

Komposisi dan Fungsi Darah 1

Plasma, sel darah dan platelet, kontrol hormonal terhadap produksi eritrosit, transport oksigen

HEMATOPOIESIS (*Cellular lineage- growth factors*)



Herwi

Komponen, jumlah relatif dan fungsi darah

Protein plasma (50 % - 60 % dari vol total)

1. Air 91%- 92% dr volume plasma

Fungsi : pelarut

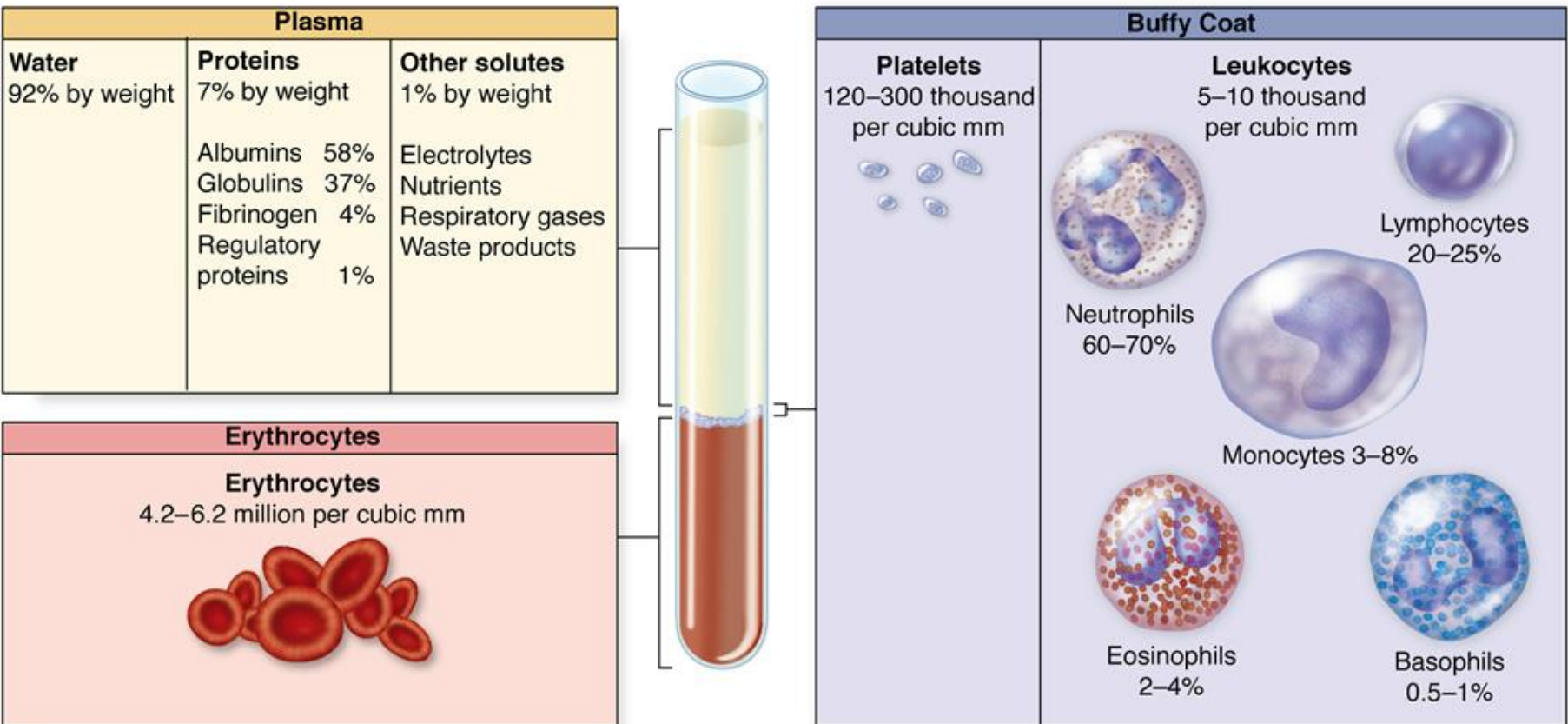
2. Protein plasma (albumin, globulin, fibrinogen dll) 7%-8%

Fungsi : Pertahanan, transport lipid, berperan pada pengaturan volume cairan ekstraselluler

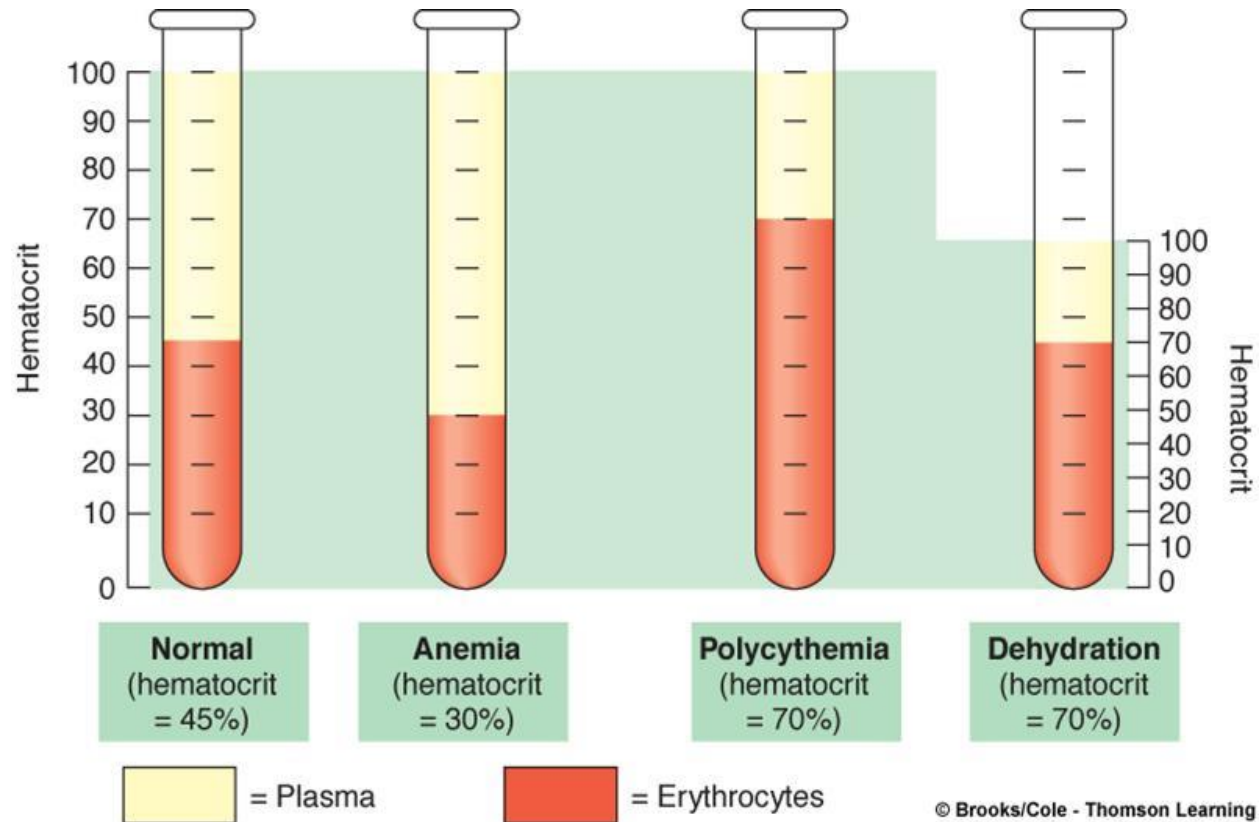
3. Ion, gula, lipid, asam amino, hormon, vitamin dan gas terlarut
1%-2%

Fungsi : Pengaturan cairan ekstraseluler, pH dll

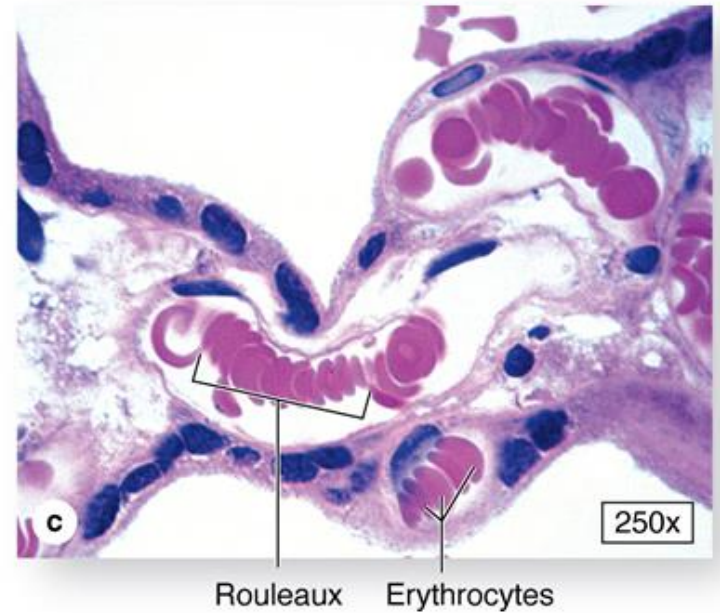
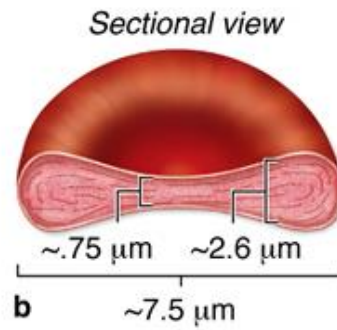
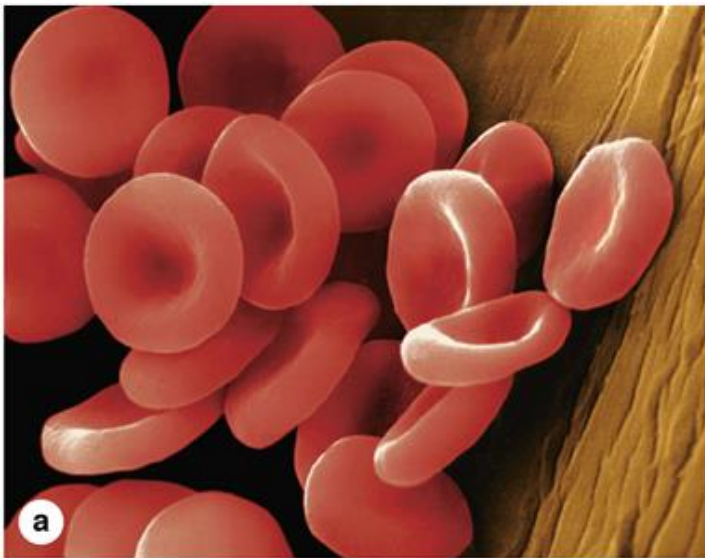
Composition of whole blood



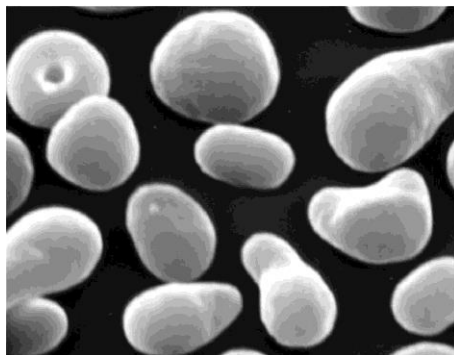
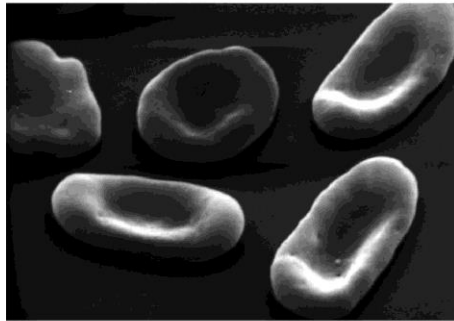
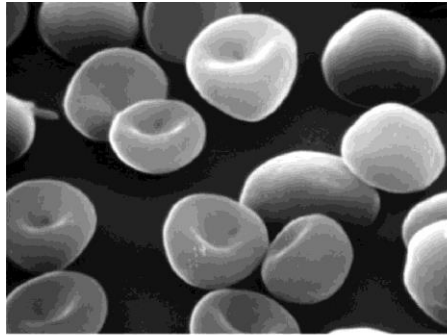
Konsentrasi haemoglobin



Normal human erythrocytes.



Red cell morphology.



Red cell morphology. Hereditary spherocytosis (HS; top panel); nonhemolytic hereditary elliptocytosis (HE; middle panel); elliptocytes, poikilocytes, and fragmented red cells in hemolytic HE (bottom panel).

