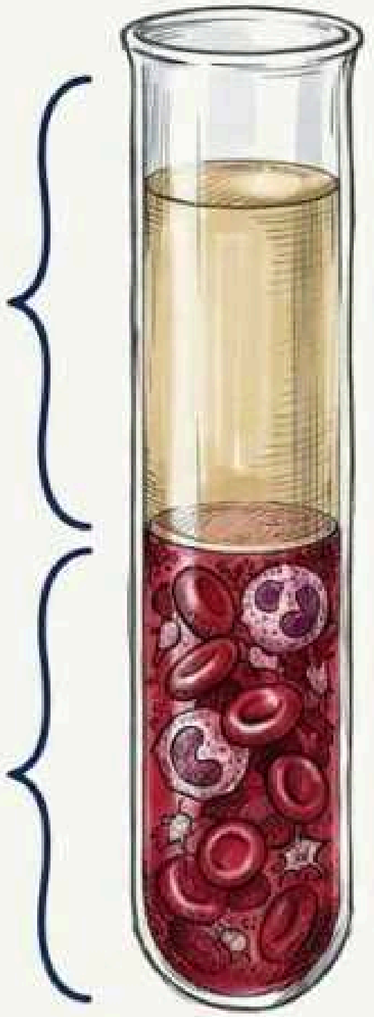
The Components of Whole Blood

¶ 1.1

$\text{Total Blood}_{\text{Adult}} \approx 5\text{L}$ (7–8% Body Weight)

Plasma (>50%)
Straw-coloured fluid.
Proteins, salts, nutrients, hormones, and clotting factors.

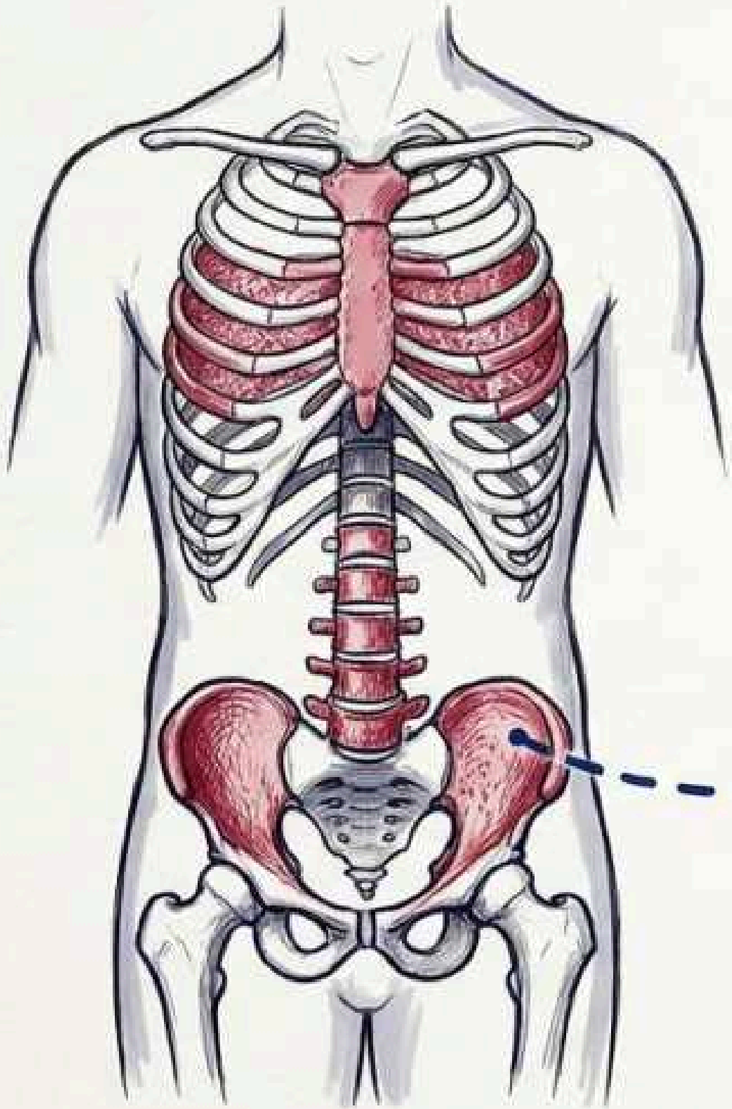
Cells (<50%)
Red cells, white cells, and platelets.

