

Approach to Bone Marrow Disorders

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Objectives

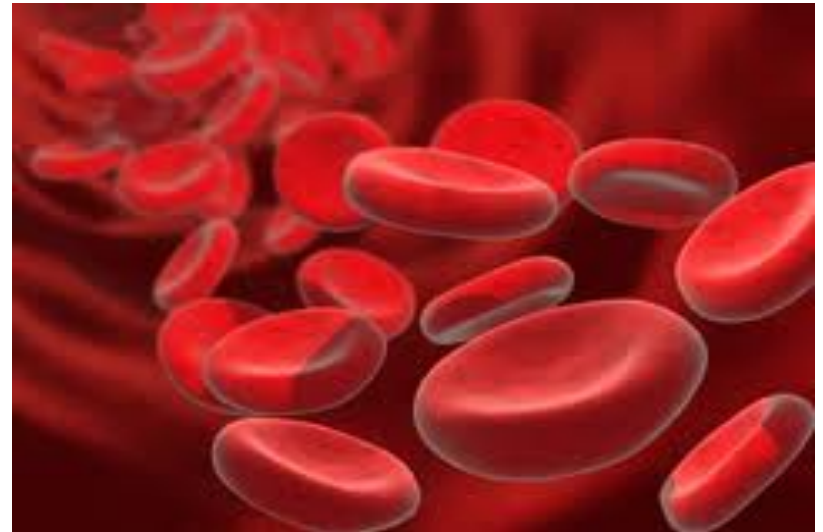
- Understand the language of Hematology
 - What is a CBC?
 - What happens in the bone marrow?
- Understand the common presentation of bone marrow failure
- How do we get to the diagnosis?
- Treatment plans to be addressed in the specific presentations

Complete Blood Count

- Hemoglobin men 135- 175 women 125 -160
- Hematocrit men .41 - .52 women .37 - .46
- MCV 80 - 100
- WBC 4 - 10
- Platelets 140 - 450

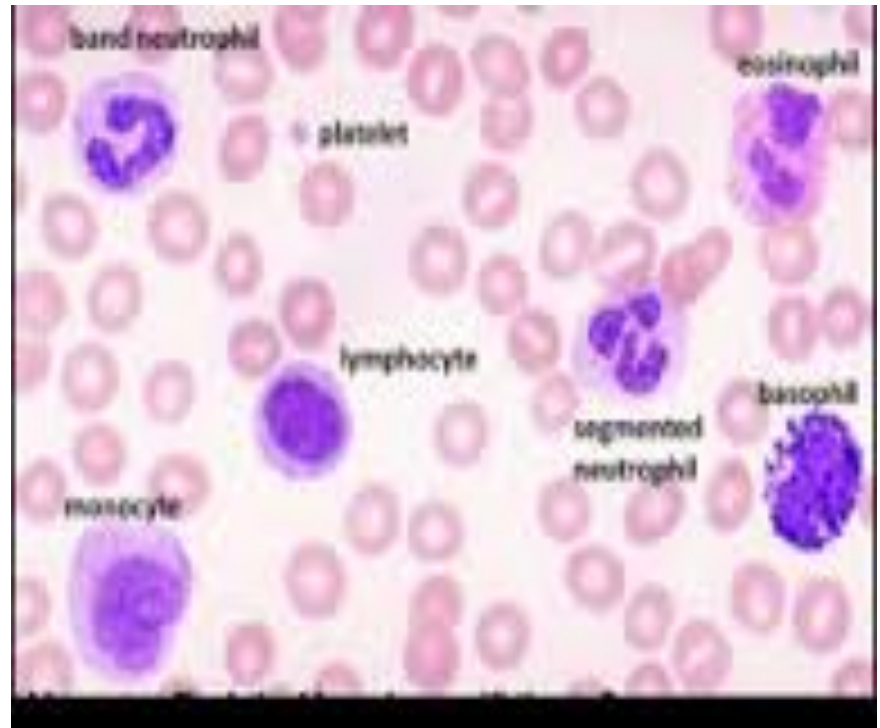
Red Blood Cells

- Hemoglobin
- Normal range
- Hct
- MCV
 - Microcytic <80
 - Normocytic 80 - 100
 - Macrocytic > 100
 - Megaloblastic >120