Mohandas N , and Gallagher P G Blood 2008;112:3939-3948

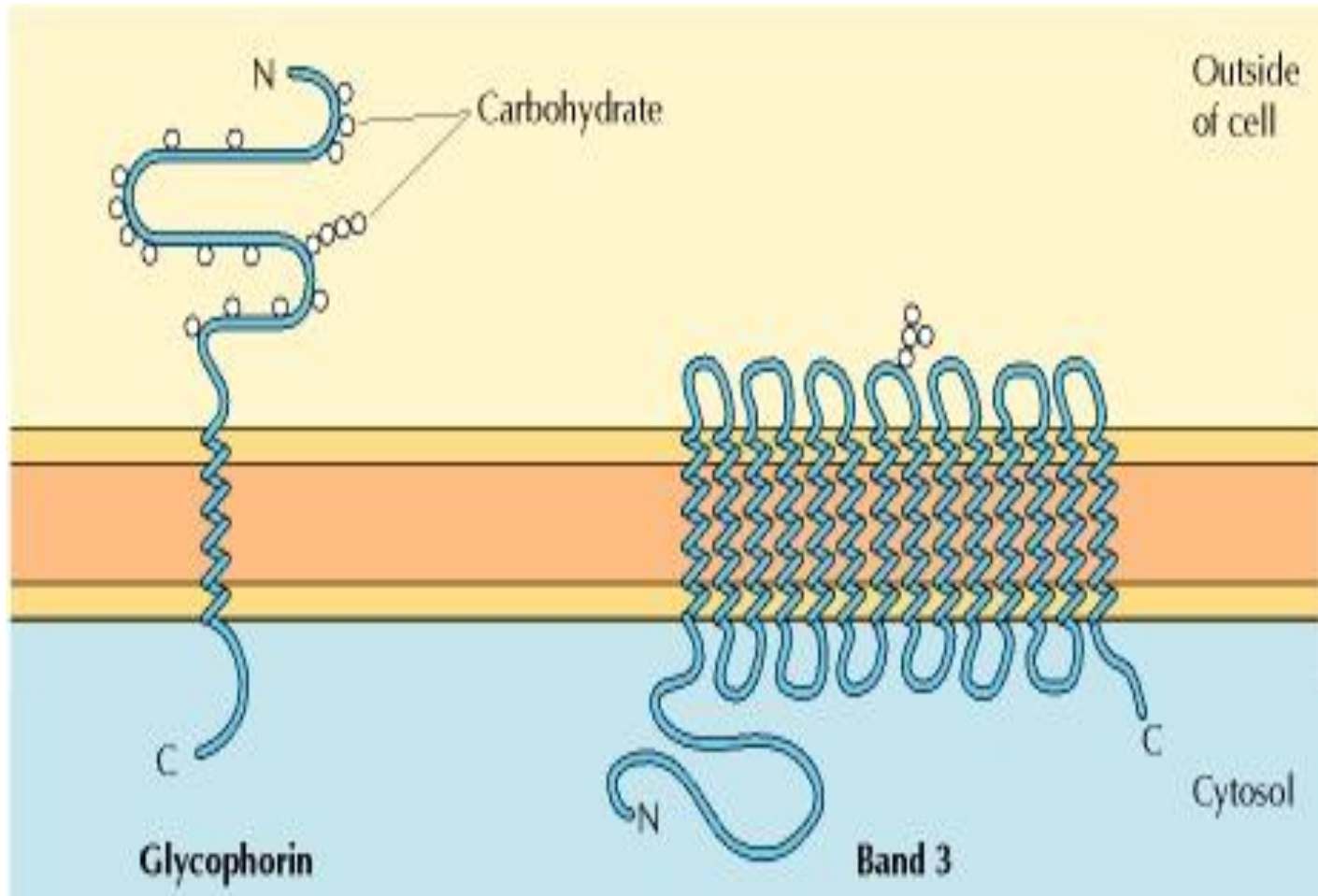
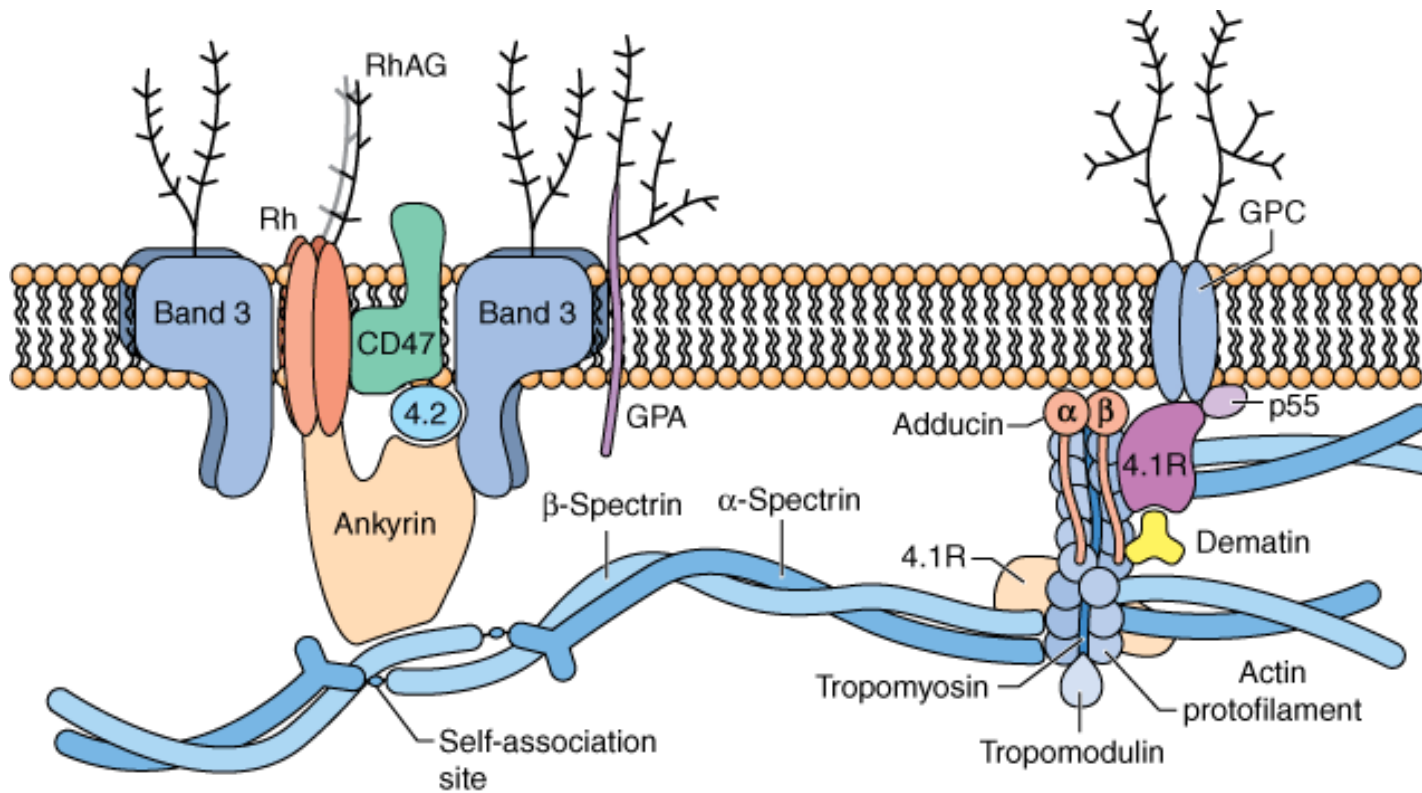


Figure .Integral membrane proteins of red blood cells

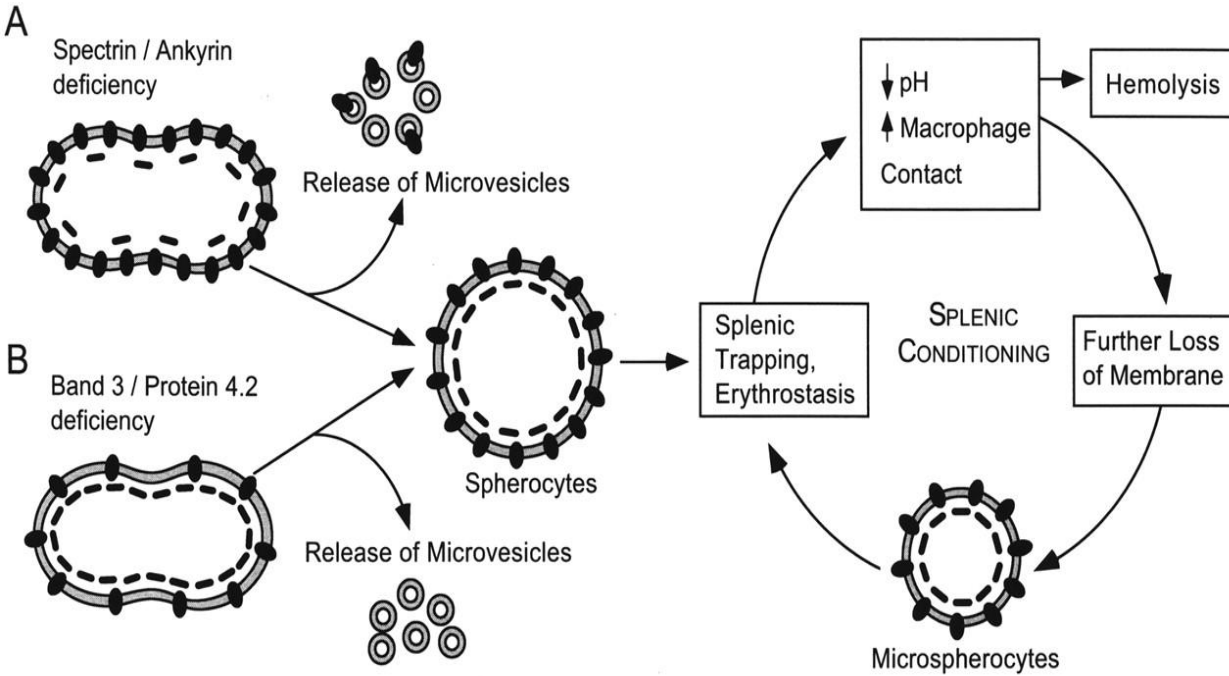
A schematic representation of red cell membrane



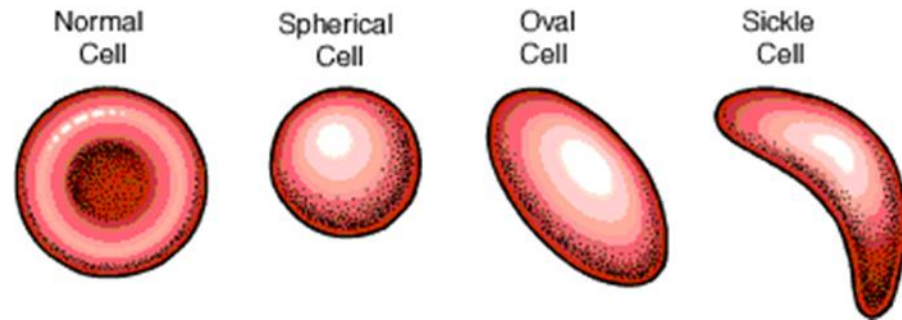
Source: Fauci AS, Kasper DL, Braunwald E, Hauser SL, Longo DL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine*, 17th Edition: <http://www.accessmedicine.com>

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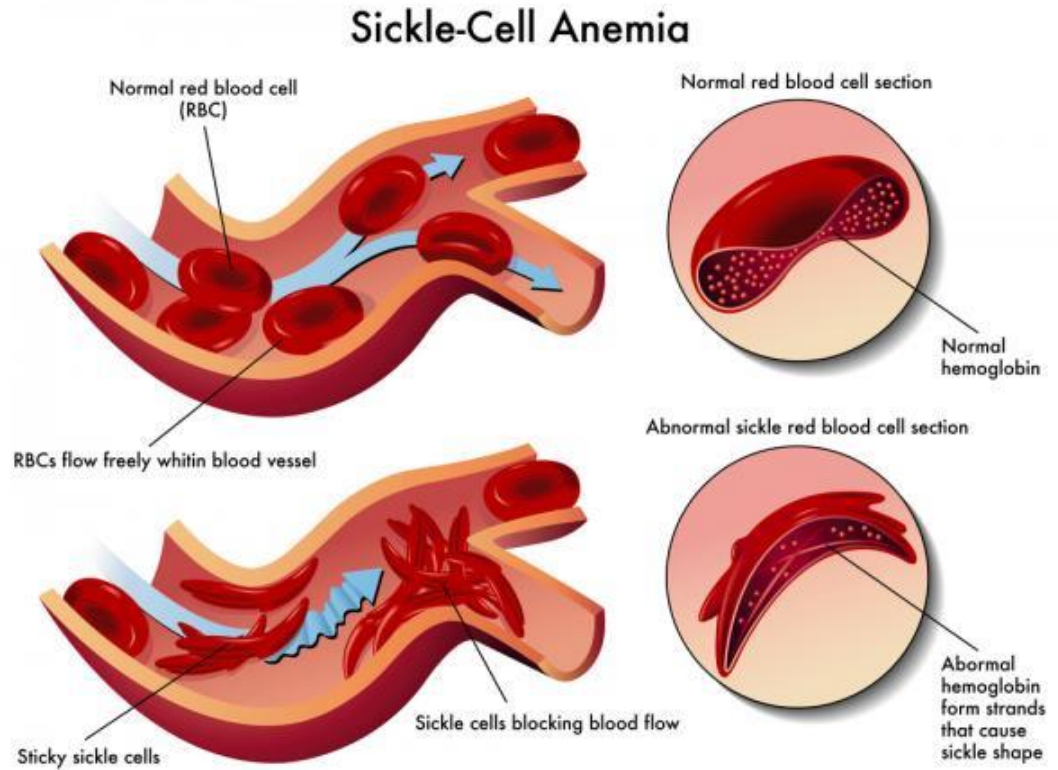
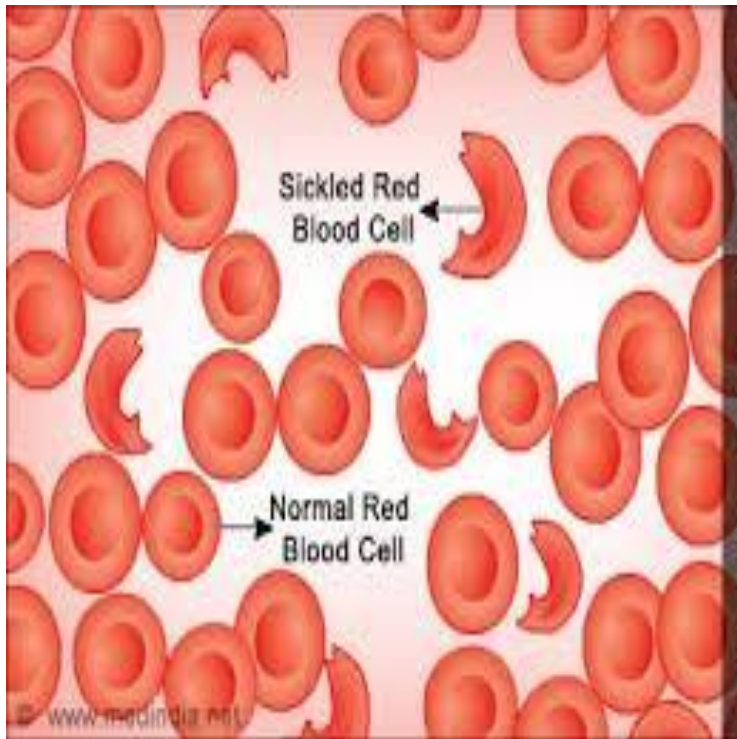
Spherocytosis



Basic Principles and Practice. Hoffman R, Benz EJ Jr, Shattil SJ, et al (eds). 4th ed, WB Saunders, Philadelphia, 2005.

