The Anatomy of a CBC

Clinical Updates Podcast: Cell lines and pathologies

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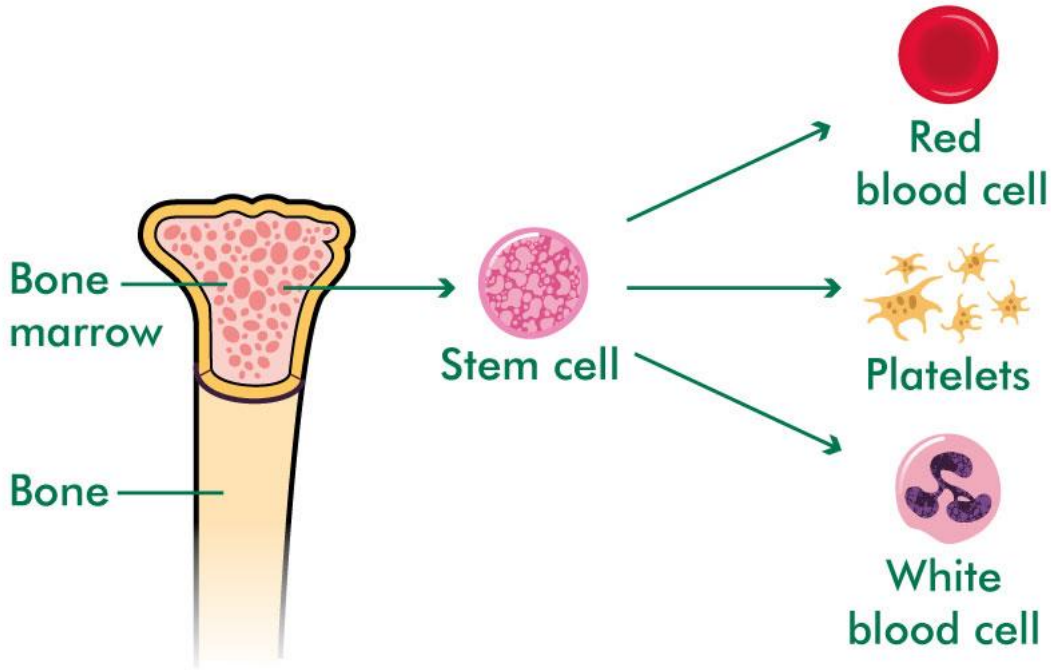
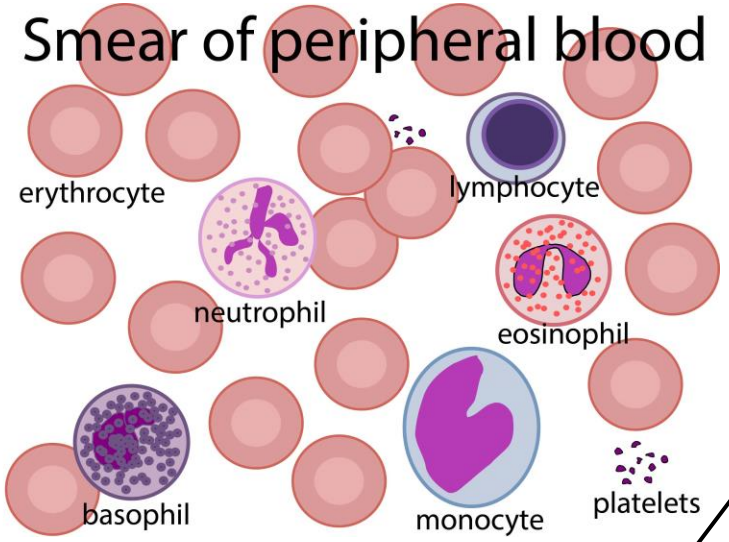
THREE CELL LINES



WBC


Smear of peripheral blood
erythrocyte
lymphocyte
neutrophil
eosinophil
basophil
monocyte
platelets

Basic Understanding Normal range 4-11 x109/L

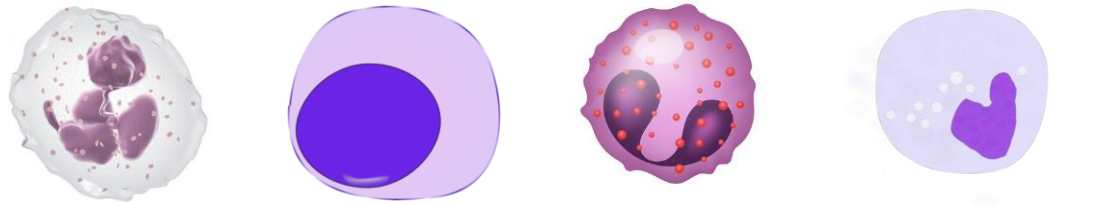
Leukopenia <4 K

- Watch Trends of ABSOLUTE counts!!
- DIFFERENTIAL

Neutrophils	Lymphocytes	Monocytes
Meds Infection Cancer	VIRAL infection (CMV) Lymphoma Meds	Hairy cell leukemia!