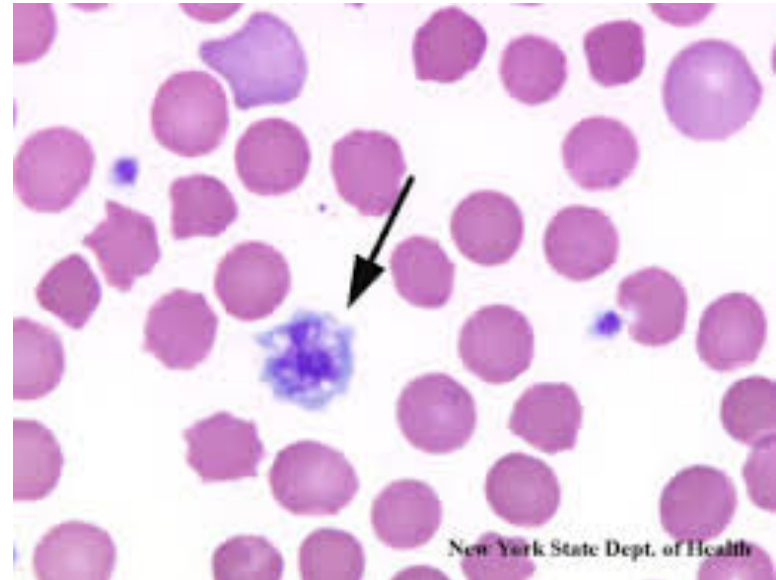
WBC

- Total Leucocyte 4 -10
- Neutrophil >1.8
 - Bands, myeloids
- Lymphocyte >1.0
- Monocyte
- Eosinophil
- Basophil
- Immature cells or others



