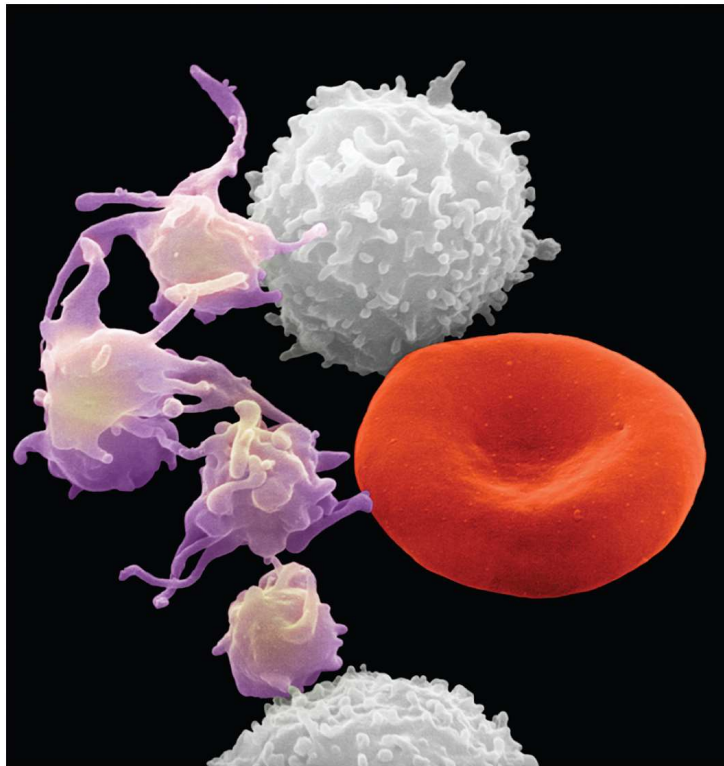


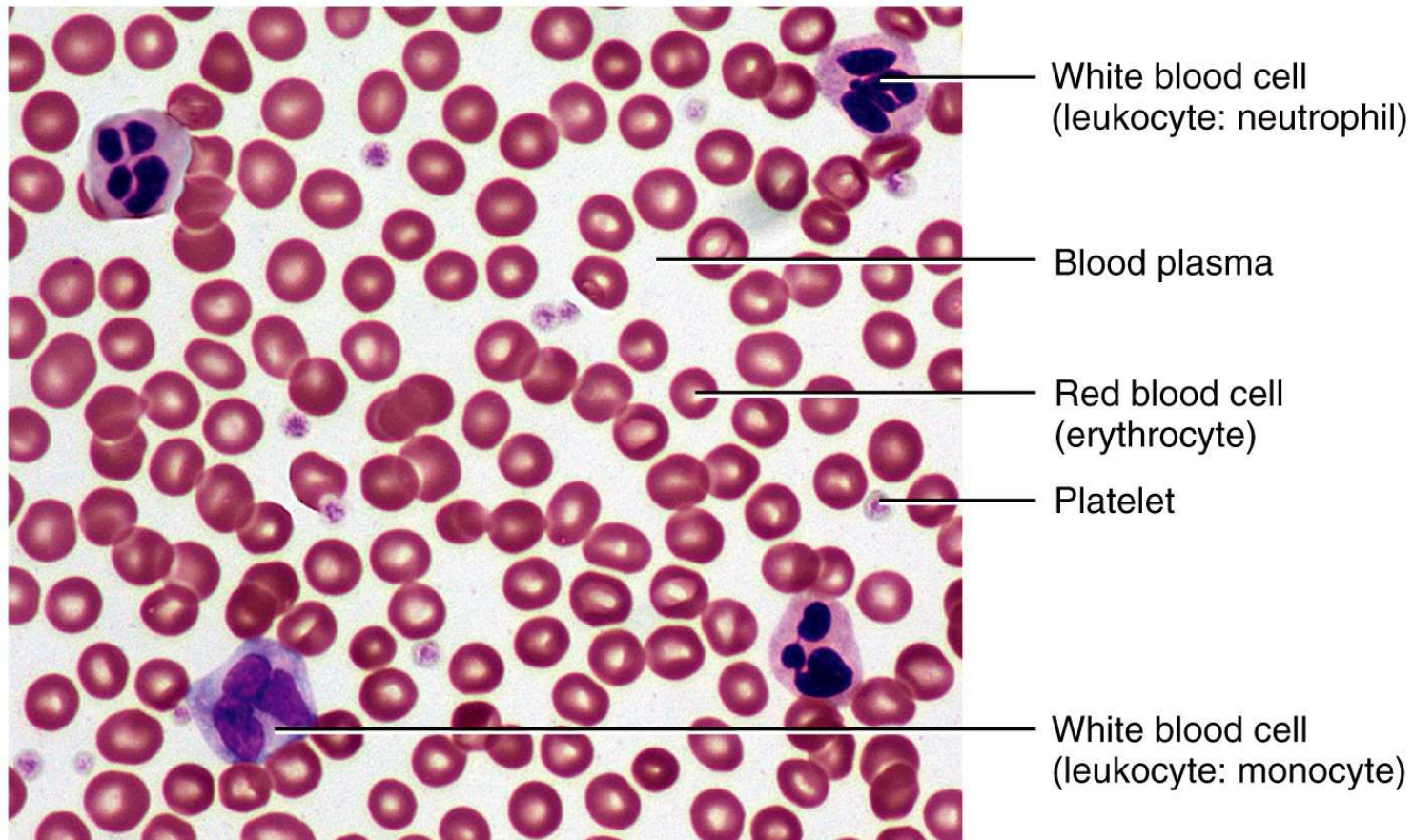
Hemopoiesis

(Erythropoiesis and Leukopoiesis)



Hemopoiesis is the Production of the Formed Elements

Where are they formed? How are they formed? Why are they formed?



Mark Nielsen

LM 400x

(b) Blood smear (thin film of blood spread on a glass slide)





Hemopoiesis

- **Hemopoiesis** = the production of the blood (especially its formed elements)
 - **Red bone marrow produces all nine formed elements** /// hemopoietic tissues is producer of blood cells (WBC / RBC / Platelets)
 - embryonic development from yolk sac = embryonic structure - produces stem cells for first blood cells // stem cells colonize fetal bone marrow, liver, spleen and thymus
 - liver stops producing blood cells at birth
 - spleen remains involved with lymphocyte production after birth
- Adult daily production
 - 400 billion platelets
 - 200 billion RBCs
 - 10 billion WBCs


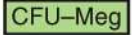
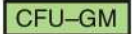
Hemopoiesis