Leukocytosis > 11K

- Watch Trends of ABSOLUTE counts!!
- DIFFERENTIAL



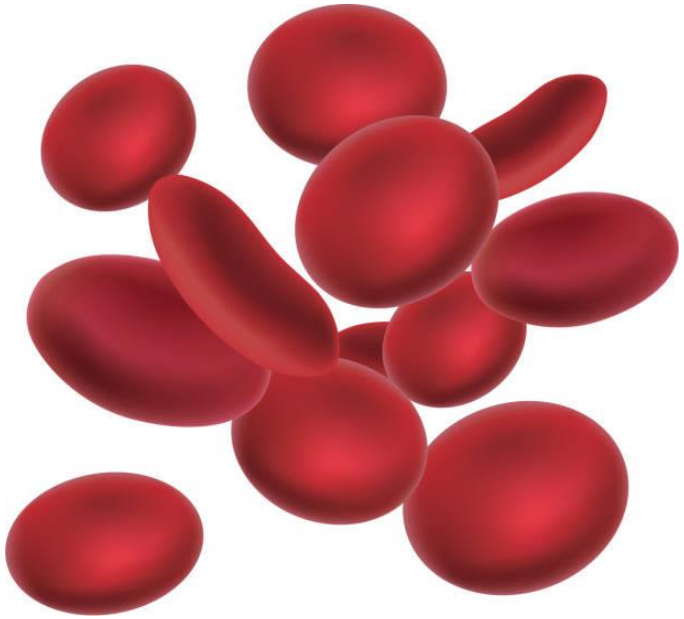
Neutrophils	Lymphocytes	Eosinophils	Monocytes
Pyogenic or bacterial infx (most common Dr. Minces ☺) Smoking Inflammation Obesity Meds (Steroids)	VIRAL infection Lymphoma Meds	Allergies Parasites Skin disorders Pulmonary disorders MEDS	Pyogenic or bacterial infection Neoplasms (CMML) >2.0

WBC Emergencies/Urgent

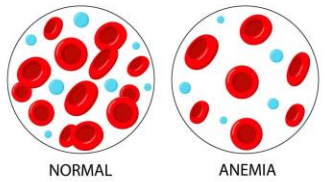
- WBC count <0.5 (risk of infections)
- WBC count >100 (sludging, bleeding)
- ANY New BLASTS detected on the differential

HGB (#)

HCT %

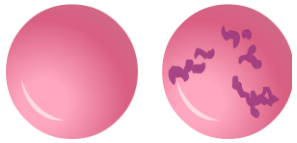


Basic Understanding Normal range ~11.5-16.5 x109/L

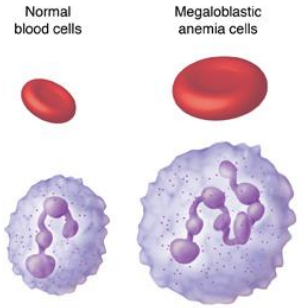


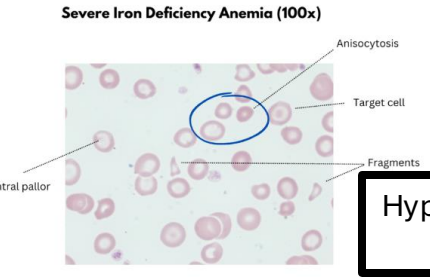
ANEMIA <11.5

- Look at MCV



80-100 Normocytic





- Hypoproliferative Low Retic
- Hyperproliferative High retic.
- >100 Macrocytic
- <80 Microcytic

<80 Microcytic

Iron deficiency, iron deficiency, iron deficiency

Thalassemia. Clue (Elevated RBC)

Hypoproliferative Low Retic

CKD

Liver dz

Inflammation

Bone marrow disease

Hyperproliferative High retic.