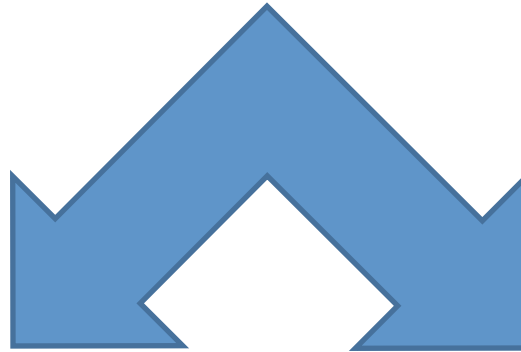
Platelets

- Normal range
- 140 - 450



Neoplasm

An abnormal growth of cells



**Benign
(Non-Malignant)**

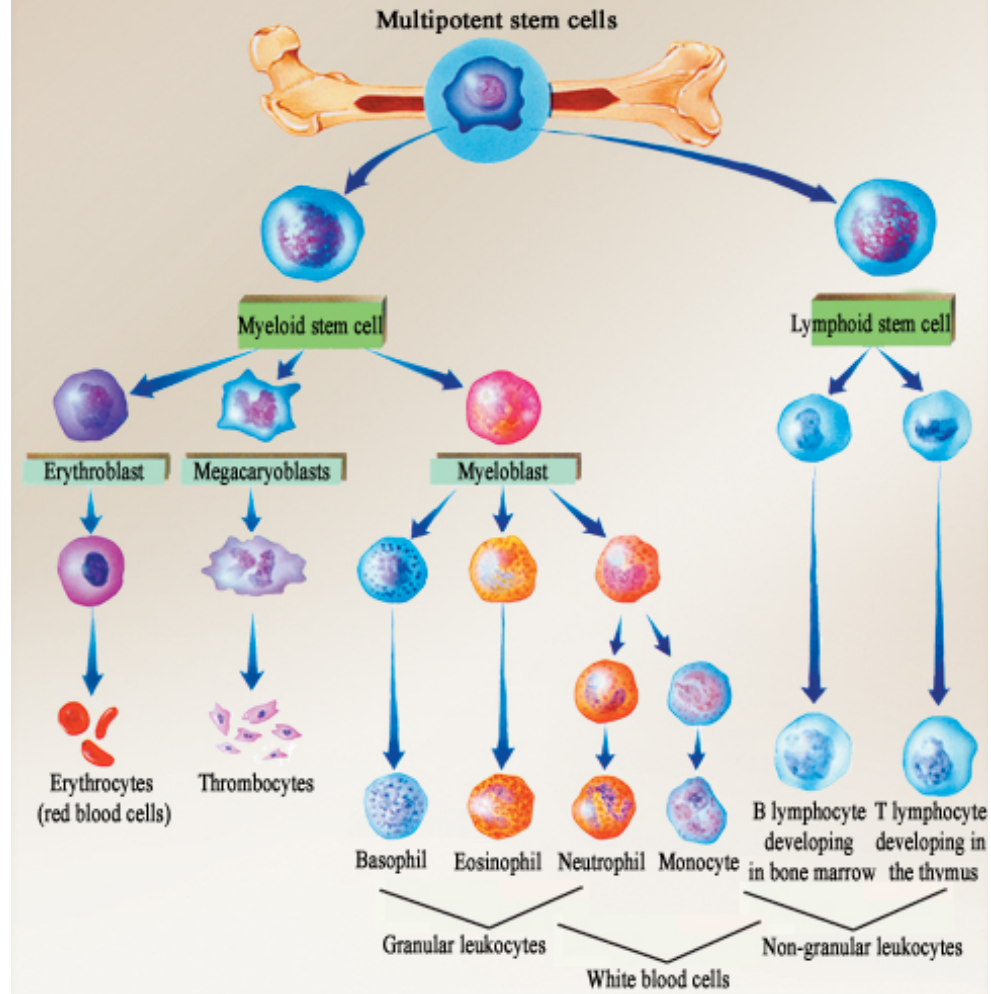
Malignant

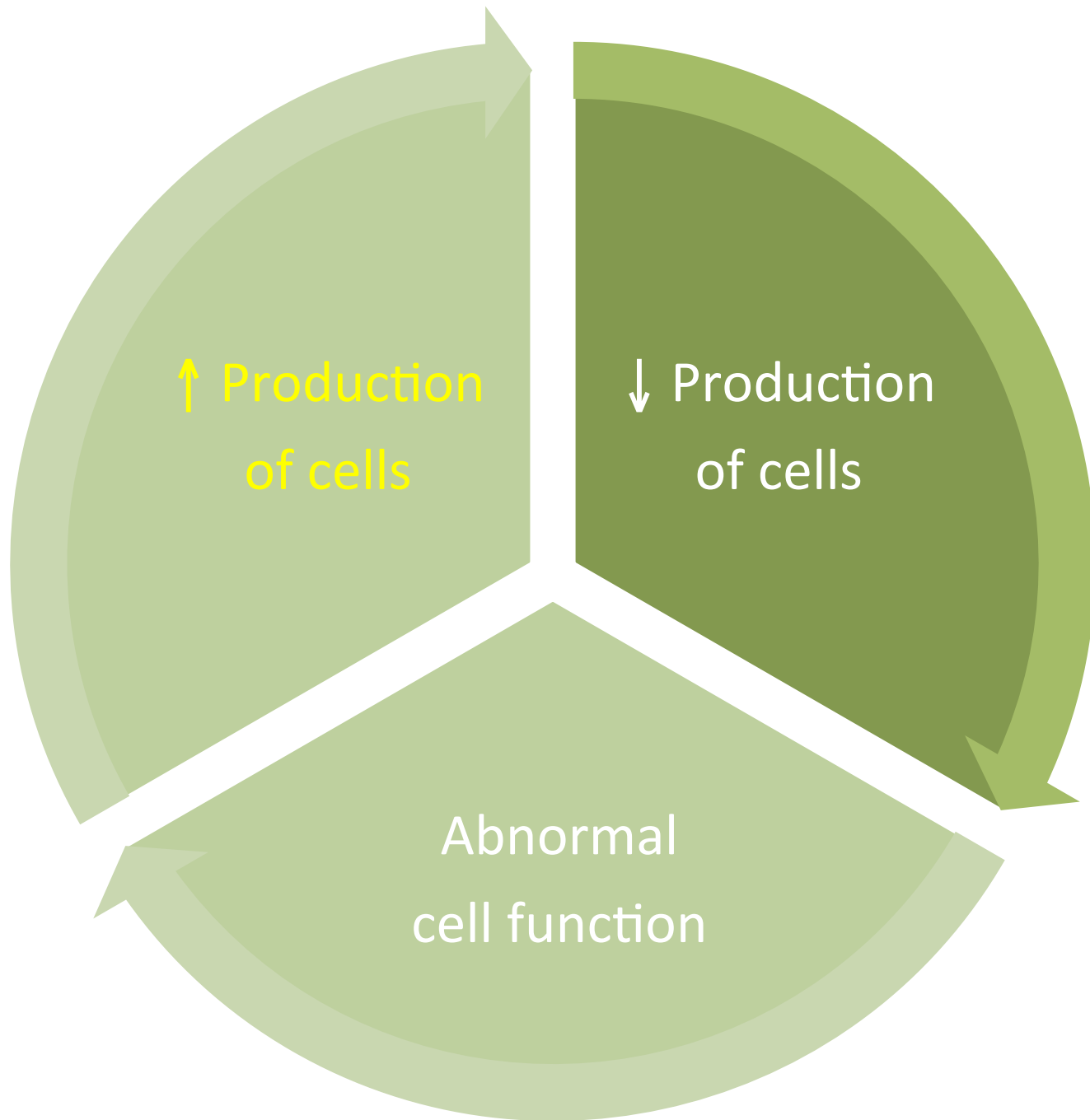
Clone

- A cell, group of cells, or organism that are descended from and genetically identical to a single common ancestor



FROM STEM CELL TO BLOOD CELL





↑ Production
of cells

↓ Production
of cells

Abnormal
cell function

↑ Production of Cells

	Myeloid	Lymphoid
Acute	AML	ALL Aggressive Lymphoma
Chronic	MPD	Indolent Lymphoma CLL

Leukemia

Acute

- Rapid onset
- Rapidly progressive
- Rapidly fatal without treatment
- Clonal proliferation of **immature** cells