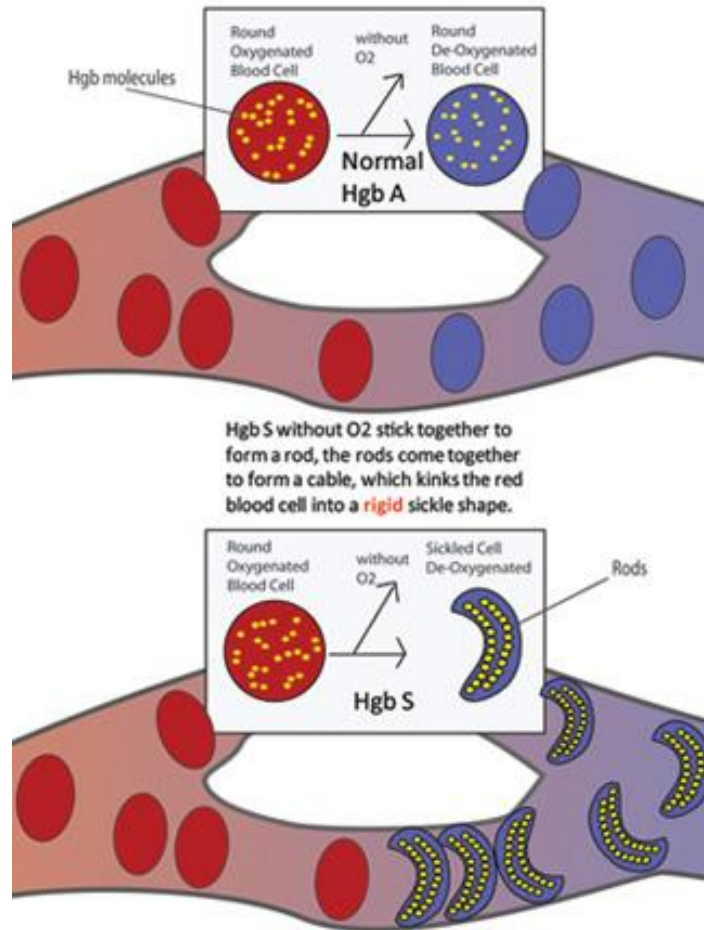


Sickle-Cell Anemia

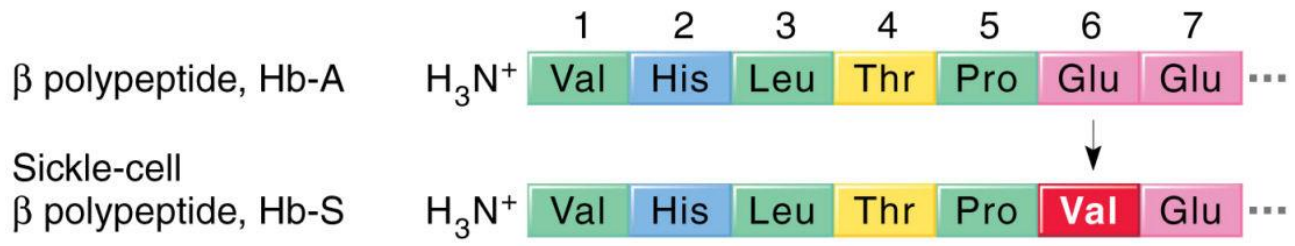
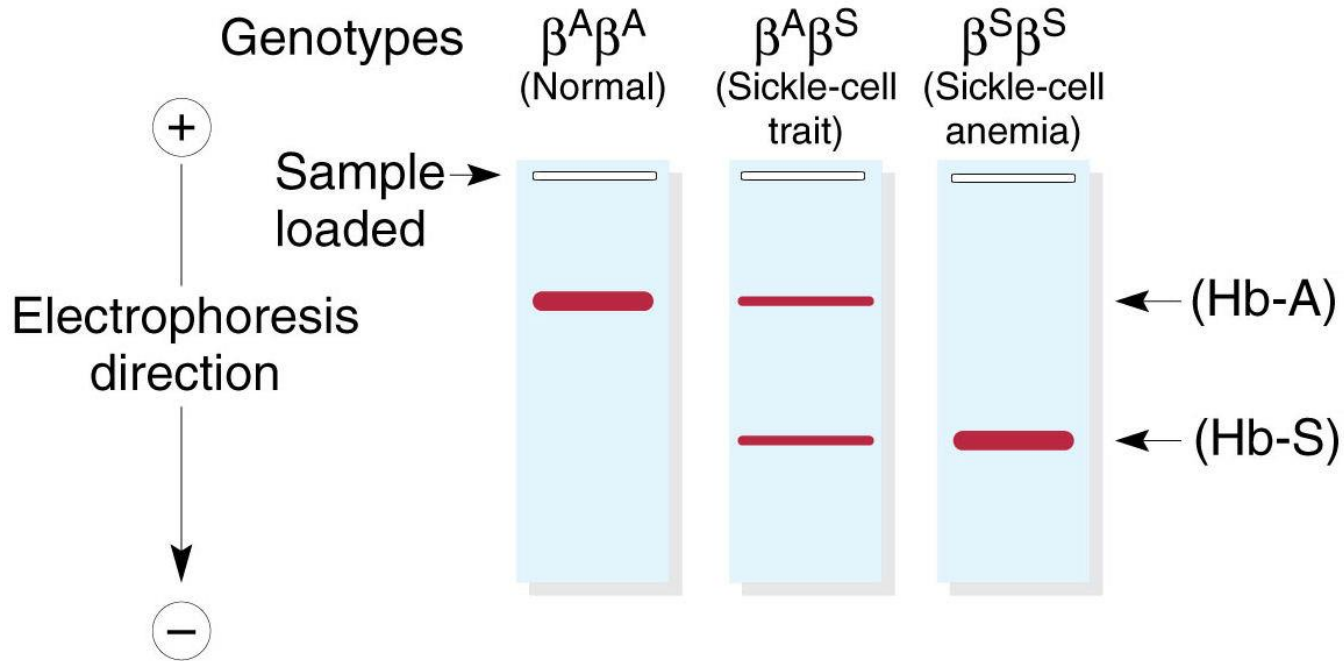


(<http://www.genome.gov/glossary/>)

Normal-sickle cell

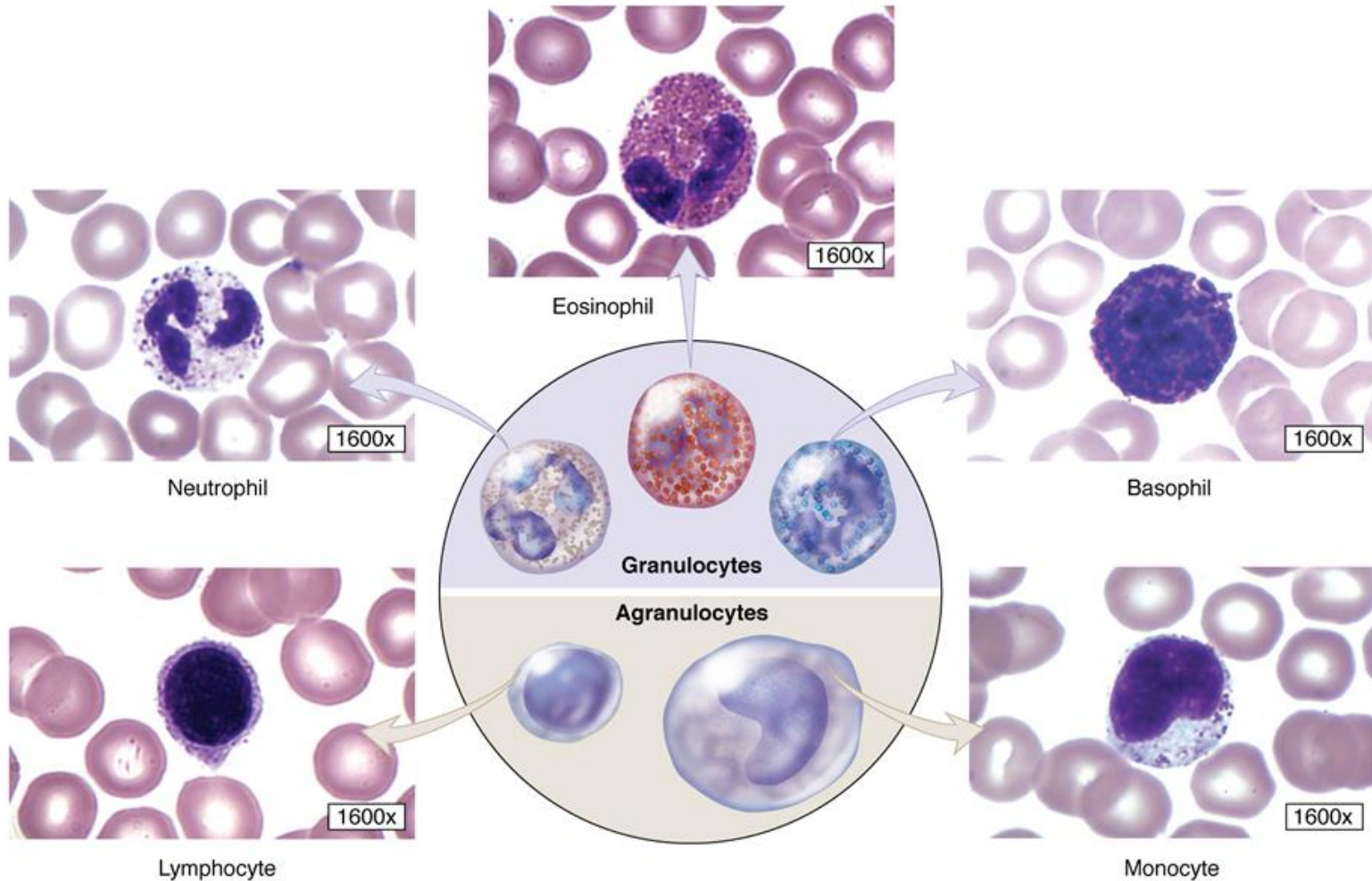


Electrophoretic detection of HbA and HbS proteins

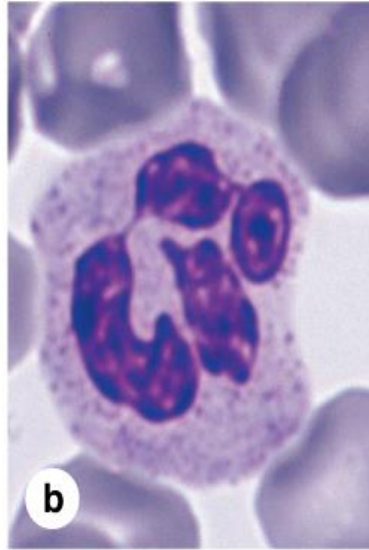
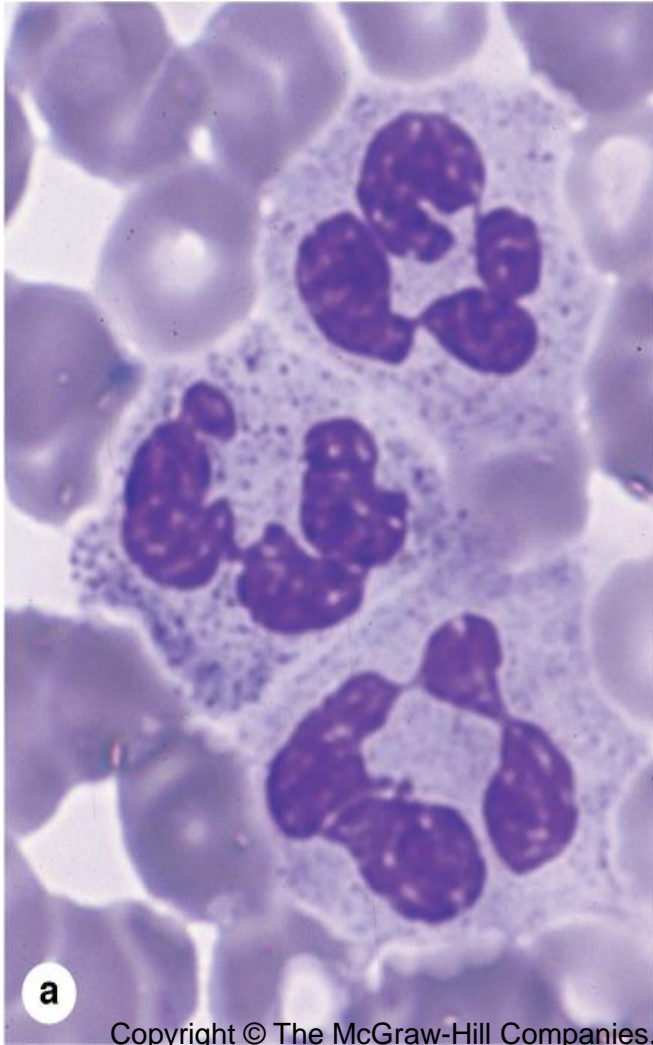


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Five types of human leukocytes