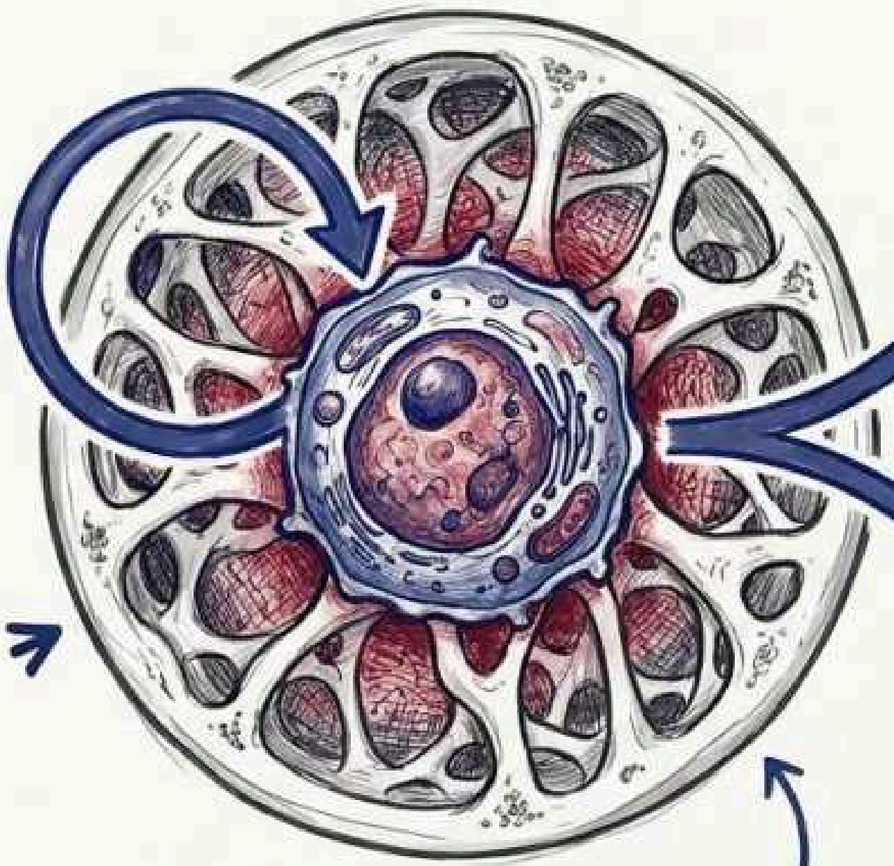


Gemini Notebook

Haematopoiesis Inside the Marrow Factory

¶ 1.2





Self-Renewal

Differentiation into every type of blood cell

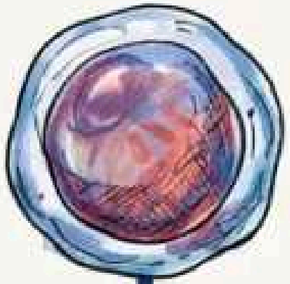
The soft tissue inside

Gemini Notebook

Two Main Lineages Arise from the Stem Cell

¶ 1.3

Haematopoietic Stem Cell



Makes 100s of billions of new cells each day.

Myeloid Family

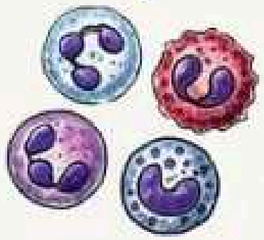
Lymphoid Family



Red Cells



Platelets



White Cells



Lymphocytes

[Immune System – Ref: Medicine 504 B]