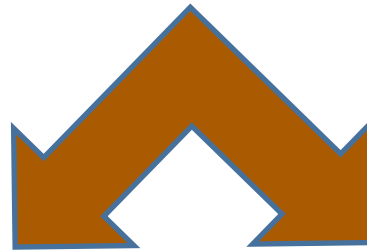
Chronic

- Gradual onset
- Slowly progressive
- People can often live with the disease for many years after diagnosis
- Clonal proliferation of **mature** cells

Acute Leukemia

Acute = Rapid onset (days to weeks)

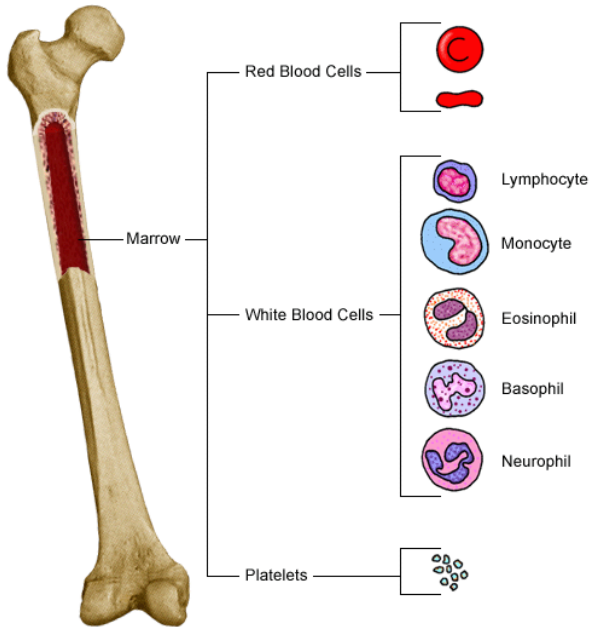
Leukemia = Clonal malignancy of WBC precursors



↑ Blasts

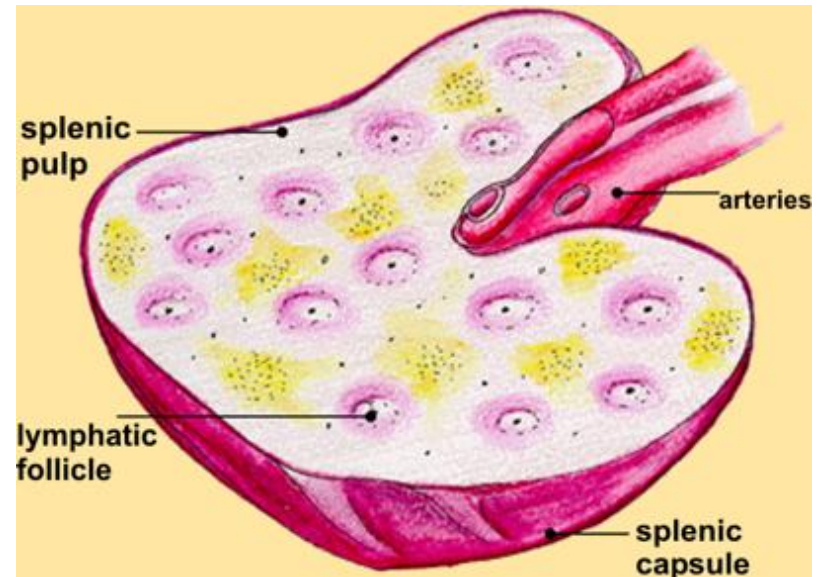
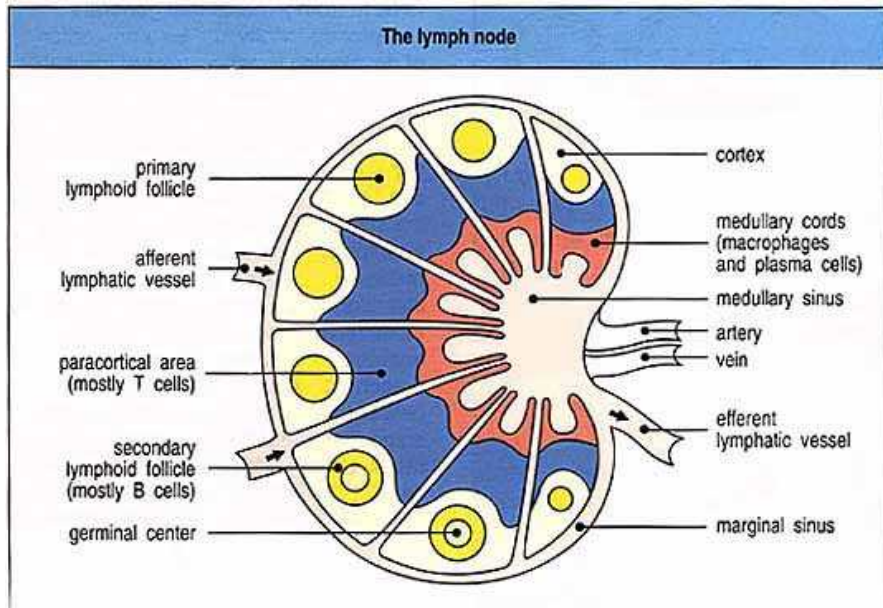
Pancytopenia