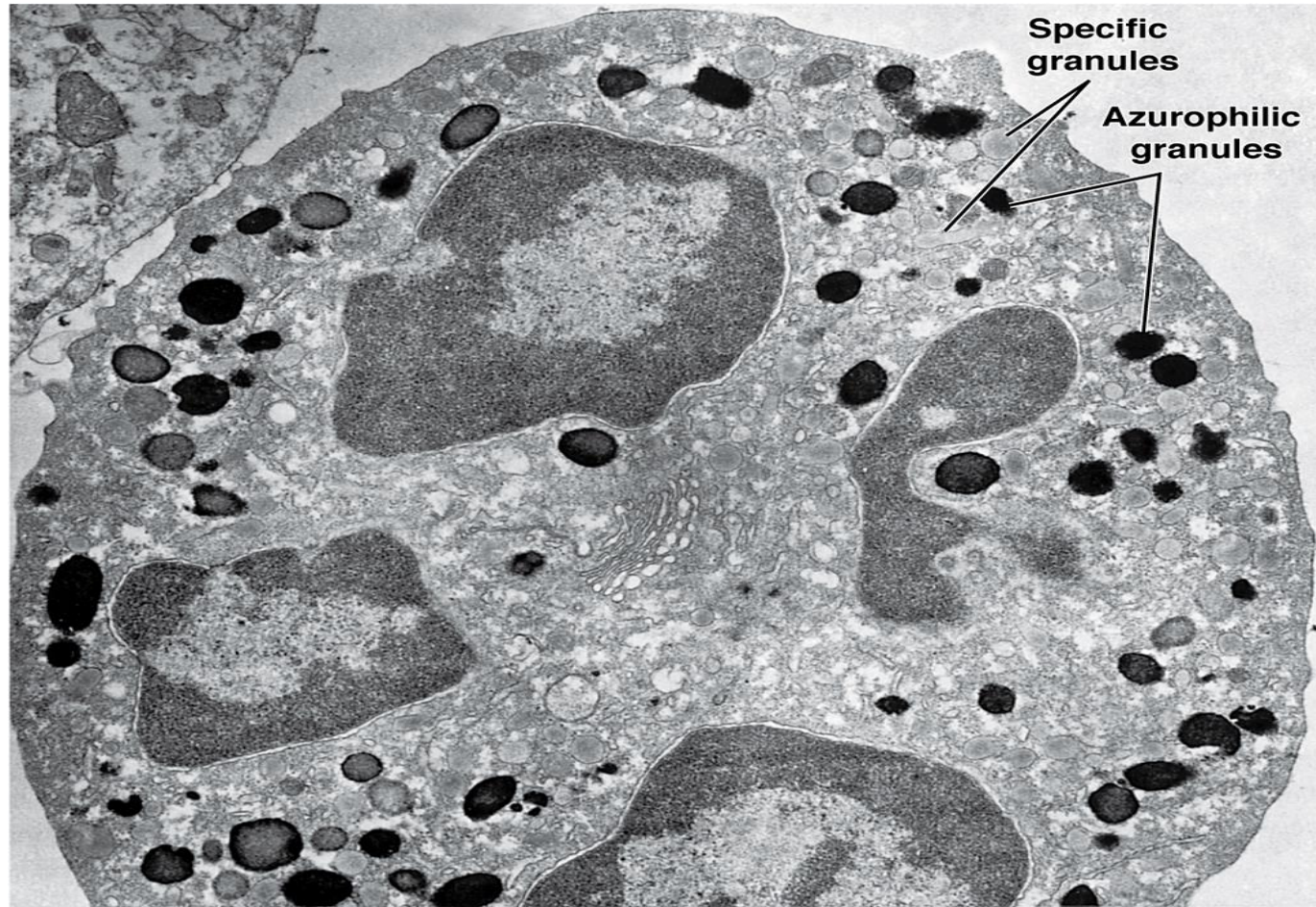


Neutrophils

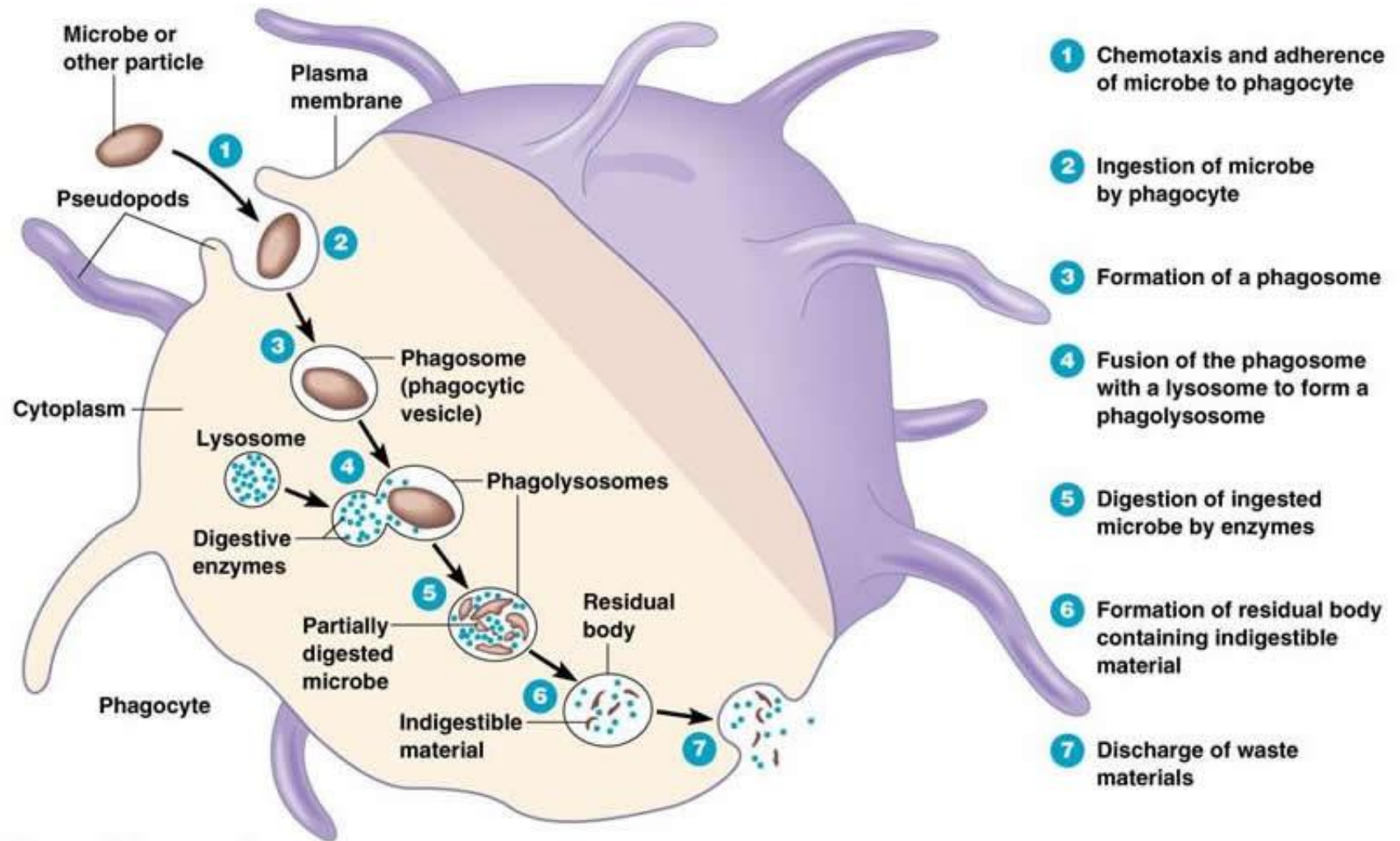


- **Spesifik granula**
- Alkalin fosfatase
- Collagenase
- Lactoferin
- Lisosim
- **Granula azurophil**
- Acid fosfatase
- Arysulfatase
- B glukoronidase
- Lisosim
- defensin

Neutrophil ultrastructure.

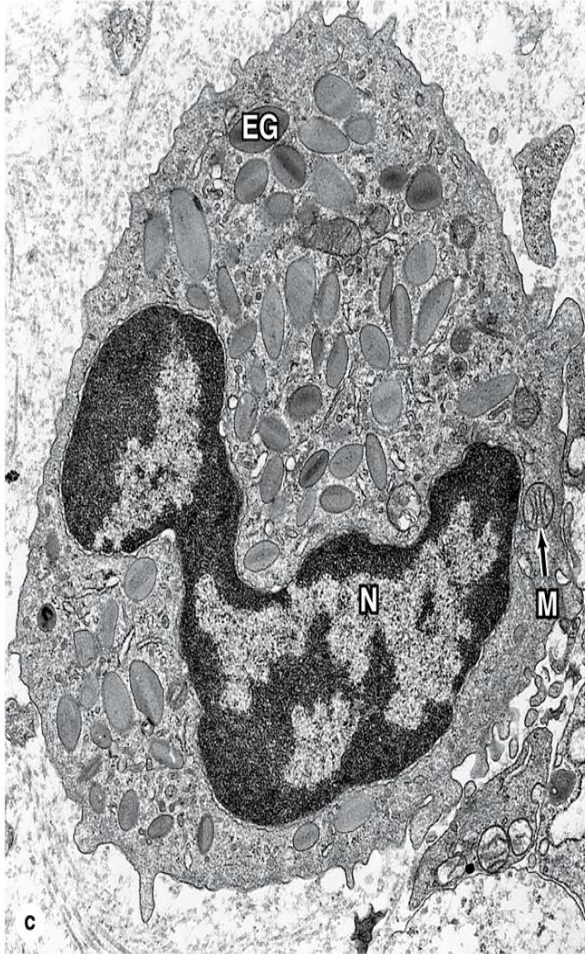
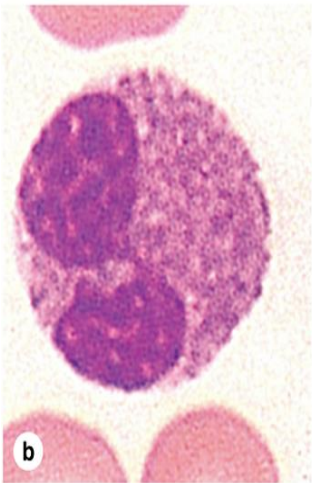
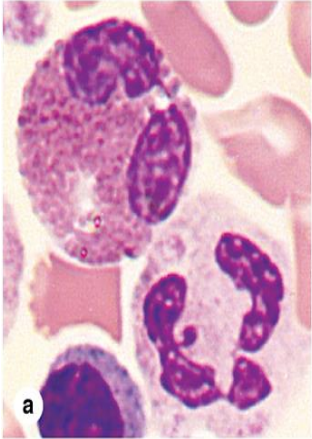


Fagocytosis



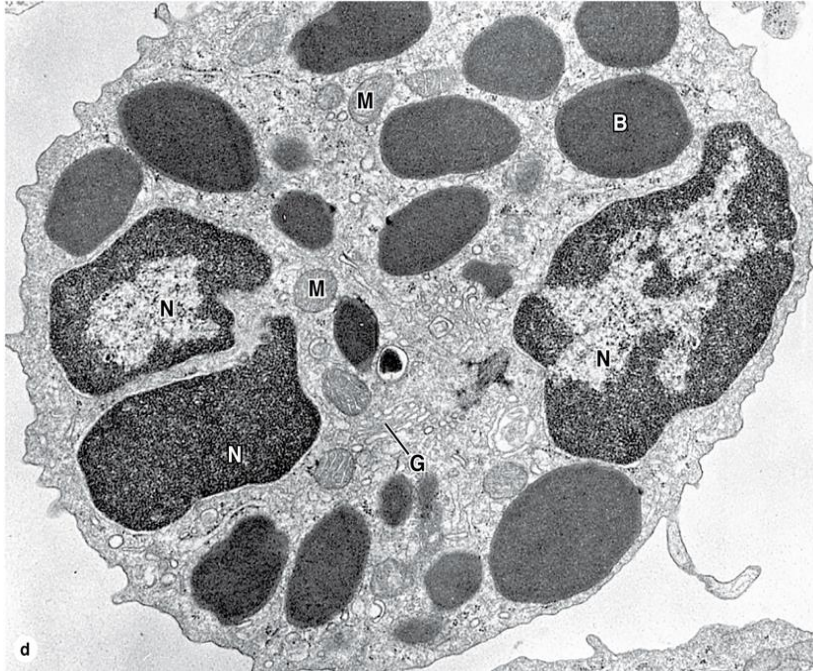
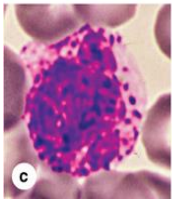
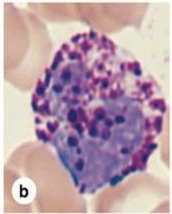
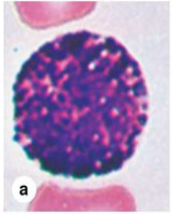
Phases of phagocytosis

Eosinophils



- Granula spesifik
- Acid fosfatase
- Arylsulfatase
- B glukoronidase
- Cathepsin
- Fosfolipase
- RNAase
- Mayor basic protein
- Peroksidase eosinofilik

Basophils

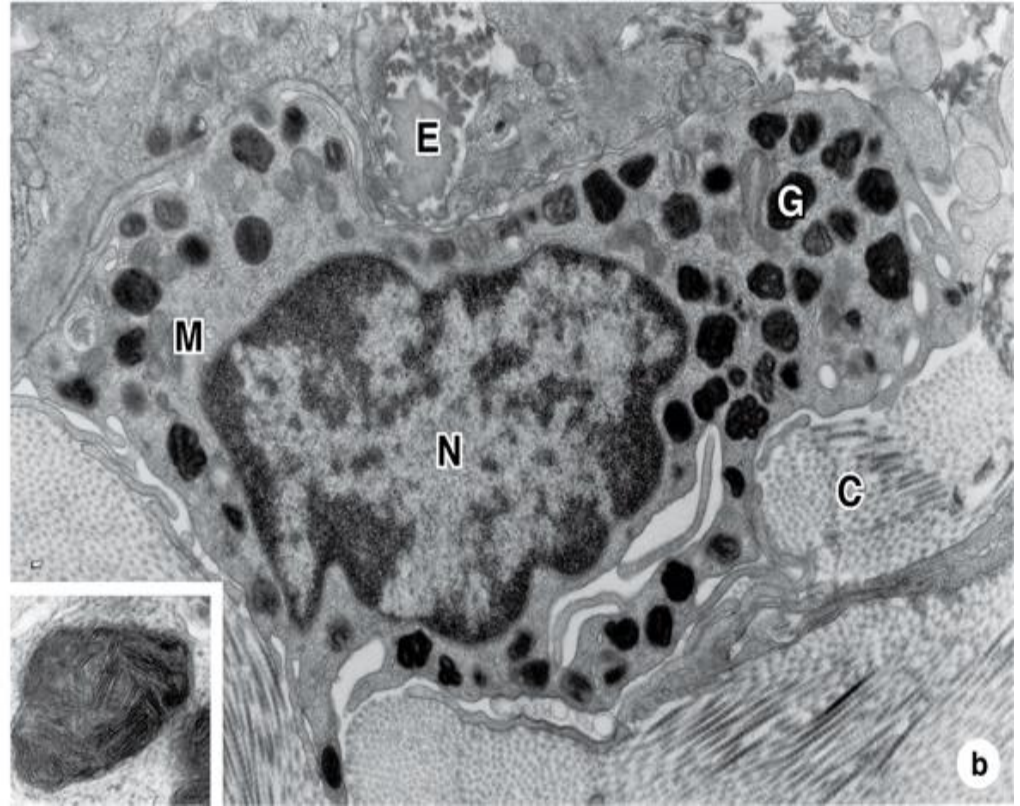
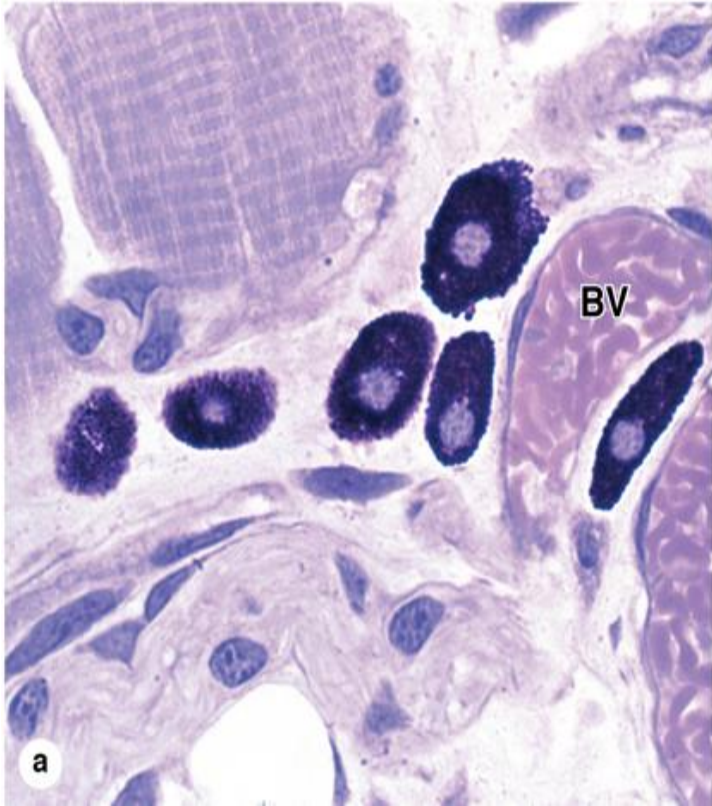


- **Granula spesifik**
- Eosinophilic chematactic factor
- Heparin
- Histamin
- Peroxidase
- Phospholipase A
- Platelet activating factor