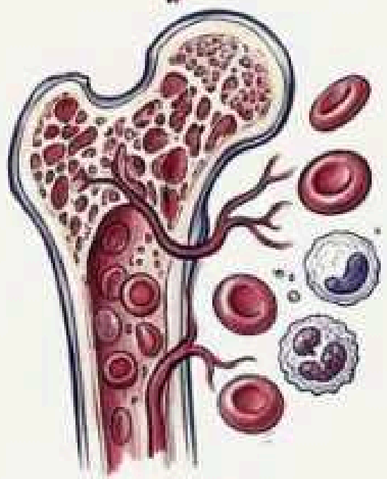
Gemini Notebook

Growth Factors Regulate the Production Pipeline

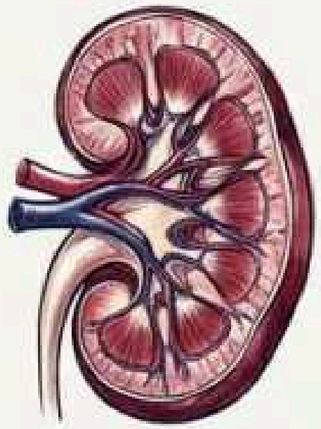
¶ 1.4

Stimulus

↓ O_2 Delivery



Target/Effect
Drives red cell production to restore O_2



Sensor/Producer
(Ref: Medicine 523 B)

Erythropoietin (EPO)

Signal

Other Growth Factors → drive white cells & platelets.

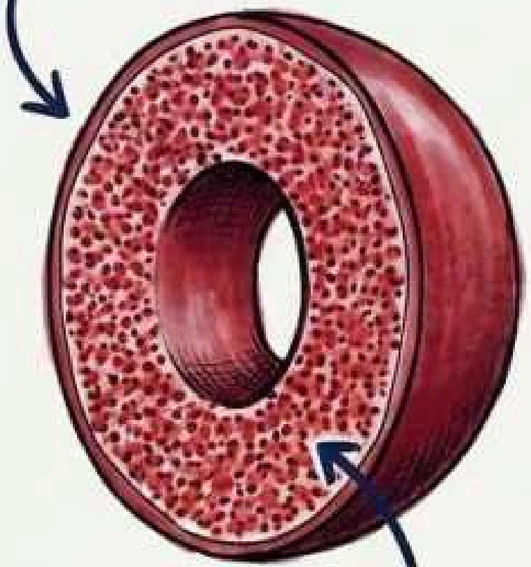
Clinical Application: Synthesized as drugs to boost white cell counts after chemotherapy.

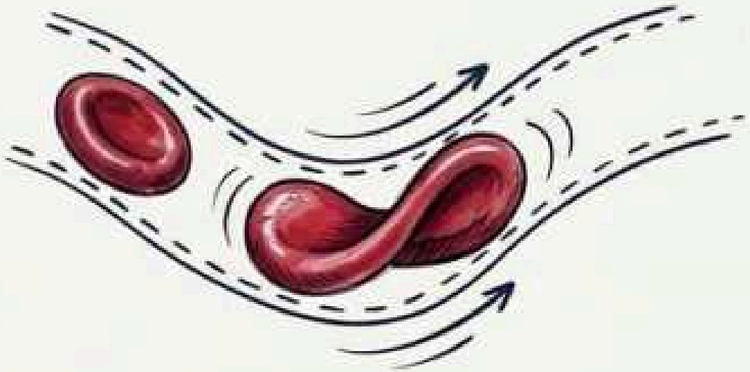
Gemini Notebook

Erythrocytes are Specialized Oxygen Transporters

¶ 1.5



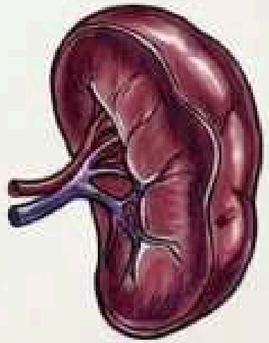




Function = O_2 Transport
(via Haemoglobin)