(↓ normal cells)



**Myeloid precursors
reside in the
Bone Marrow**

**Lymphoid precursors reside in
Lymph Nodes, Spleen and
Bone Marrow**



Myeloproliferative Disorders (MPD)

Chronic → slowly progressive over years

Myelo = Myeloid

Proliferative = ↑ Blood counts

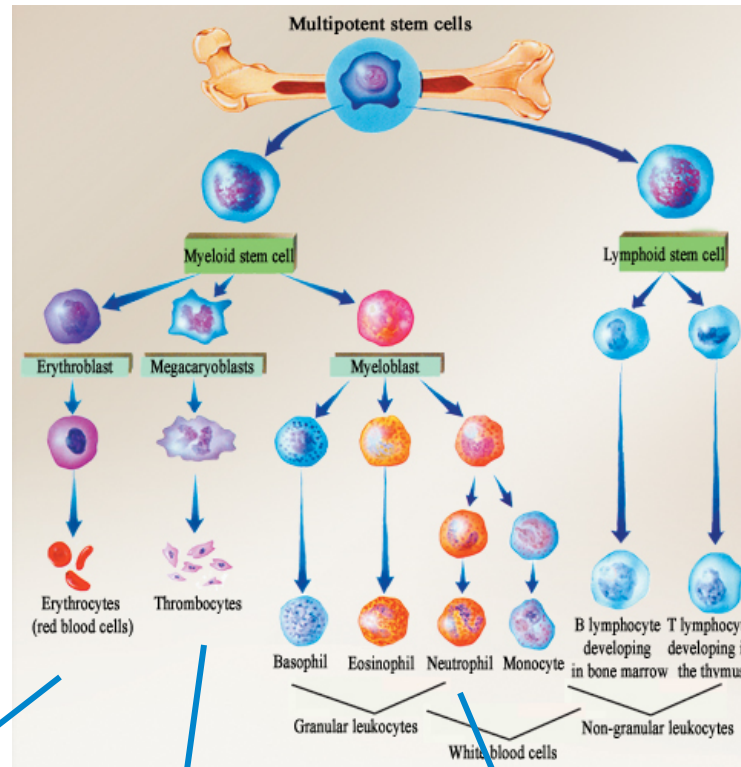


↑ Blood counts from the myeloid lineage

Fibrosis

↓

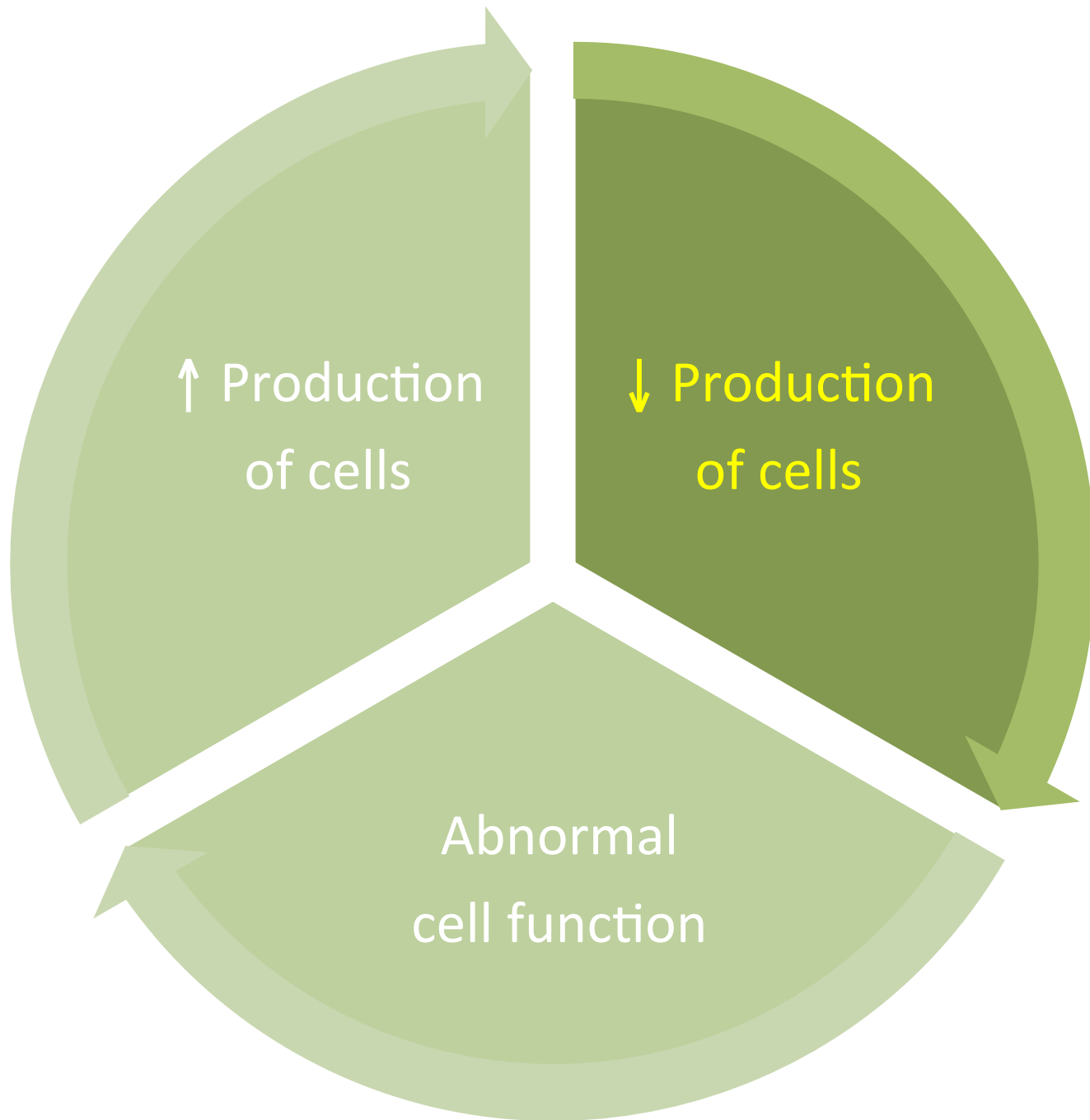
**Idiopathic
Myelofibrosis**



**Polycythemia
Rubra Vera**