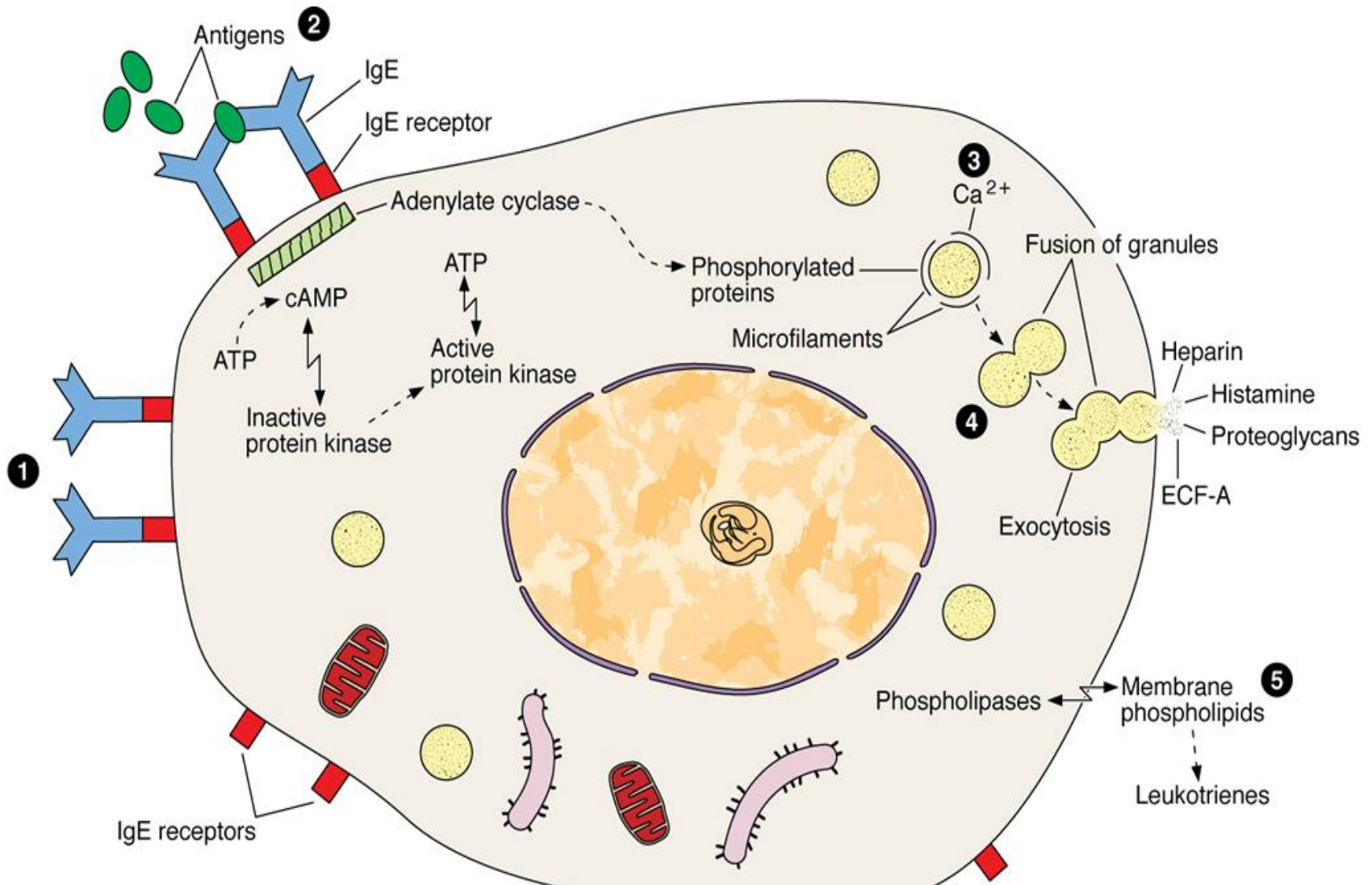
Leukotrin

Mast cells

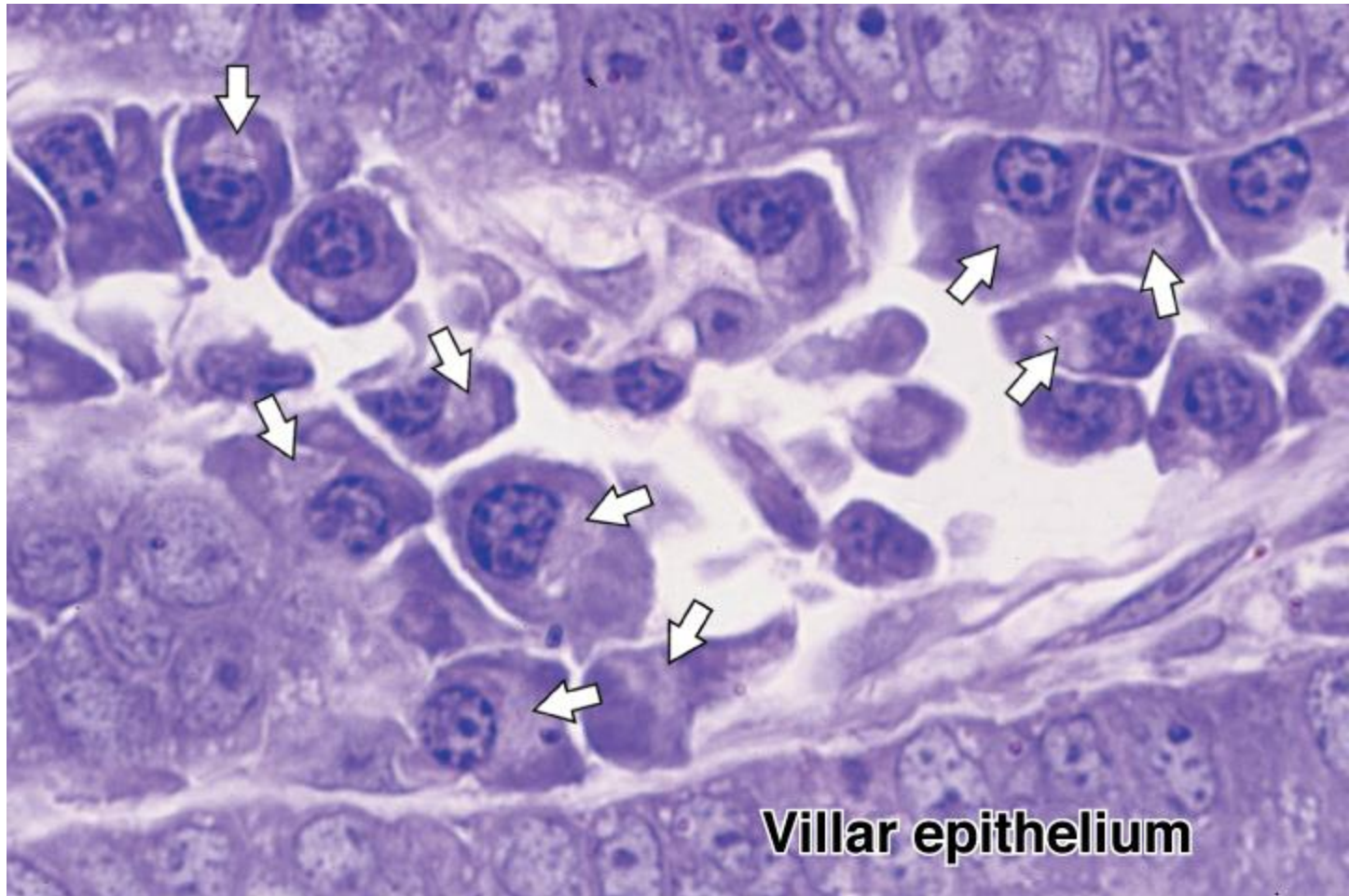


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Mast cell secretion.

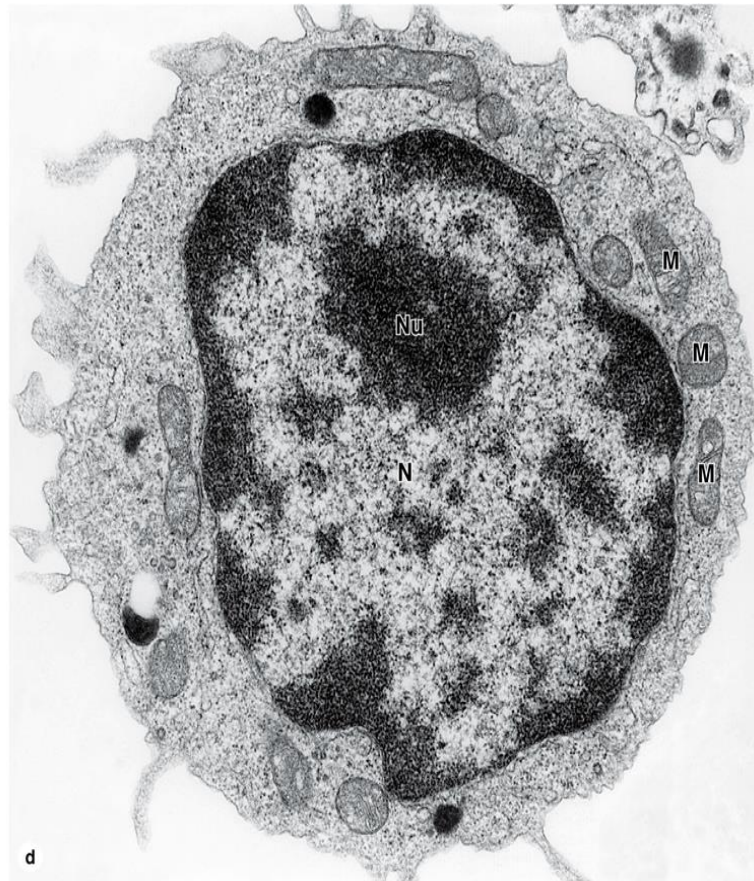
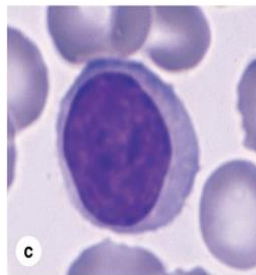
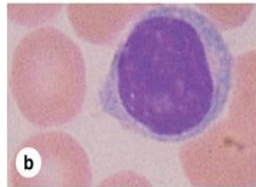
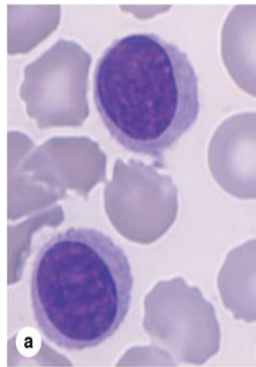


Plasma cells



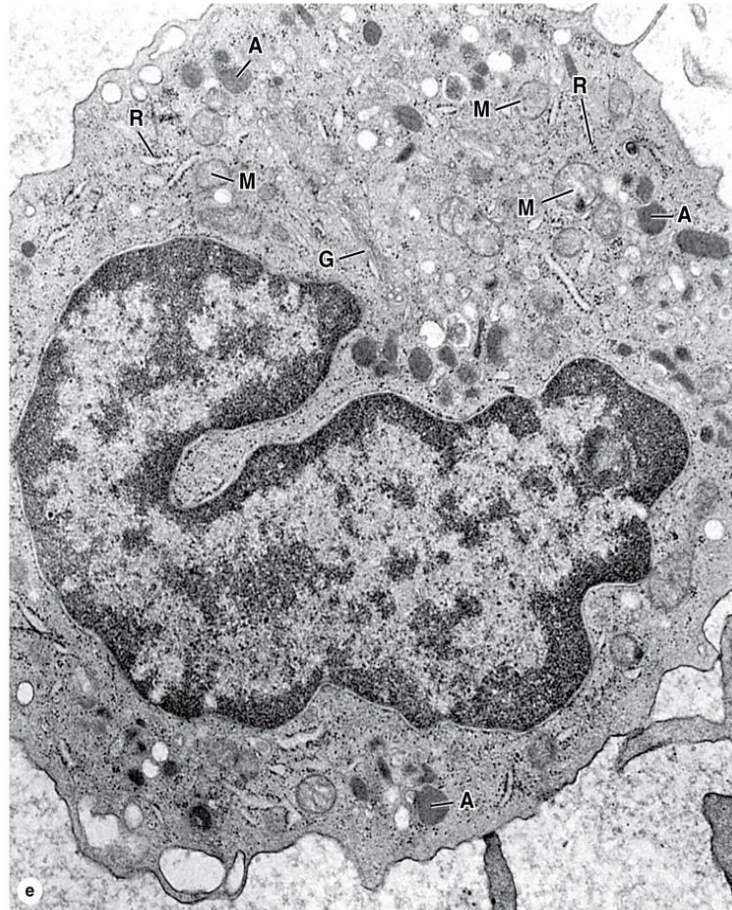
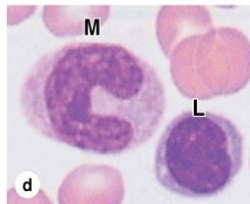
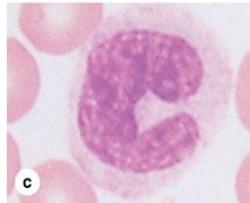
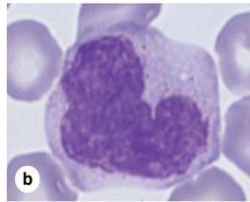
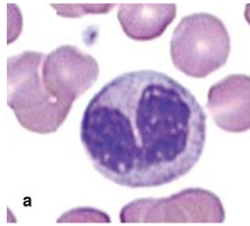
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Lymphocytes



