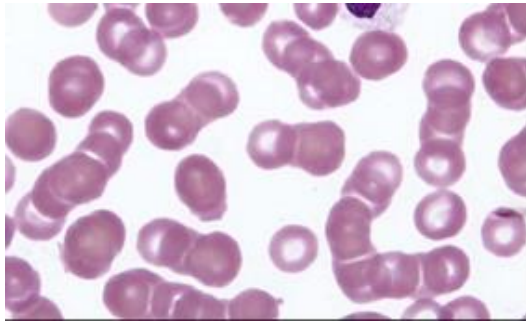
1. Anaemia of Inflammatory Disease (previous "Anaemia of Chronic Disease") - this can drop PCV to 15% in cats, 20% in dogs.
2. Pre-regenerative (4 days)
3. CKD
4. Iron Deficiency
5. Non-Regenerative IMHA
6. Bone marrow disease
7. HypoT4 – dogs
8. Addison's - dogs

- Macrocytosis (=high MCV) test for FeLV
- Hypochromasia (=low MCHC)
- Polychromasia (=different colours)
- Anisocytosis (=different sizes)
- Polychromatophilic RBCs (= immature RBCs)

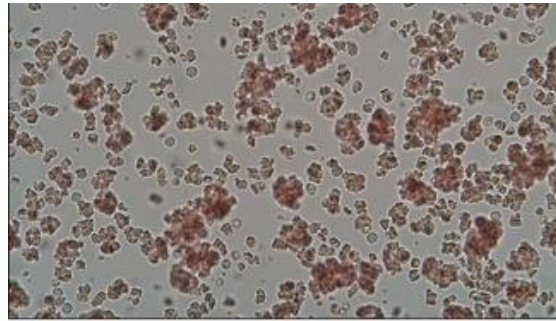
Saline Agglutination Test = 1 drop blood + 3 drops saline



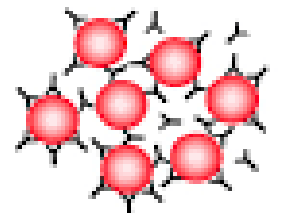
Rouleaux (inflammation)



Agglutination (confirms IMHA)



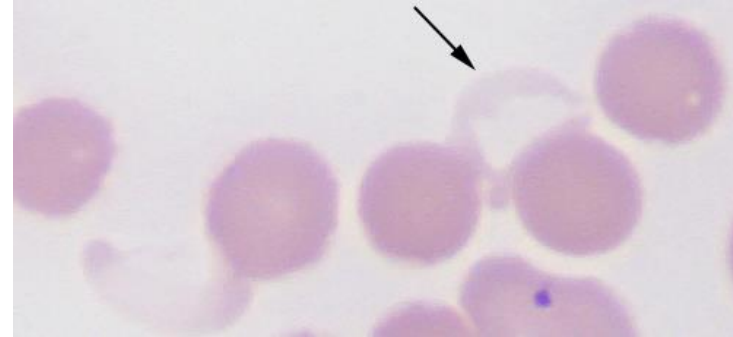
If still unsure, add 2 more saline drops:
cells will separate in rouleaux but not in agglutination (antibodies on their membrane are sticking together)



IMHA

Diagnosis:

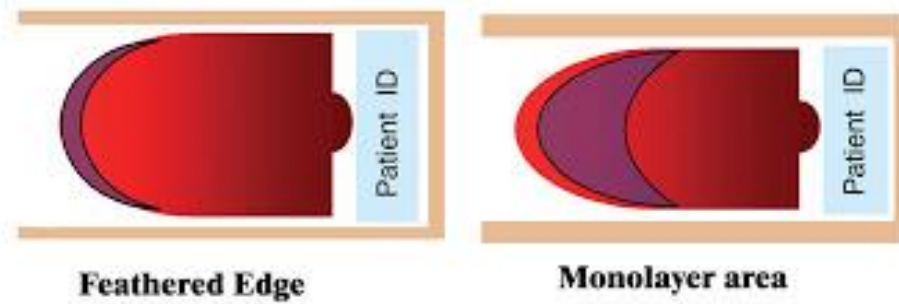
- ↑bilirubin
- Blood smear: spherocytes, ghost cells
- + Saline Agg Test: confirms IMHA
- - Saline Agg Test: Coombs test
- Search for cause: FIV FeLV, AUS, thoracic rads, urine sediment, Mycoplasma haemofelis PCR (if regenerative)
- Non-reg IMHA: BM cytology