**Essential
Thrombocytosis**

**Chronic
Myelogenous
Leukemia**



↑ Production
of cells

↓ Production
of cells

Abnormal
cell function

↓ Production of Cells

Acute

Infectious: sepsis, EBV, CMV, HSV, parvovirus

Drugs: ganciclovir, antibiotics, anti-epileptics

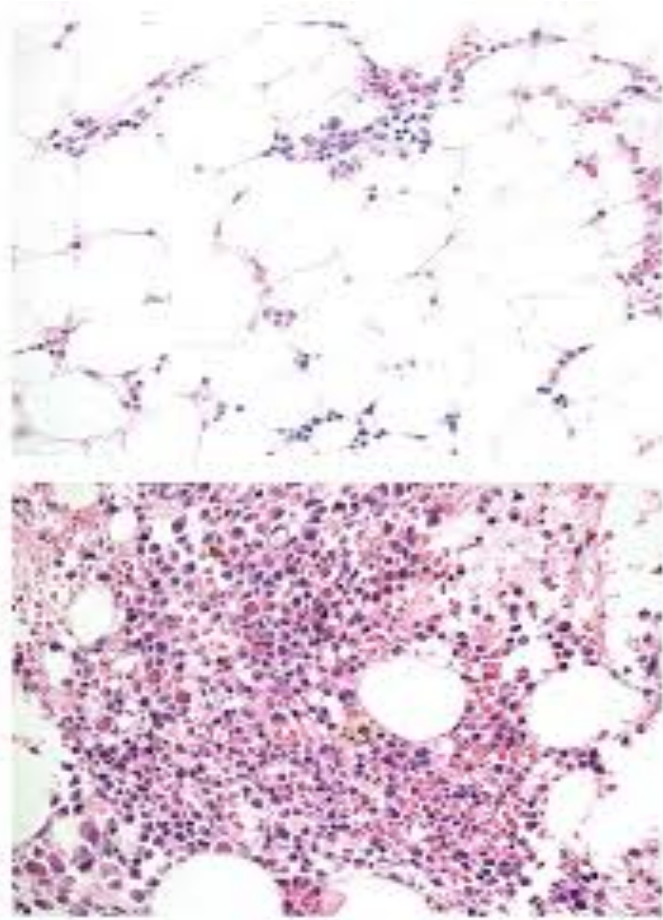
Chronic

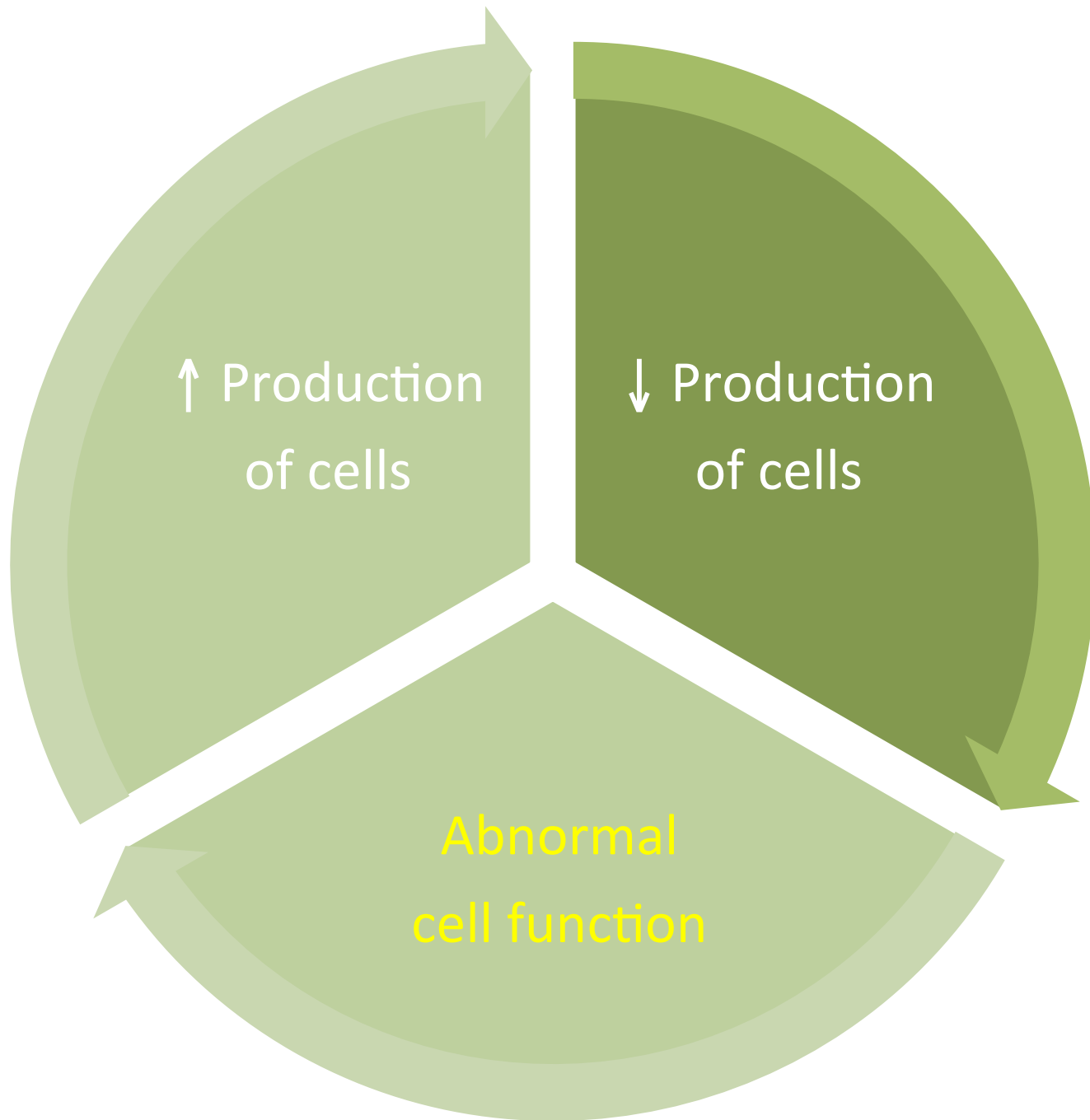
Infectious: HBV, HCV, HIV

↓ Building Blocks: Vitamin B12, Folate

Aplastic Anemia

Bone Marrow





Myelodysplastic Syndrome (MDS)