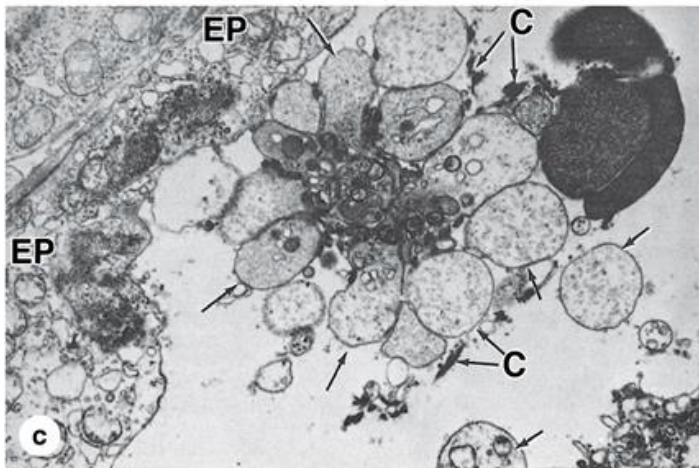
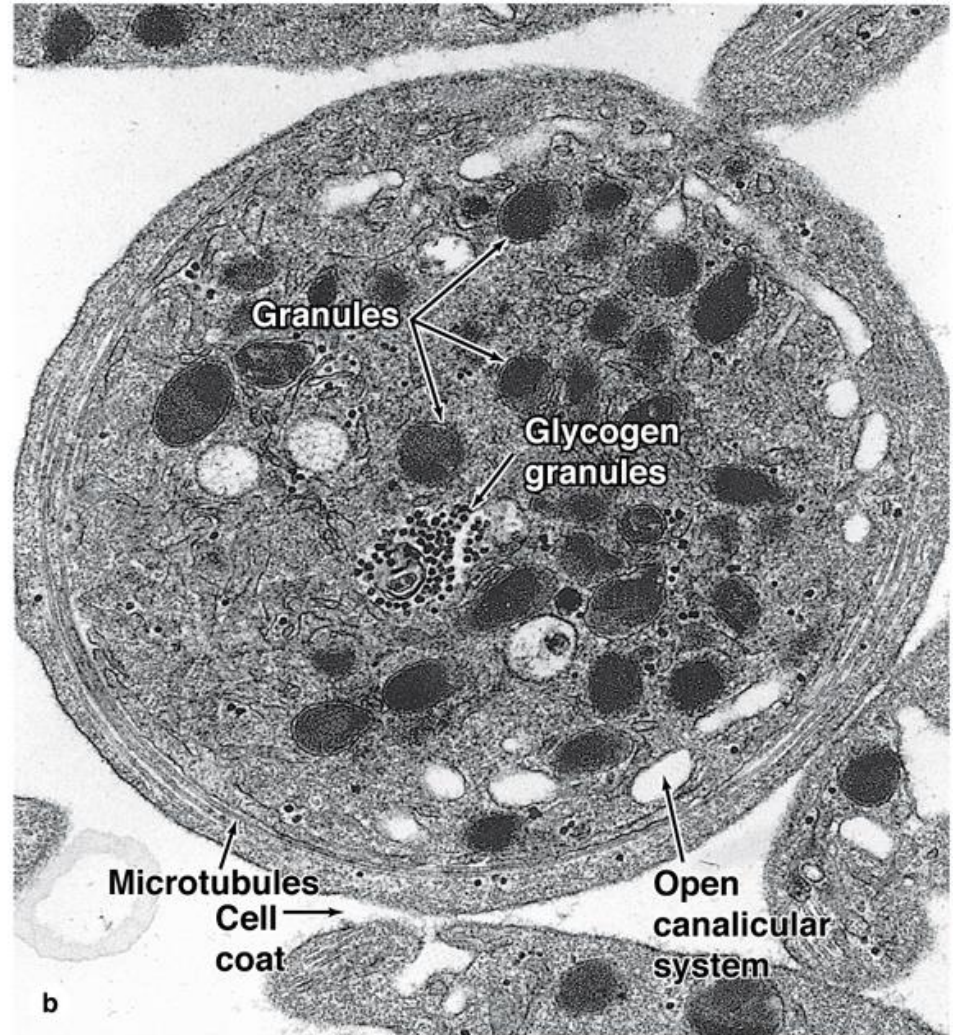
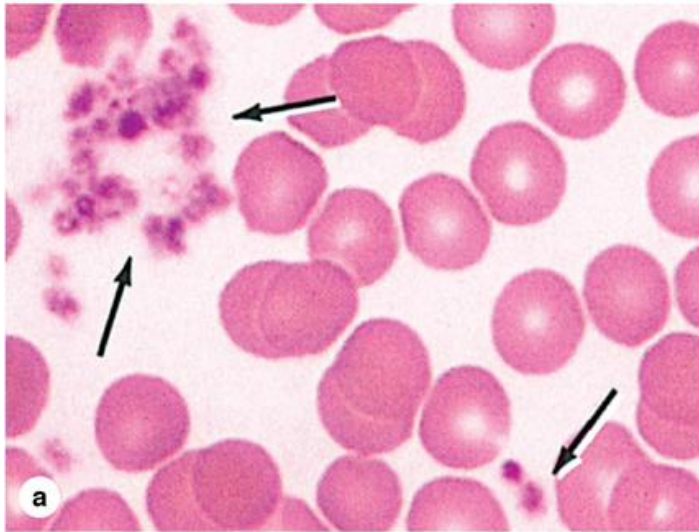
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Monocytes



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Platelets



Platelet

- Hyalomer (perifer)
- Granulomer (pusat)
- Selubung (GAGs & glikoprotein) → adhesi
- Berkas marginal (mikrotubulus & mikrofilamen) → menjaga bentuk ovoid
- Sistem *open canaliculi* → memfasilitasi pengambilan serotonin & fibrinogen
- Sistem *dense tubular* → menyimpan Ca^{++}

Granulomer

- Granulomer
- Granula delta (ADP, ATP, serotonin)
- Granula alpha (Platelet-derived growth factor, platelet factor 4, platelet-specific protein)
- Granula lambda (lisosom)

Fibrin clot.

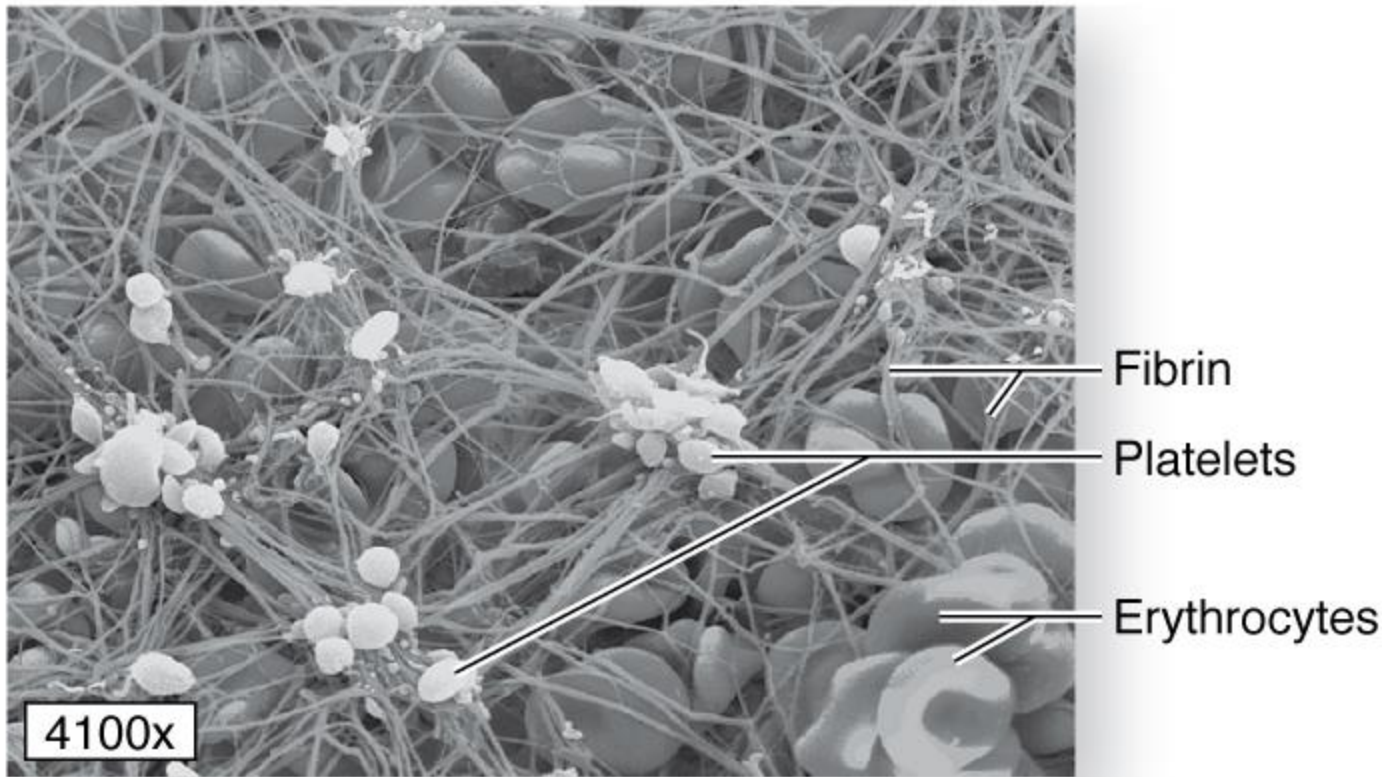
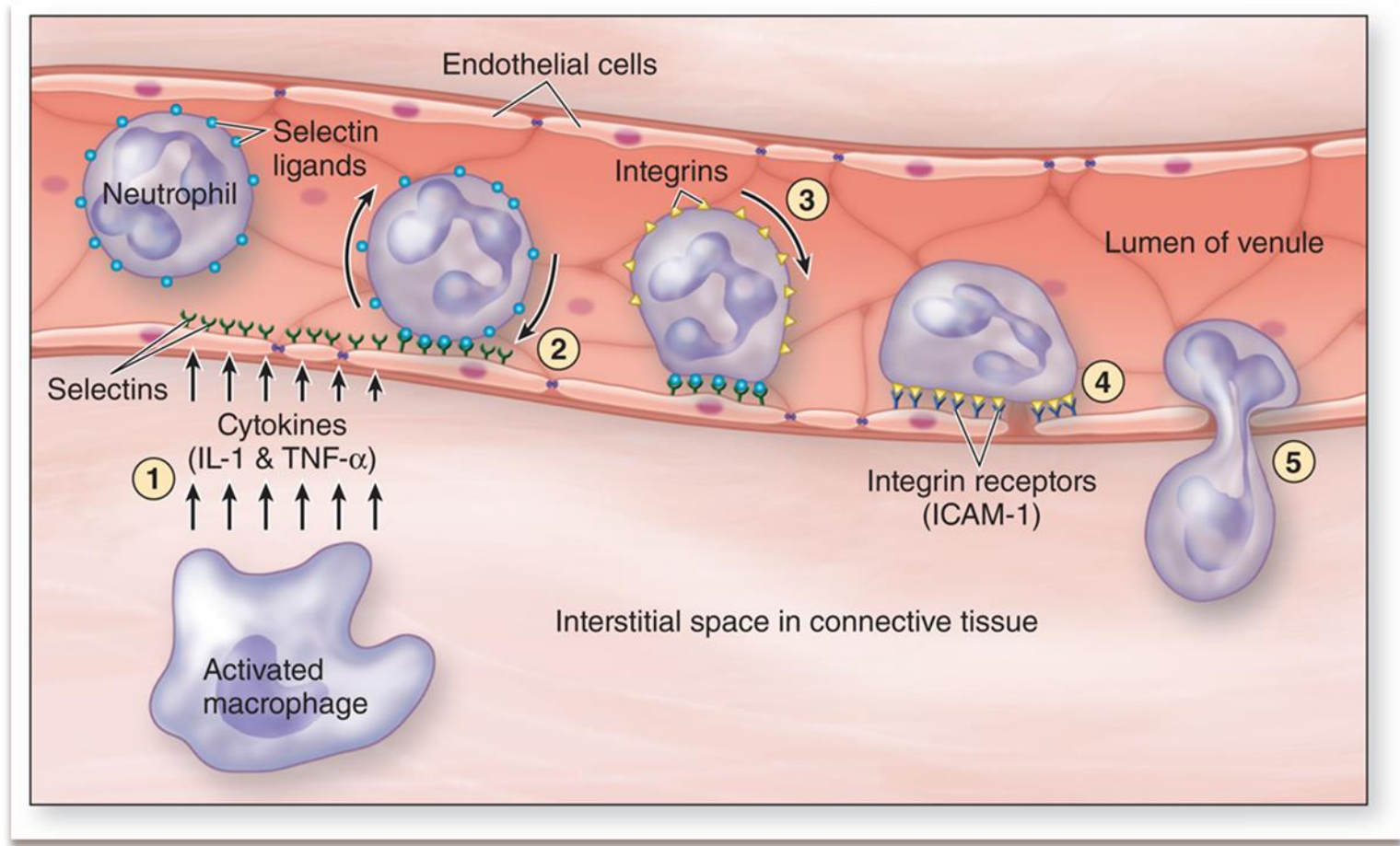


Diagram of events involving leukocytes in a postcapillary venule at sites of inflammation.



HEMATOPOIESIS (*Cellular lineage- growth factors*)

- Proses pembentukan sel darah → Hematopoiesis

Dapat dibedakan menjadi:

- **Erythropoiesis**
Proses pembentukan erythrocytus/sel darah merah
- **Granulopoiesis**
Proses pembentukan leucocytyus/sel leucocyte (darah putih)
- **Monocytopoiesis**
Proses pembentukan monocytyus/lymphocytes
- **Megakaryocytopoiesis**
Proses pembentukan megakaryocytyus

Hematopoiesis tergantung

1. Growth factors (faktor pertumbuhan)
2. Faktor lingkungan (Micro)

Growth factors

- **Granulocyte (G-CSF)**
 - menstimulasi pembentukan leucocytus
- **Granulocyte+macrophage (GM-CSF)**
Macrophage (M-CSF)
- **Interleukin 3**
 - menstimulasi pembentukan sel myeloid
- **Erythropoietin (EPO)**
 - menstimulasi pembentukan sel darah merah (erythrocytus)

SEL PLURIPOTENTIAL STEM
(ASAL SEL DARAH)
Berada di sumsum tulang

Proliferasi

LYMPHOCYTUS
(Sel lymphoid)

SEL MYELOID
(Berkembang di sumsum tulang)