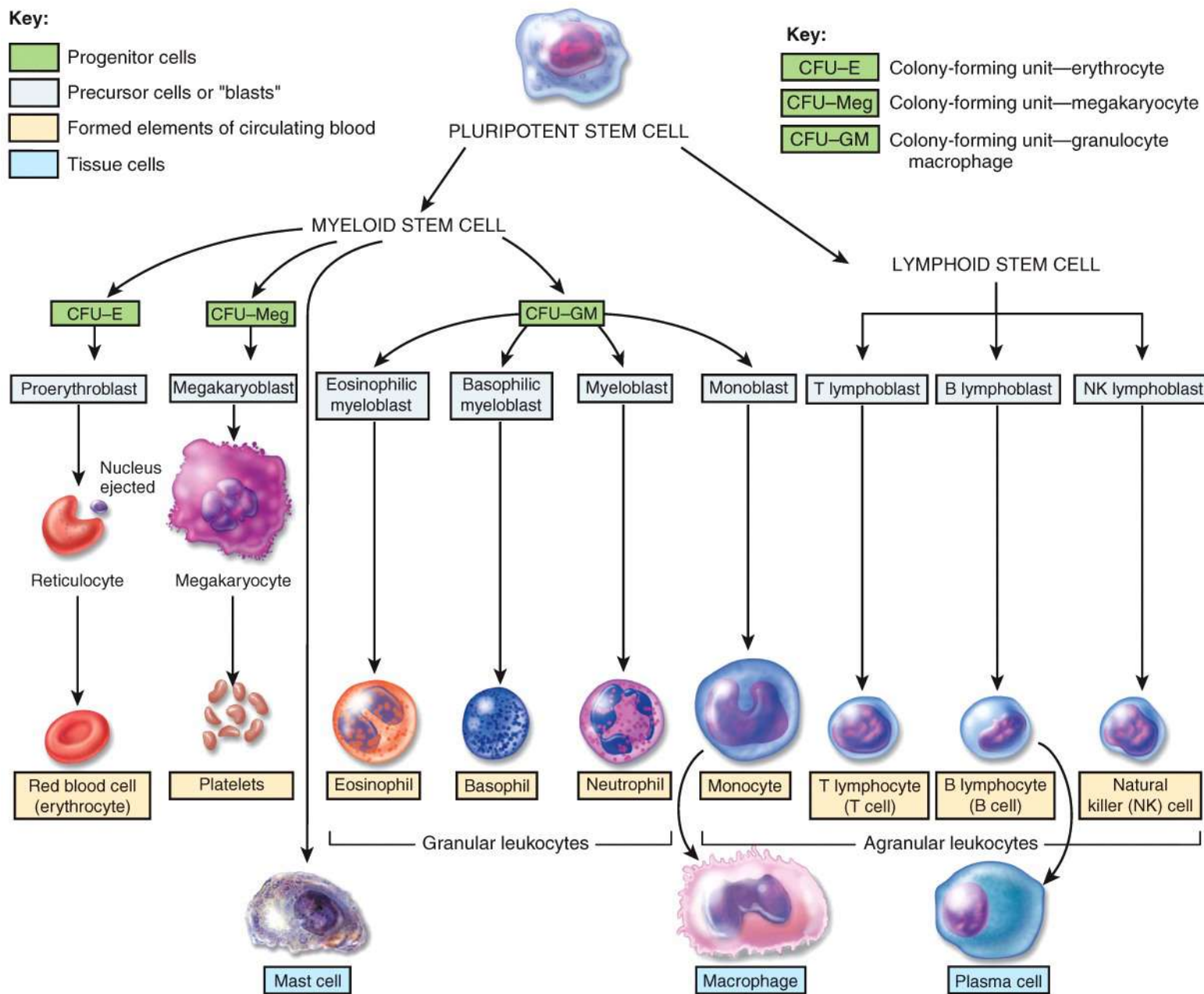
- pluripotent stem cells (PPSC) // formally called hemocytoblasts or hemopoietic stem cells // PPSC generate specific colony forming units for each formed element
- colony forming units – specialized stem cells only producing one class of formed element of blood
- myeloid hemopoiesis – blood formation in the red bone marrow (note: sometimes called myeloid tissue or hemopoetic tissue)
- lymphoid hemopoiesis – describes blood formation in the lymphatic organs

Key:

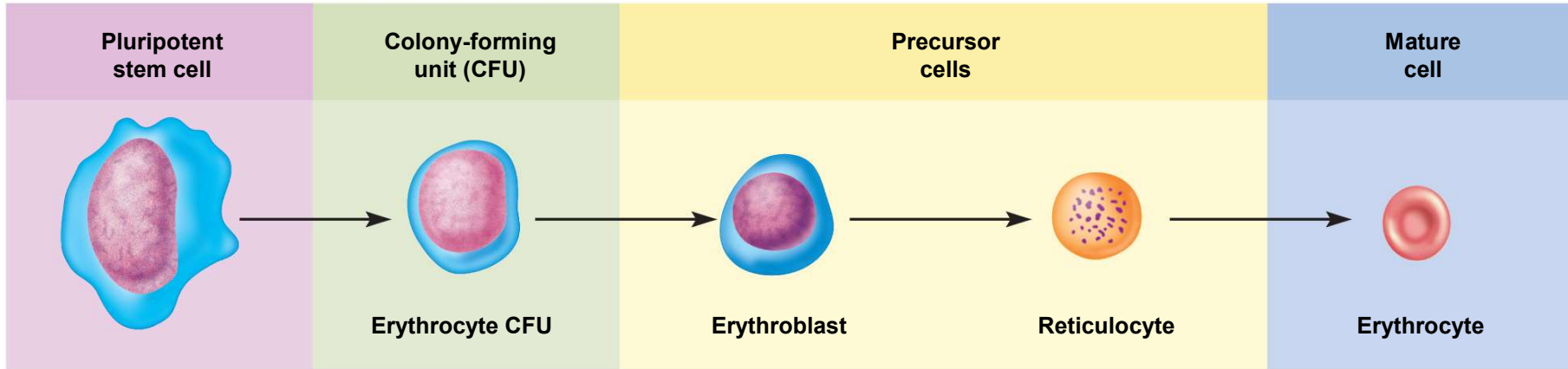
-  Progenitor cells
-  Precursor cells or "blasts"
-  Formed elements of circulating blood
-  Tissue cells