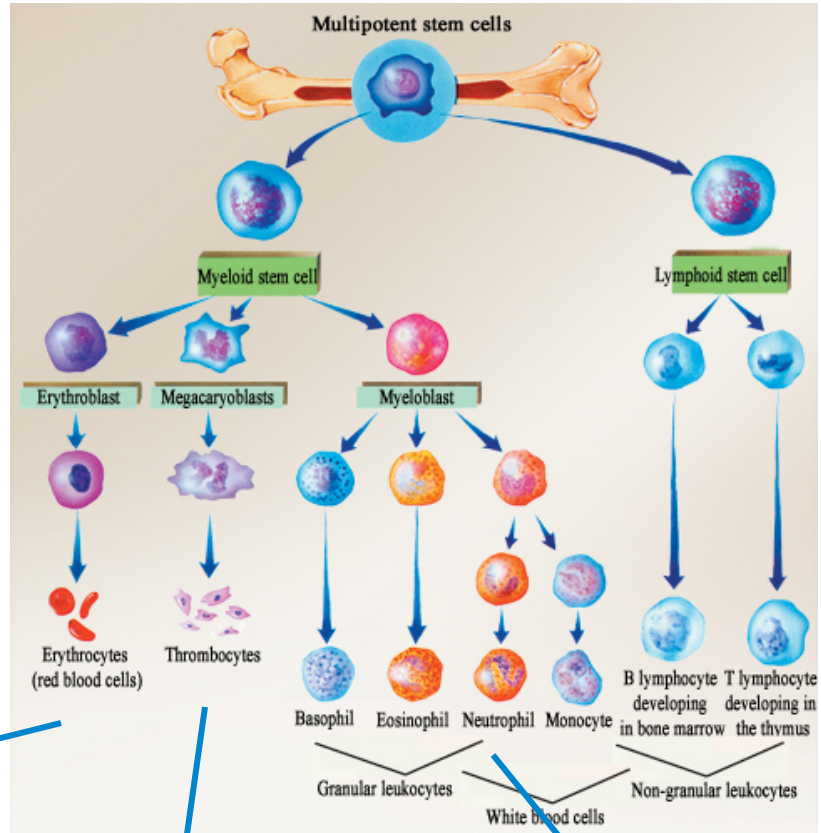
Chronic → slowly progressive over years

Myelo = Myeloid

Dysplastic = Abnormal growth and function



Abnormal growth and function of myeloid cells



Anemia

**Thrombocytopenia
Dysfunctional platelets**

**Neutropenia
Dysfunctional neutrophils**

Case 1

- A 35 y old woman presents to her family doctor with progressive fatigue over the last few months. She is finding it difficult to keep up with her friends jogging. Her periods have gotten very heavy and she has noted a rash on her legs over the last few days. She has not had any fevers. She is not on any medications including OTC . She is married with no “toxin” exposure.

Physical Exam

- Pale without jaundice
- HR 100 BP 100/ 60 oxygen sat normal
- No enlarged lymph nodes
- No enlarged liver or spleen
- Rash on legs

Petechiae



Next Step Laboratory

- CBC and differential
- Biochemistry testing
- Thyroid function studies
- Viral serology

CBC

- Hemoglobin 72
- WBC 3.0
- Neutrophils 1.0
- Lymphocytes 1.5
- Monocytes .5
- Platelets 10,000
- Reticulocyte count absolute 10

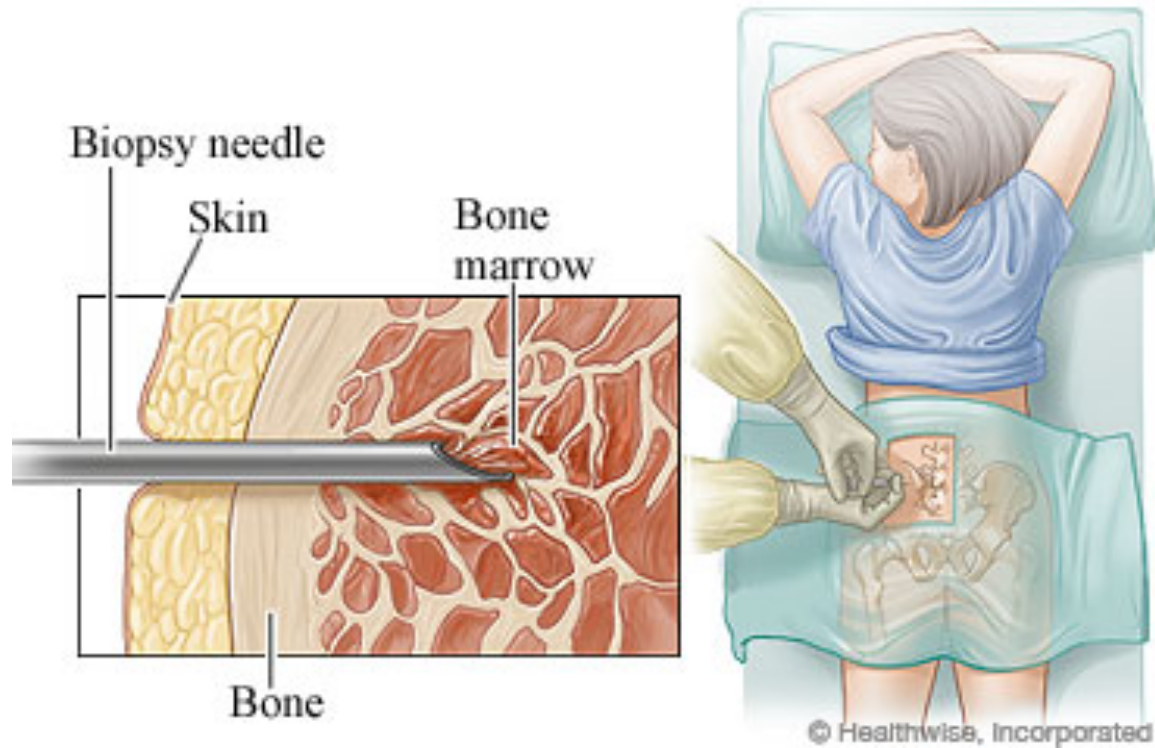
Next Step

- Referral to large center with hematologists for evaluation of PANCYTOPENIA

Hematologist Assessment

- History
- Physical Exam
- More Labs
- Transfusion Support
- The bone marrow
 - The key to the diagnosis

Bone Marrow Aspiration



Next

- The plan
- Dr Larratt AA and PNH
- Dr Zhu MDS

- Questions??