Hemolysis

Bleeding

>100 Macrocytic

B12/folate def

Meds

EtOH

Hypothyroid

MDS (if persistent)

ERYTHROCYTOSIS > 16.5

Primary
Low or Nm EPO

Congenital

Polycythemia vera

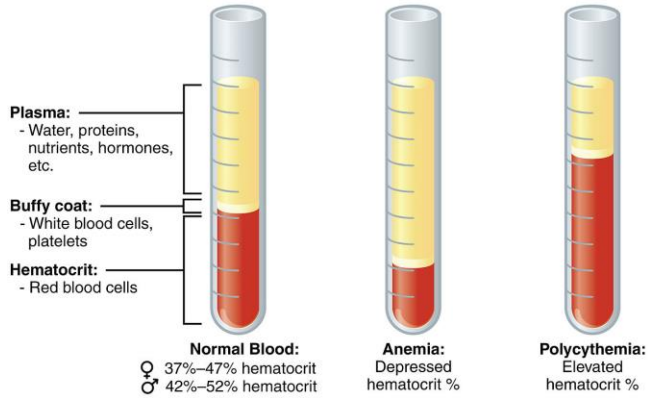
Get a JAK2 mutational study!

Secondary
High EPO

Congenital

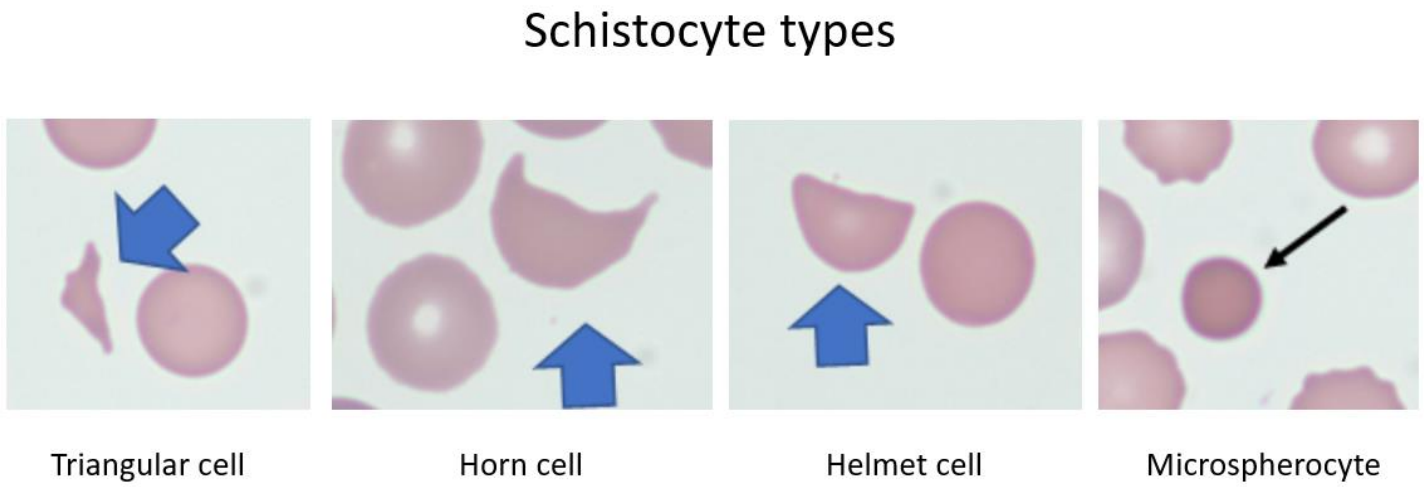
Acquired (chronic hypoxemia)

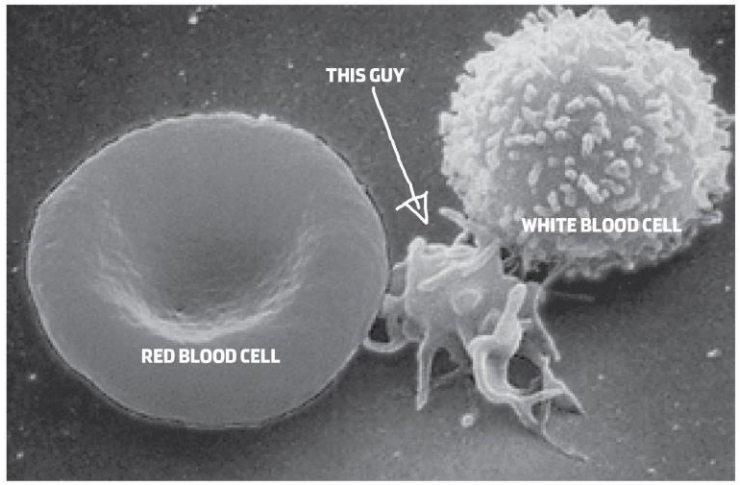
- Renal dz
- Lung dz
- Smoking (most common)
- Meds (testosterone)
- Sleep Apnea