MIGRASI

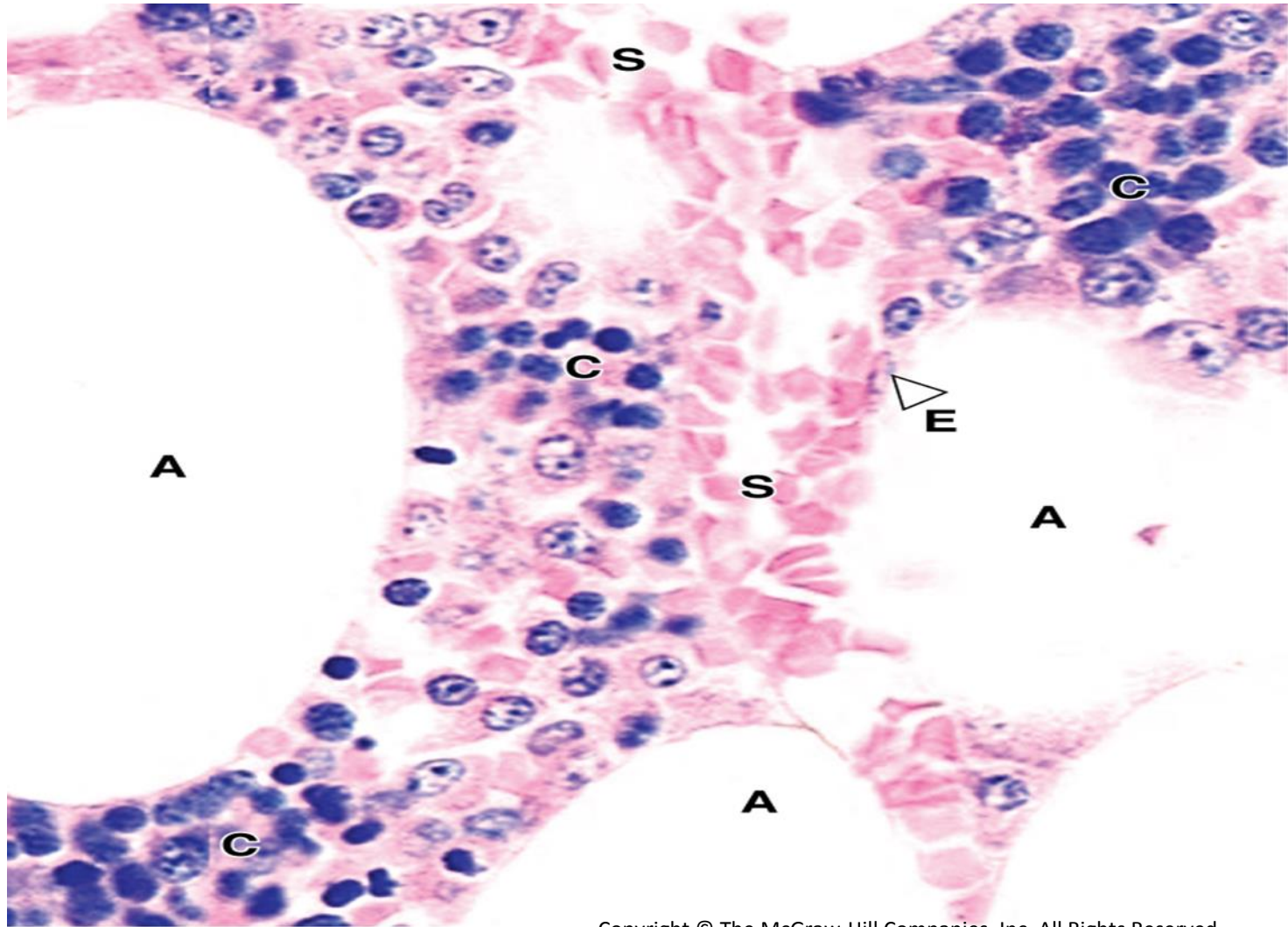
THYMUS

NODUS
LYMPHATICUS

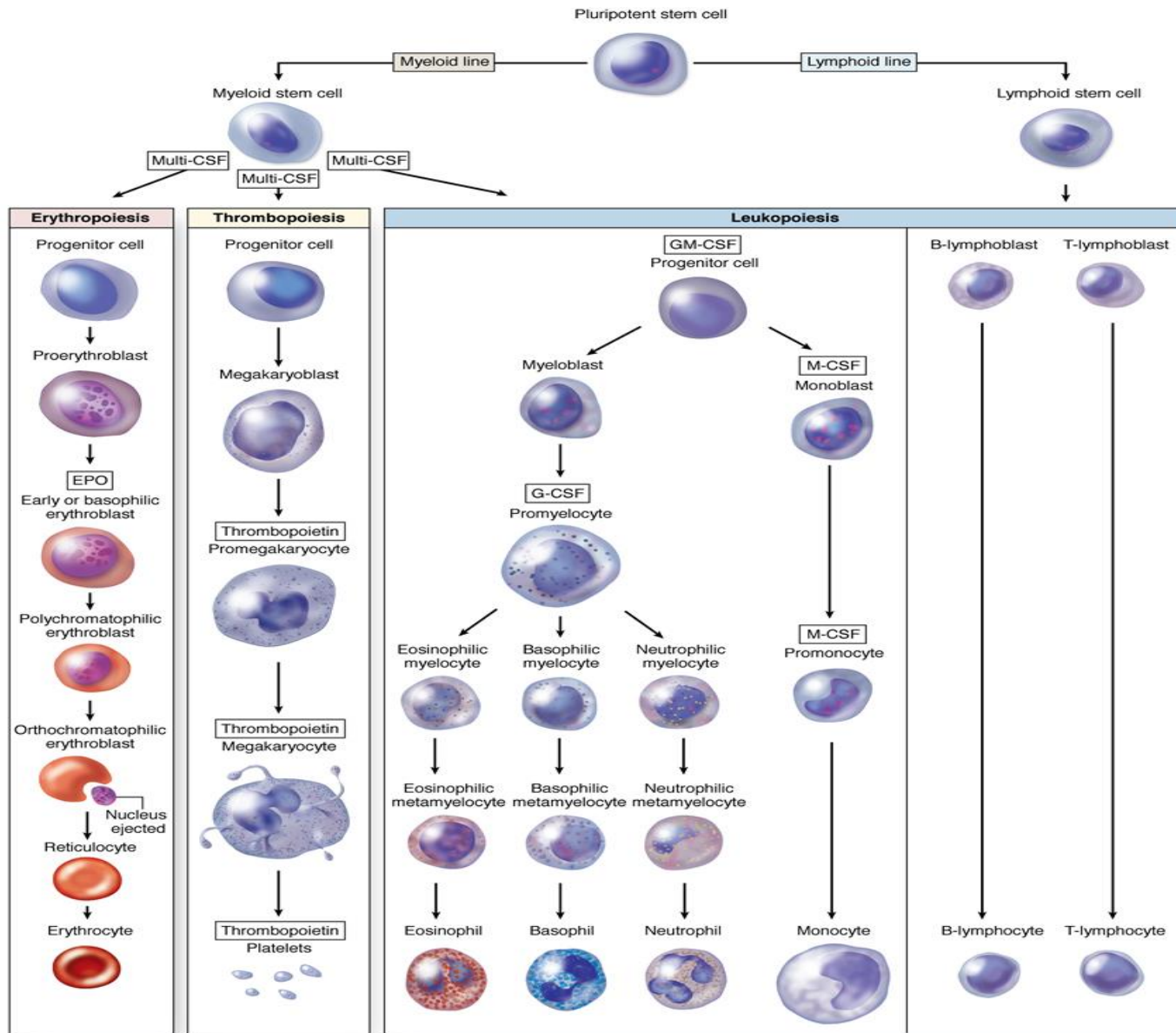
LIEN

TONSILLA

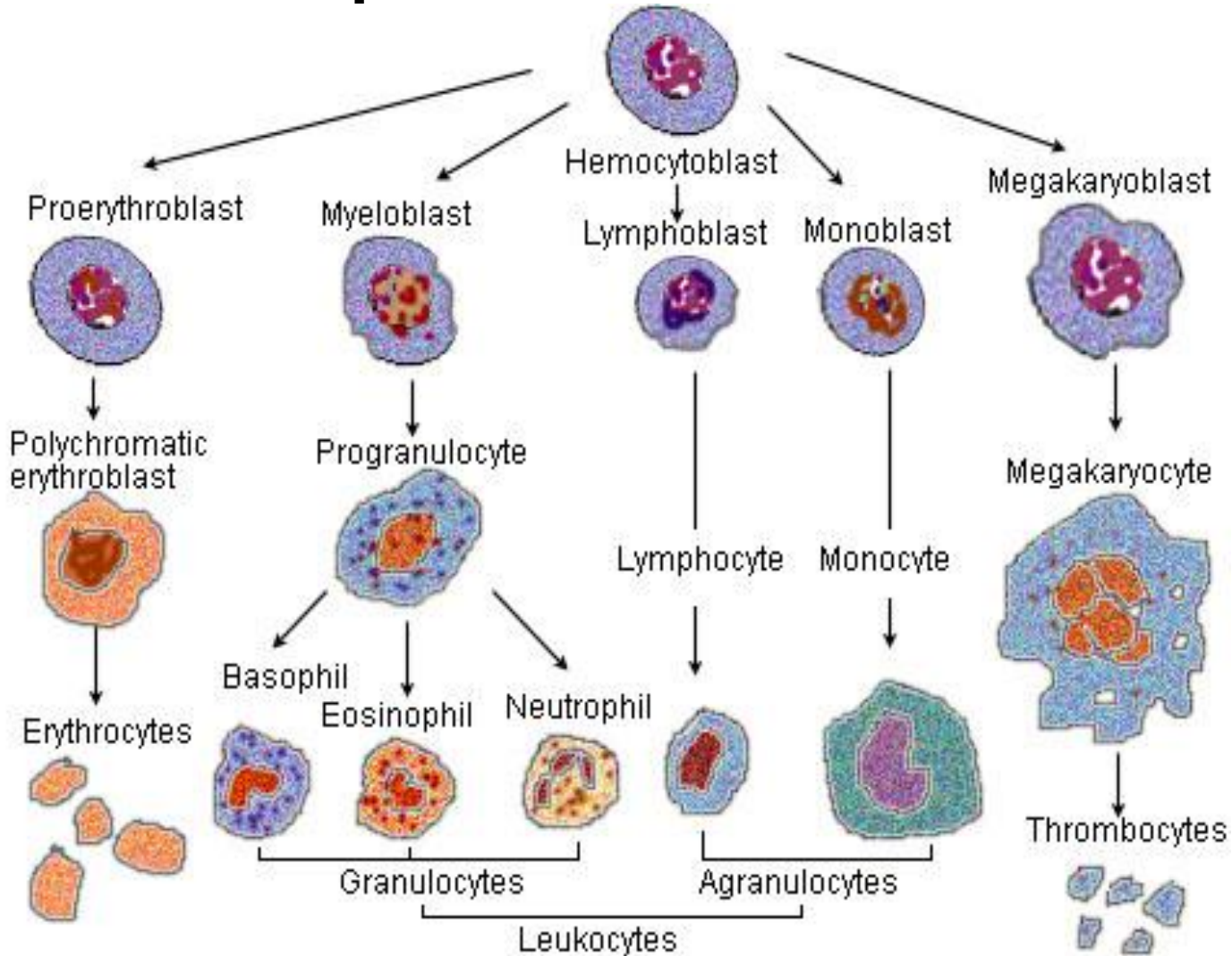
Red bone marrow (*active in hemopoiesis*)



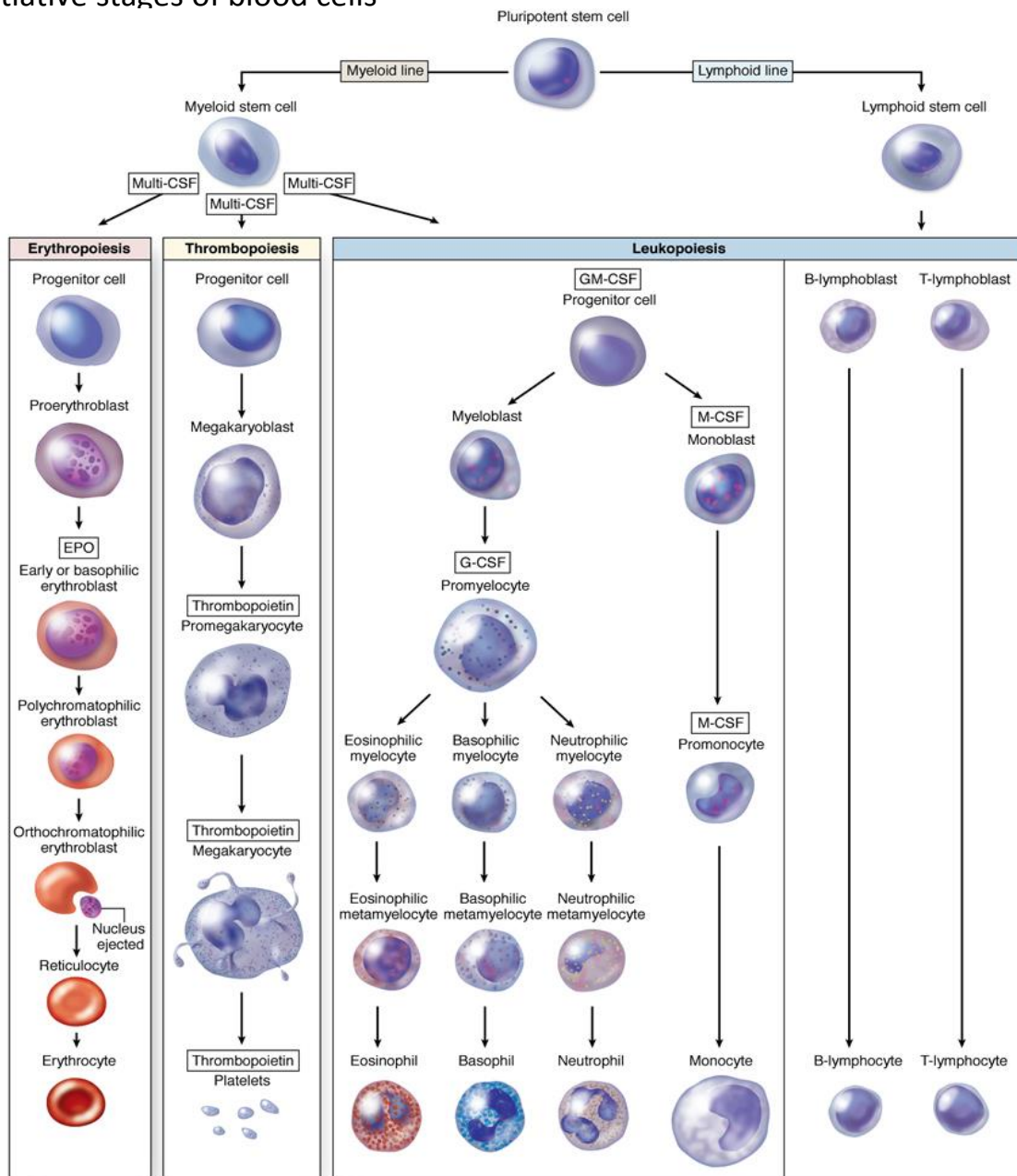
Origin and differentiative stages of blood cells.