Day 0

Day 120



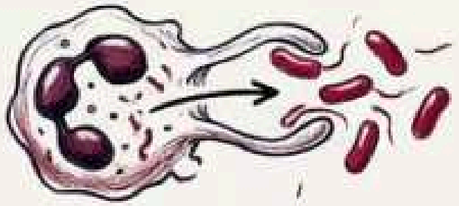
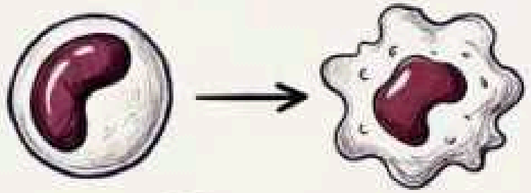
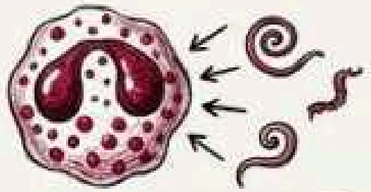
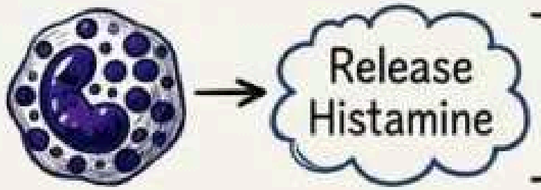
Removal Site

Gemini Notebook

Five Distinct Leukocytes Provide Cellular Defense

¶ 1.6

Counts change in characteristic ways in different illnesses.

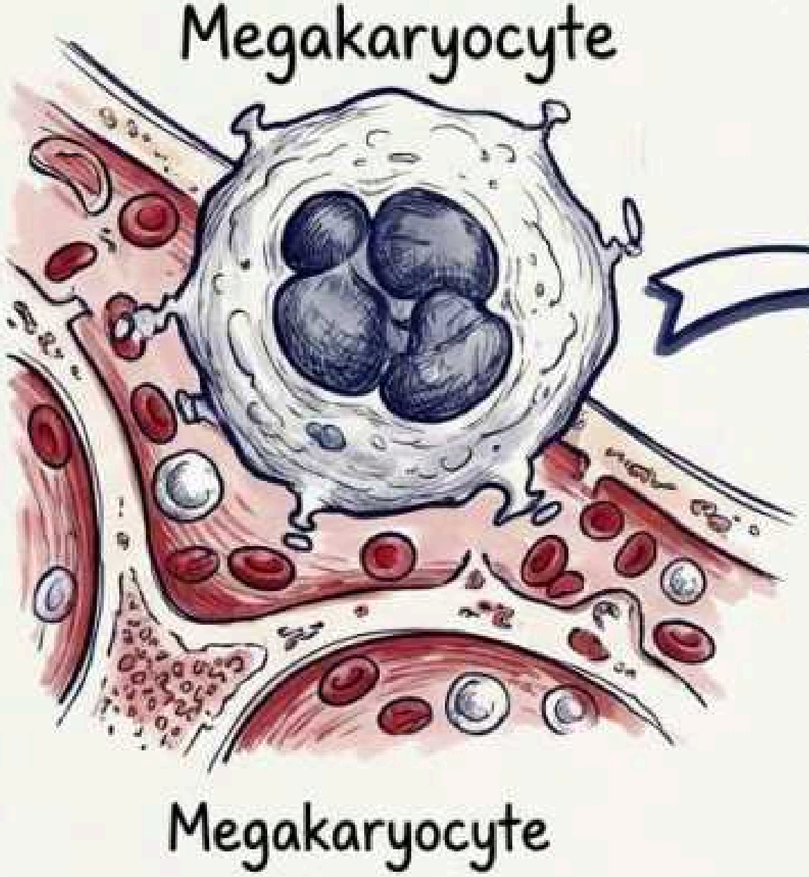
Neutrophils (Most numerous)		Kill bacteria
Lymphocytes		Directs specific immune responses
Monocytes		Blood (Monocyte) → Tissue (Macrophage)
Eosinophils		Responds to parasites and allergy triggers
Basophils		Basophil → Release Histamine