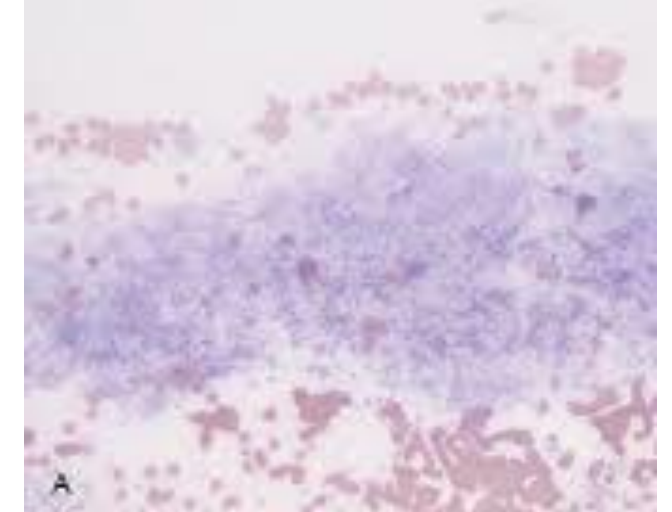
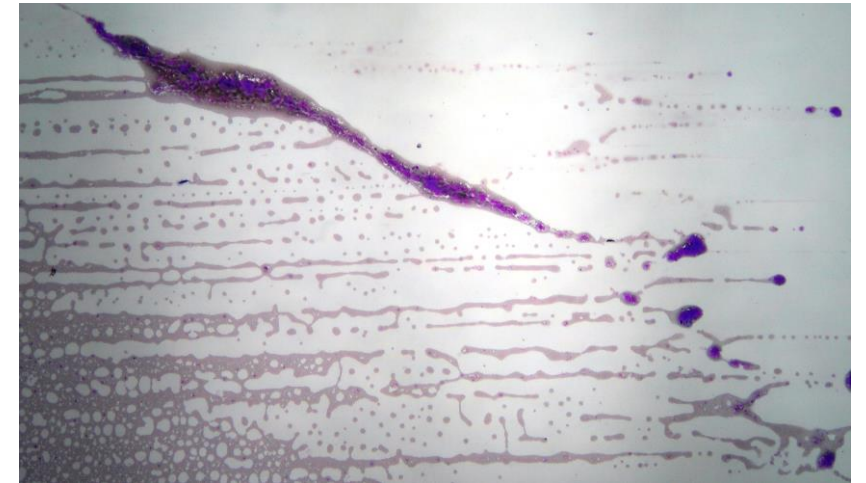
Treatment:

- Pred 2mg/kg q24h for a minimum of 3 weeks and until PCV>30%
- ↓25% every 2-3 weeks
- TREAT ANY IMMUNE-MEDIATED DISEASE FOR A MINIMUM OF 4 MONTHS
- Dogs must also be given clopidogrel and/or rivaroxaban!

Thrombocytopenia in cats - probably just platelet clumps



- 1 (lens 10x) check feathered edge for clumps
- 2 (lens 40x) confirm these are platelets
- 3 (lens 100x oil) count how many platelets per field in ~12 fields, then average;
- 4 $\text{average} \times 15,000 = \text{PLATELET COUNT}$



IMTP

Diagnosis:

- There is no confirmatory test (like Saline Agglutination Test or Coombs in IMHA), diagnosis of exclusion
- What are the DD for thrombocytopenia?

↑ consumption (DIC, vasculitis, haemorrhage) → history, physical exam

Sequestration (splenomegaly) → panel for vector-borne diseases

↓ production by bone marrow → not if other cell lines are not affected

↑ destruction (IMTP) → can be 2ry to infection/neoplasia: FIV FeLV, AUS, thoracic rads, urine sediment

Treatment?

Pred min 4 months.

In dogs, vincristine 0.02mg/kg IV (1DOSE) or IVIg (1DOSE, anaphylaxis if repeat dose) ↓ platelet recovery time by 2-4 days.

Hypoalbuminemia DD:

- Inflammation (**acute phase protein response**) → inflammation likely if globulins are ↑ (in cats think FIP)
- Loss through **skin burns** → physical exam
- Loss into **effusions** → FAST abdomen & thorax
- Loss through the kidneys **PLN** → urine sediment, if no infection (falsely ↑UPC) do UPC
- Loss through the intestines **PLE** → GI signs, diagnosis of exclusion

Hyperglobulinemia DD (same DD list as fever):

- Infection (FIP, Toxoplasma)
- Inflammation (lymphocytic cholangitis)
- Neoplasia
- Immune-mediated

alb/glo ratio <0.4 on blood or effusion - FIP LIKELY
>0.8 - NOT FIP

LIVER

Liver produces albumin, glucose, urea (from ammonia), cholesterol, and all coagulation factors except for 3,4,8. It removes bilirubin from the blood and excretes it in the bile.