Key:

-  CFU-E Colony-forming unit—erythrocyte
-  CFU-Meg Colony-forming unit—megakaryocyte
-  CFU-GM Colony-forming unit—granulocyte macrophage



Erythropoiesis



Production of RBC

3 to 5 days to complete

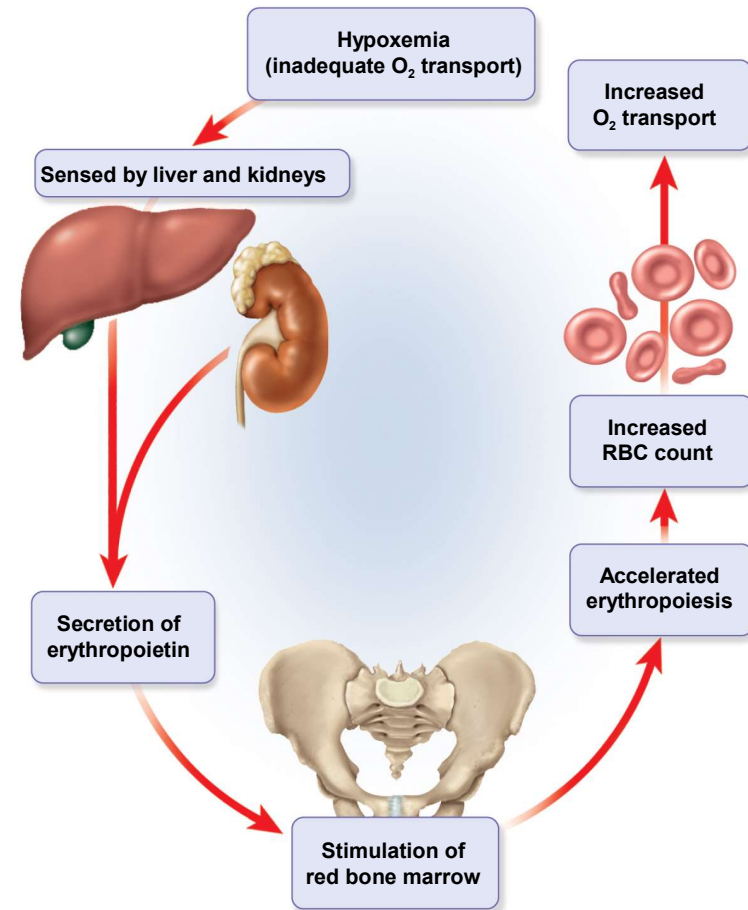
Regulatory mechanism stimulus = hypoxia

Hypoxia signals kidney to release erythropoietin (hormone)