Gemini Notebook

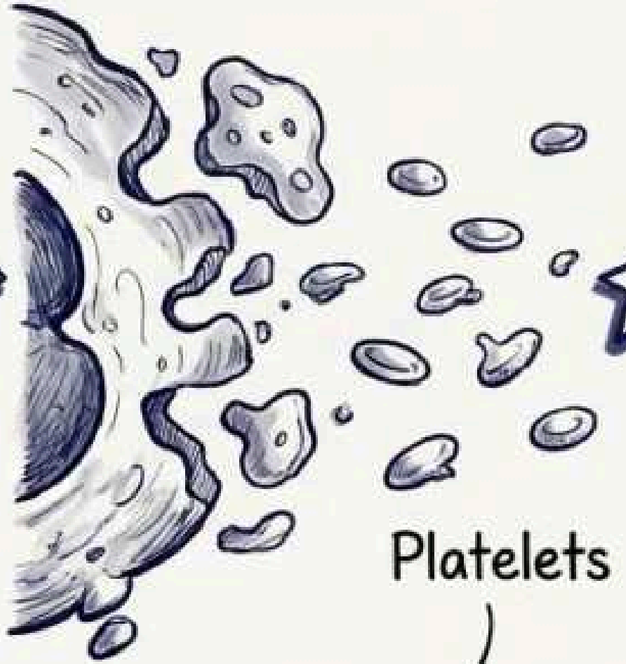
Platelets Orchestrate Primary Haemostasis

¶ 1.7

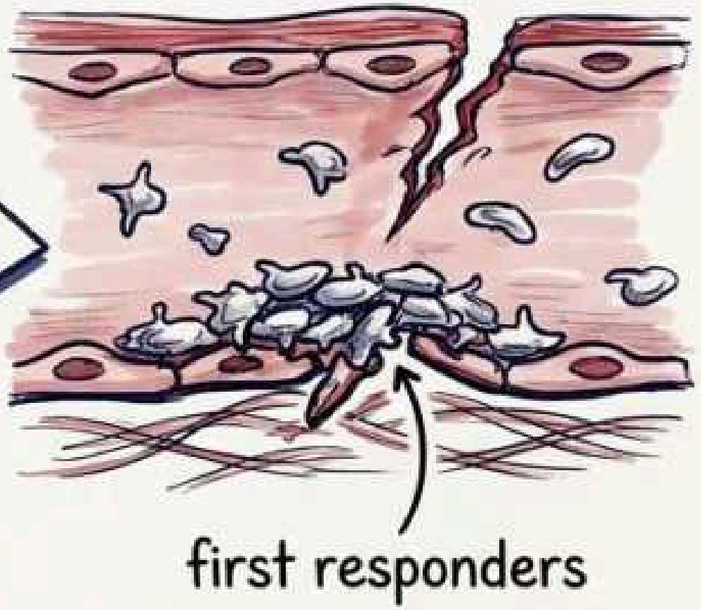
Origin



Fragmentation



Action



Details on plug formation covered in Lecture 4.