→ So what do you expect in liver failure?

Bile is composed of bilirubin, bile salts and cholesterol.

→ So what do you expect in cholestasis?

ALT or AST – in cytosol, so ↑ indicates cell death.

ALP or GGT – in membrane, so ↑ indicates cholestasis (toxic bile acids dissolve the membrane)

ALP mainly in hepatocytes - ↑ in cats often indicates lipidosis.

GGT mainly in cholangiocytes - ↑ often indicates cholangitis in cats, cholecystitis or mucocele in dogs

KIDNEYS

DIAGNOSIS OF AKI OR CKI IS NOT POSSIBLE WITHOUT URINE ANALYSIS!

DD ↑creatinine:

-
-
-

DD ↑urea:

-
-
-

DD ↓creatinine:

-

DD ↓urea:

-
-
-

Post-renal azotaemia:

- History of urinary rupture or obstruction
- ↑K

Pre-renal azotaemia:

- USG

Renal azotaemia:

- USG

They all present with ↑creatinine, ↑urea, ↑P.

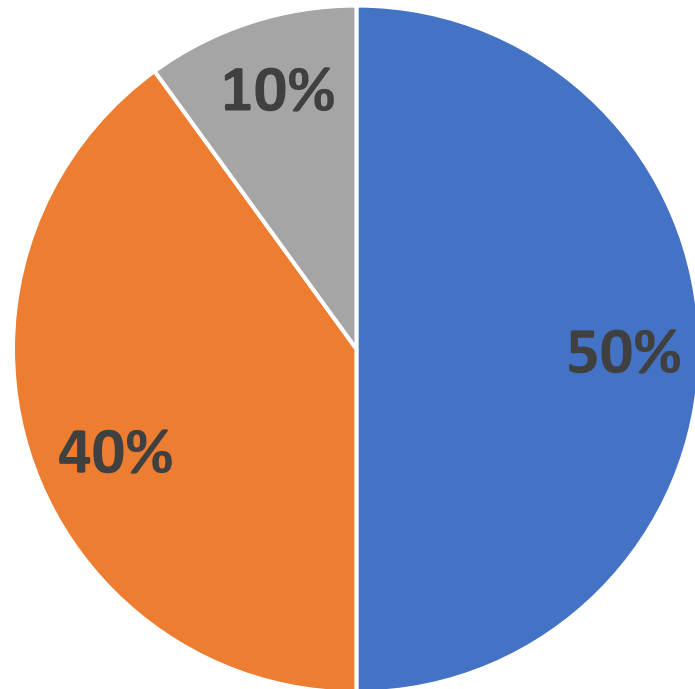
CKD MYTH: ↑P or anaemia confirm the renal disease is chronic, not acute.

WRONG: Both commonly seen in both CKD and AKI.

↑P indicates ↓GFR.

Anaemia is mainly caused by inflammation + GI ulcers in AKI; ↓erythropoietin in CKD (ulcers are rare in CKD cats!)

CALCIUM



- ionised calcium
- Ca bound to albumin
- Ca bound to anions

iCa is the only physiologically active Ca form.

A patient with \uparrow tCa and N iCa (often CKD cases) is NOT truly hypercalcaemic.

DD ↑Ca:

- D Vit D toxicity
- R Acute or Chronic Renal Disease
- A Addison's
- G Granulomatous
- O Osteolysis (osteosarcoma) **Limping?**
- N Neoplasia (lymphoma, AGASACA, multiple myeloma, carcinoma) **FULL Physical Exam** (lymph nodes, anal glands, palpate vertebrae/ribs)
- S Spurious (lab error – must be starved sample, not haemolysed, measured within minutes) **Repeat sampling**
- H Hyperparathyroidism **Measure PTH when Ca↑**
- I Idiopathic **Diagnosis of exclusion**
- T Toxic (vitD)

Most common cause of **hyperCa**: lymphoma in dogs, CKD and idiopathic in cats.

Idiopathic Hypercalcaemia

Treatment:

High fibre diet (↓calcium absorption in the intestine)

Royal C Fiber Response, Purina OM, Hill's w/d.

If Ca still ↑ 6w later, alendronate (↓mobilisation of calcium from the bones)

10mg once weekly

Fast 12h before tablet and 2h after tablet

Syringe water after tablet to prevent oesophagitis (=doxycycline / clindamycin)

Will need this lifelong!