HGB Emergencies/Urgent

- Acute blood loss with hemodynamic instability
- Hematocrit >50 with symptoms of sludging (chest pain, visual loss, severe headache, etc)
- Hemolysis (Look for Schistocytes or spherocytes on blood smear, low haptoglobin, elevated LDH, elevated bilirubin (WHY?))

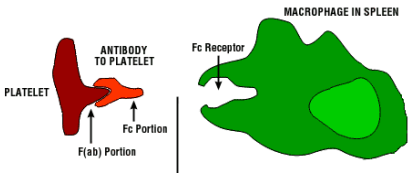




PLT

Basic Understanding Normal range 150-450

Thrombocytopenia <150



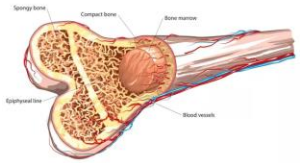
Increased peripheral destruction

- ITP
- TTP (look for schistocytes)
- DIC
- HUS
- Infection

Hypersplenism

- Lymphomas
- Liver disease – alcohol, Hep C

Note: Liver disease leads to portal hypertension → hypersplenism → decreased production of TPO (produced by liver)



Bone marrow conditions

- Aplasia: Drugs, idiopathic
- Infiltration: Leukemia, lymphoma, myeloma, MDS
- B12/Folate deficiency

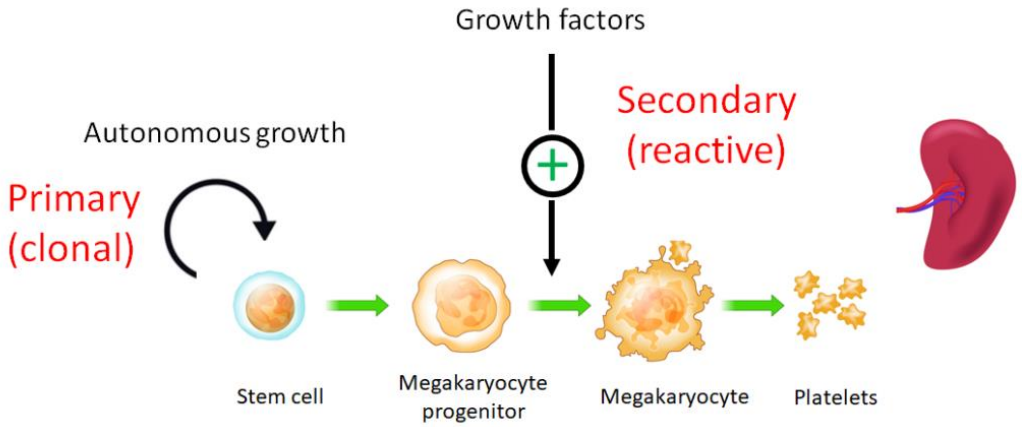
Thrombocytosis >450

Primary – Chronic and slowly progressive

- JAK2, CALR and MPL mutations to screen for a chronic myeloproliferative disorder (ET, PMF)
- Clues: Splenomegaly, bleeding

Secondary – More acute

- Acute infection
- Solid organ malignancy
- IRON DEFICIENCY!
- Inflammatory conditions (sarcoidosis, autoimmune, etc.)



Platelet Emergencies/Urgent

- Platelet count <10,000 (spontaneous bleeding)
- Platelet count >1,000,000 (in the setting of primary thrombocytosis) – risk for arterial and blood clots

CBC clues to a bone marrow condition and further evaluation.

- Pancytopenia (all cell lines affected)
- Bicytopenia (same)
- Cytopenias with lymphocytosis, lymphadenopathy or splenomegaly (lymphoma)
- Any dysplasia noted on peripheral smear (MDS)
- BLASTS on peripheral smear (MDS or AML)
- Cytopenias (most commonly anemia) with Rouleaux – need to exclude a plasma cell process

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