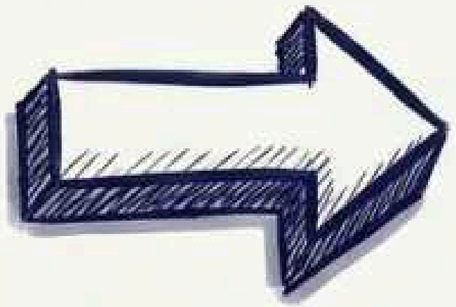
Gemini Notebook

The Full Blood Count Measures the Cellular Profile

¶ 1.8

- Haemoglobin level
- Red cell count
- White cell count
- Platelet count

MCV (Mean Cell Volume)
= Average size of red cells



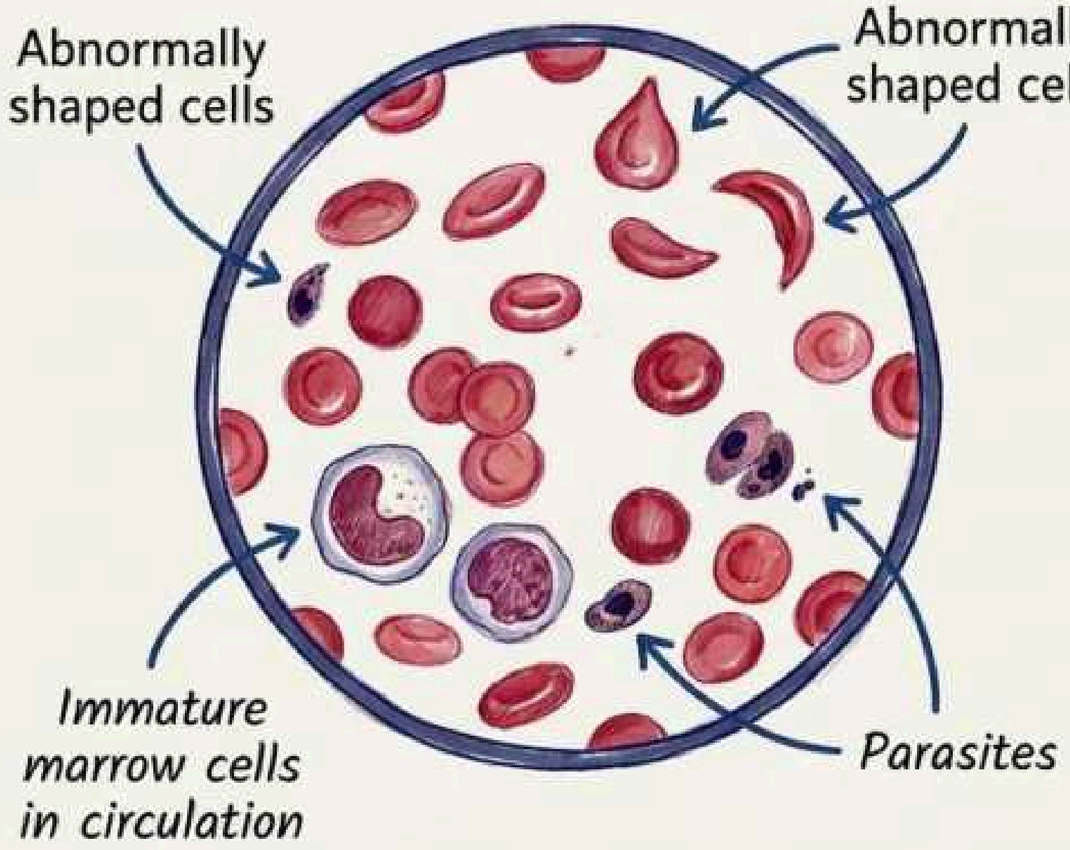
Crucial for sorting causes of Anaemia (Preview: Next Lecture).

Gemini Notebook

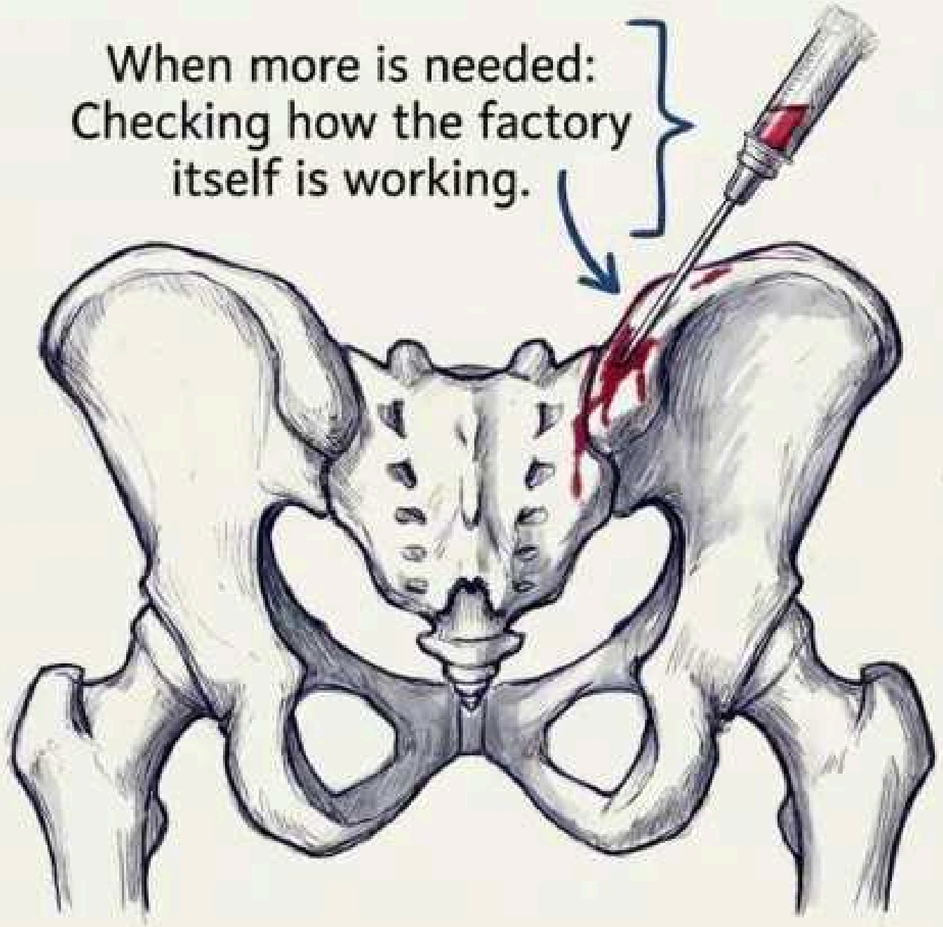
Visual Diagnostics Reveal What Machines Miss