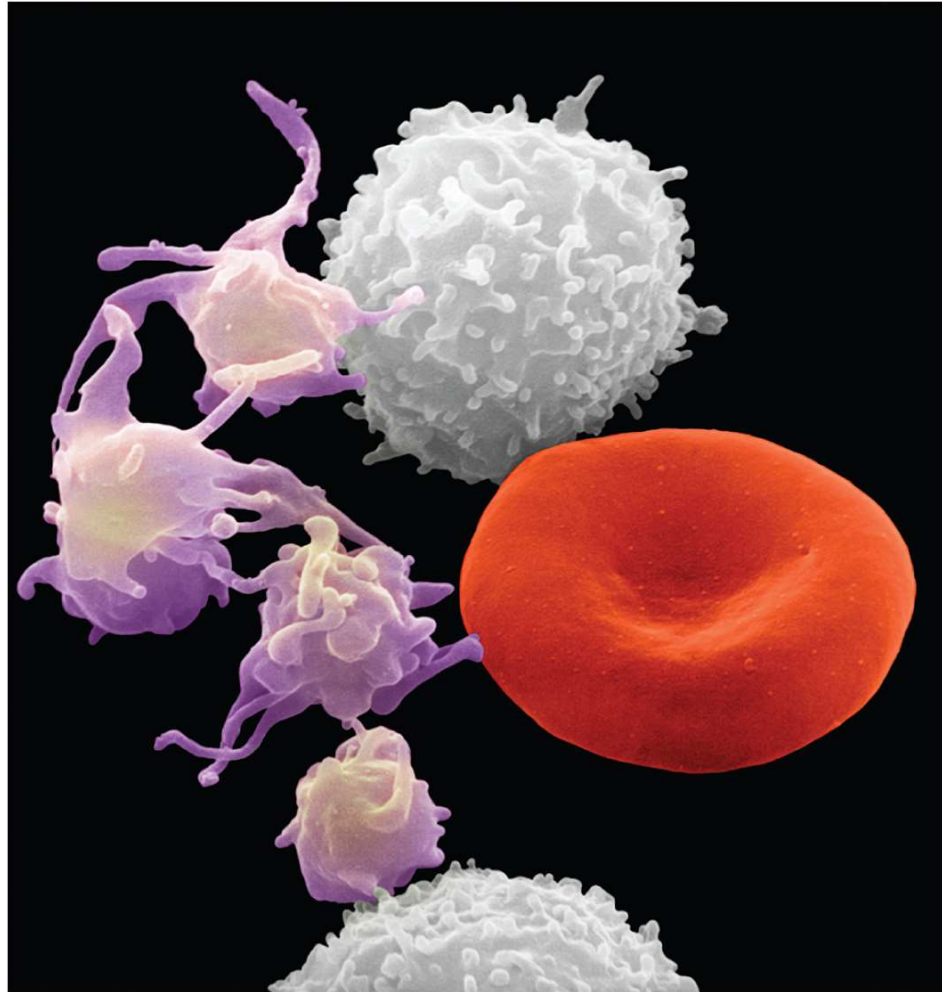
Hormone receptors on erythrocyte CFU

Regulating Erythrocyte Homeostasis

- negative feedback regulation
 - A drop in RBC count causes **hypoxemia** // the stimulus for kidneys
 - kidney produces **erythropoietin** // hormone // stimulates RBC-CFU
 - RBC count increases in 3 - 5 days
- stimulus **causing** erythropoiesis
 - low levels O_2 (hypoxemia) results from
 - high altitude
 - increase in exercise
 - loss of lung tissue as in emphysema



Leukopoiesis







Leukopoiesis

- leukopoiesis – production of white blood cells
- pluripotent stem cells (PPSCs) // produce all formed elements including the leukocytes (WBC)
 - myeloblasts – form neutrophils, eosinophils, basophils
 - monoblasts - form monocytes
 - lymphoblasts give rise to all forms of lymphocytes
- red bone marrow produce, stores and releases all granulocytes , monocytes (agranulocyte)
- B cells // a type of lymphocyte // born in red bone marrow, matures and released from RB marrow
- T lymphocytes born in red bone marrow but complete development in thymus

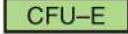
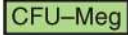
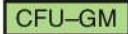
Leukocytes (WBCs)

- WBC least abundant of all the formed elements // 5,000 to 10,000 WBCs/ μ L
- Primary function = protect against infectious microorganisms and other pathogens
- WBCs have conspicuous nucleus
- Spend only a few hours in the blood stream before migrating out of blood and into connective tissue (i.e. reticuloendothelial system)
- Retain their organelles for protein synthesis

Key:

-  Progenitor cells
-  Precursor cells or "blasts"
-  Formed elements of circulating blood
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