¶ 1.9

The Product: Blood Film



The Factory: Bone Marrow Biopsy



Gemini Notebook

Pancytopenia Signals a Systemic Marrow Failure

¶ 1.10

↓ RBC → Tiredness (Anaemia)

+

↓ WBC → Infections

+

↓ Platelets → Bleeding

=

PANCYTOPENIA

(All three cell lines fall simultaneously)

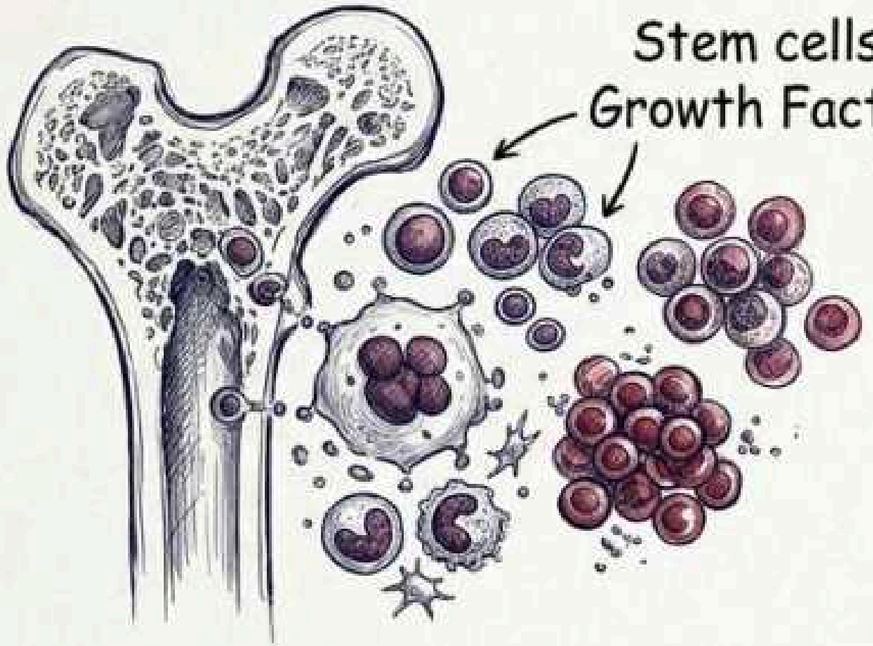
Underlying Causes:

- Primary marrow failure
- Infiltration by cancer
- Specific drugs
- Severe vitamin deficiencies

Gemini Notebook

The Diagnostic Foundation for Understanding Anaemia

¶ 1.11



Stem cells +
Growth Factors

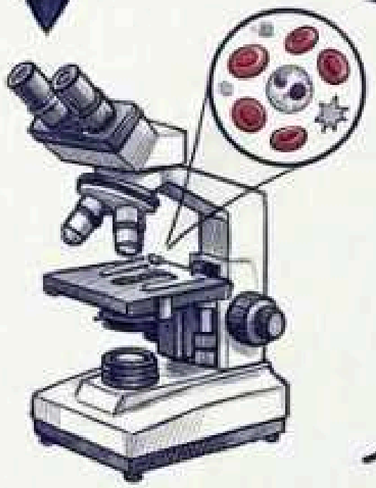
Plasma

Cells

Blood Film

FBC





The
Haematologist's
First Tools.

Next Lecture: Anaemia (The commonest blood problem).

Gemini Notebook