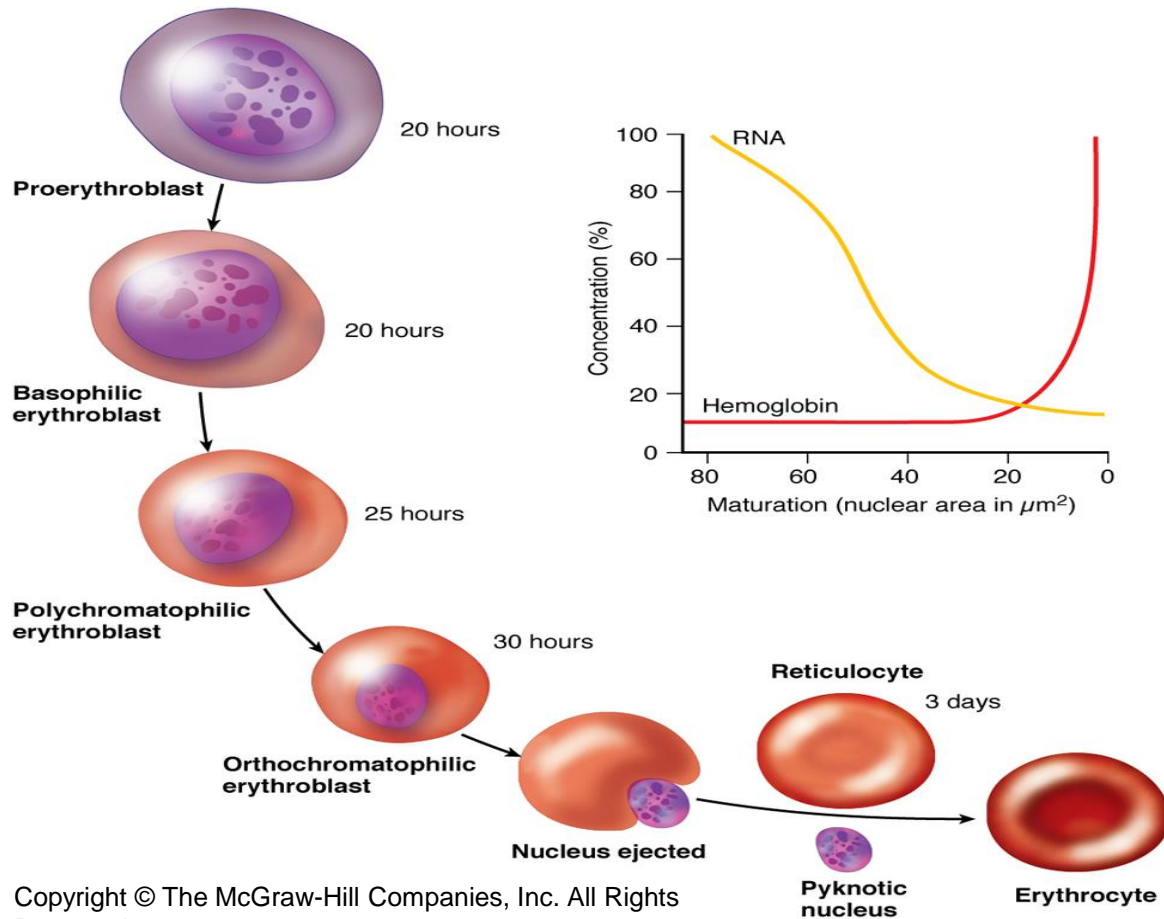
Komponen sel darah



Origin and differentiative stages of blood cells

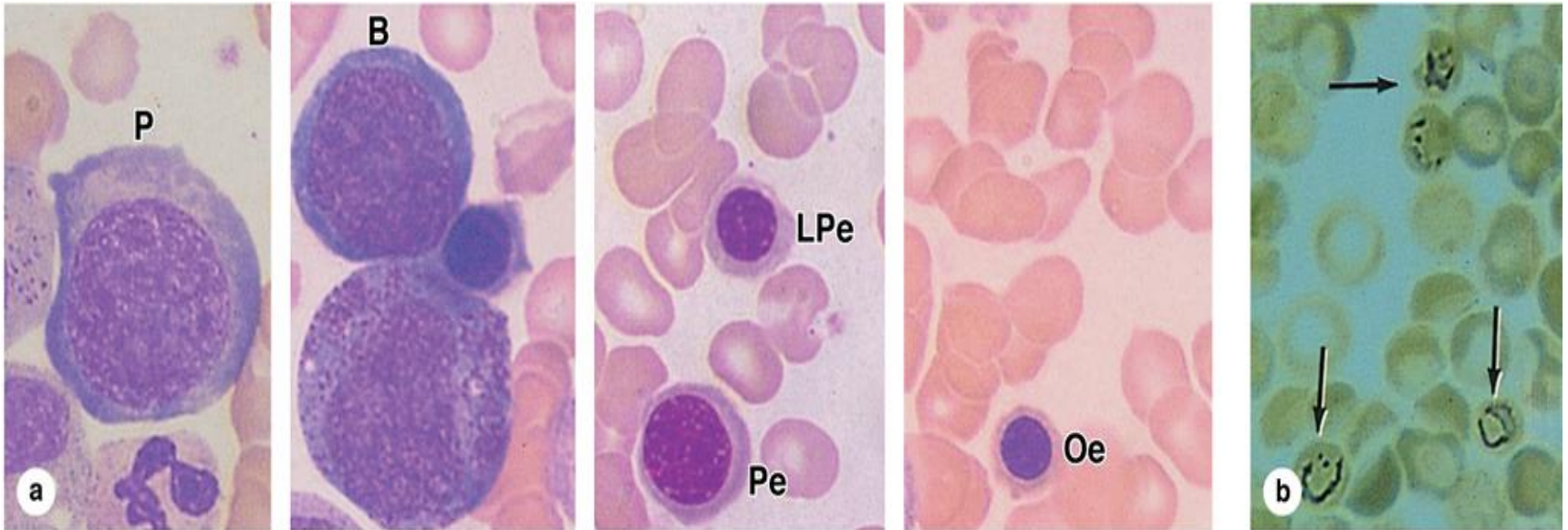


Summary of erythrocyte maturation.



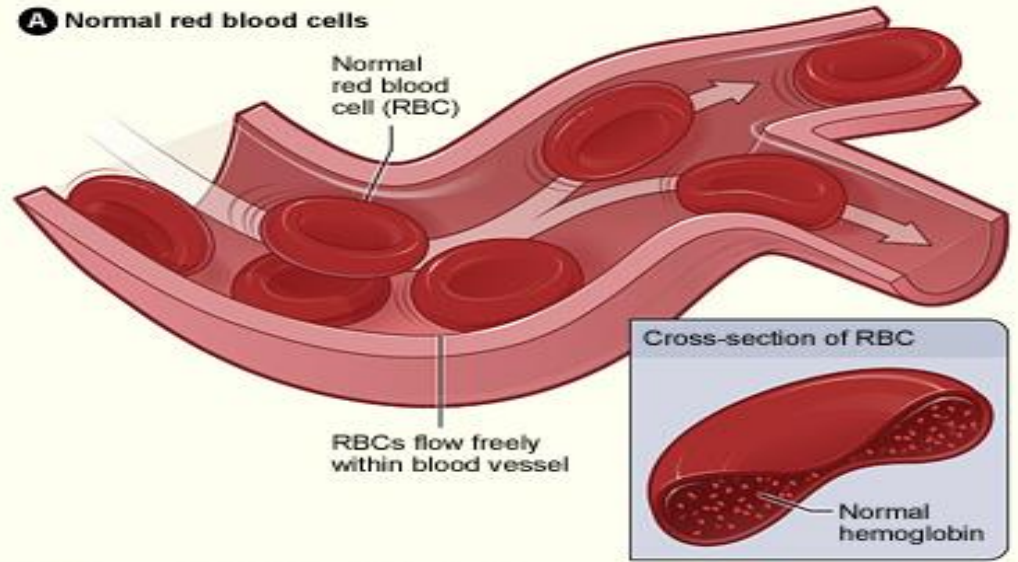
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Erythropoiesis

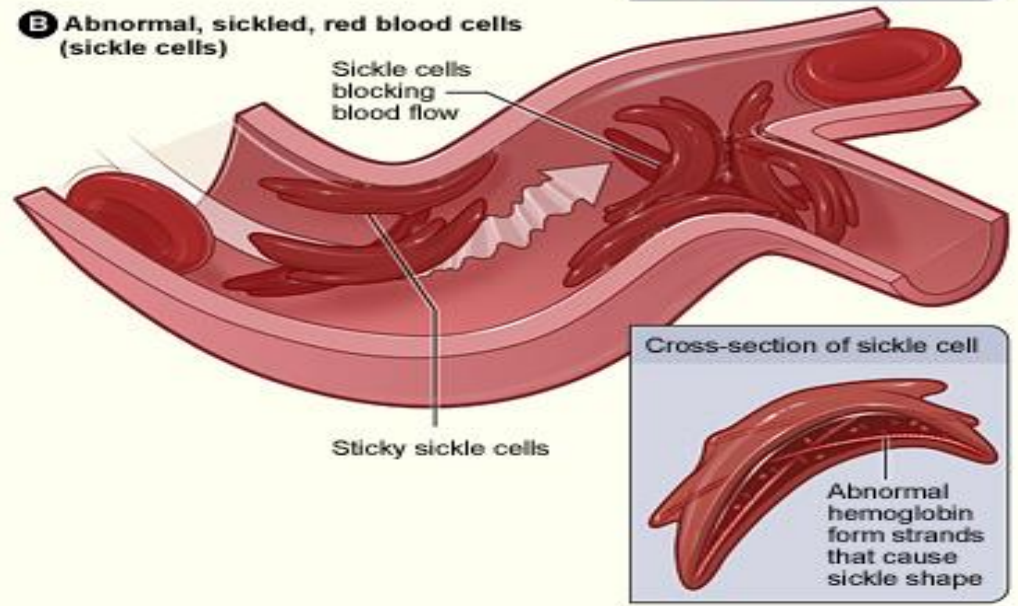


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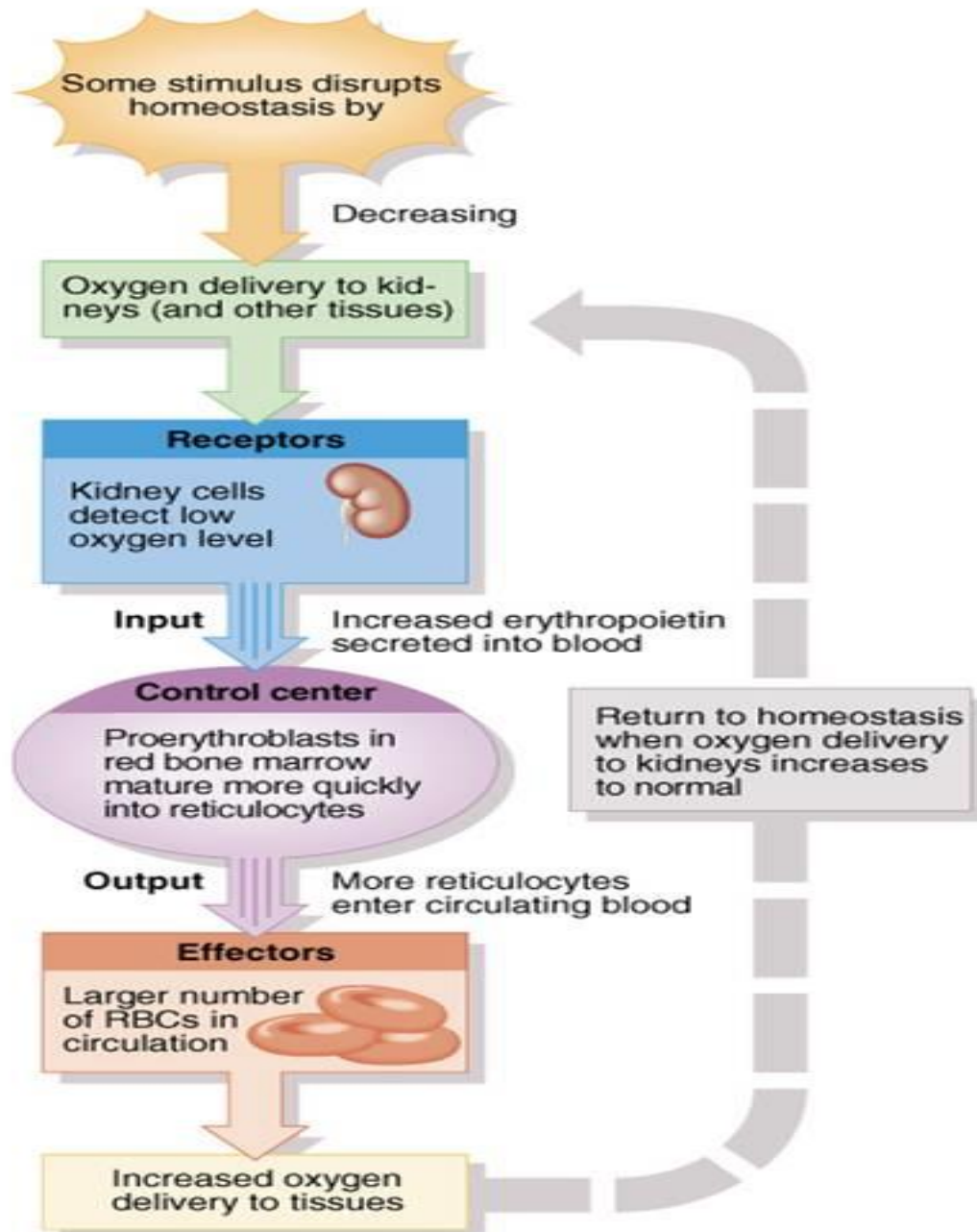
A Normal red blood cells



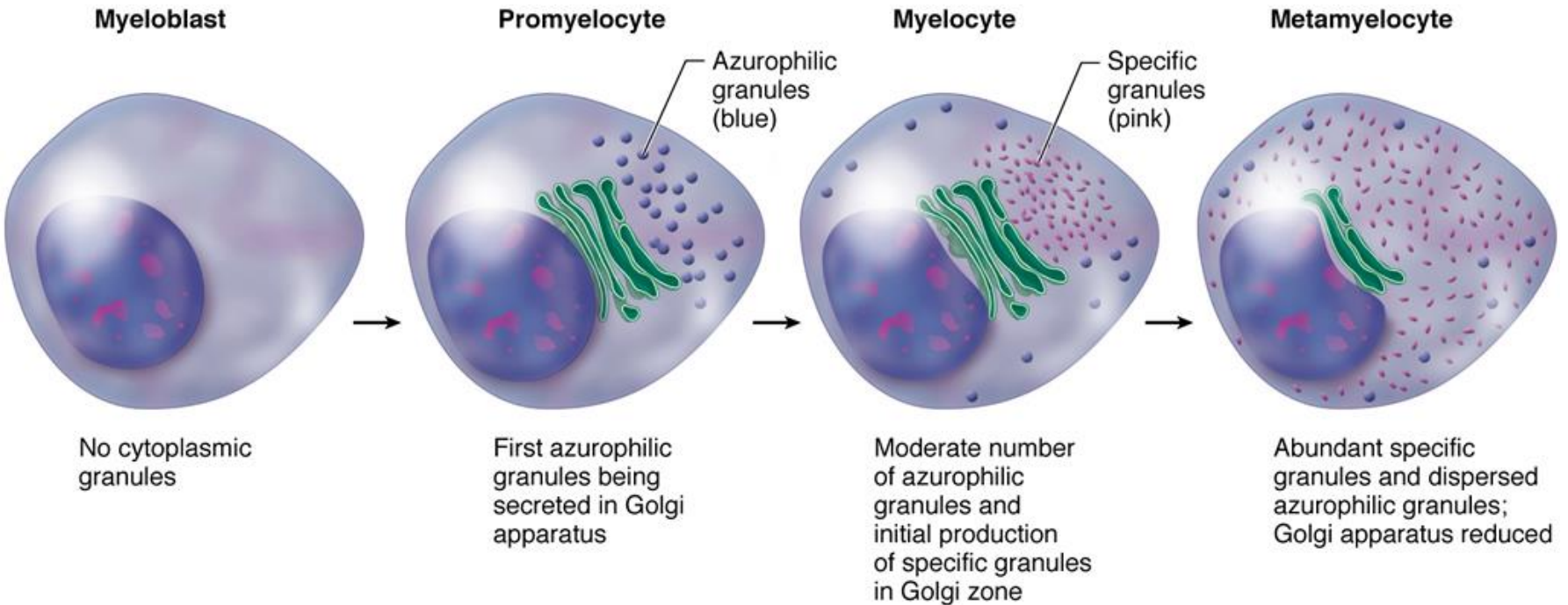
B Abnormal, sickled, red blood cells (sickle cells)



Making new red blood cell

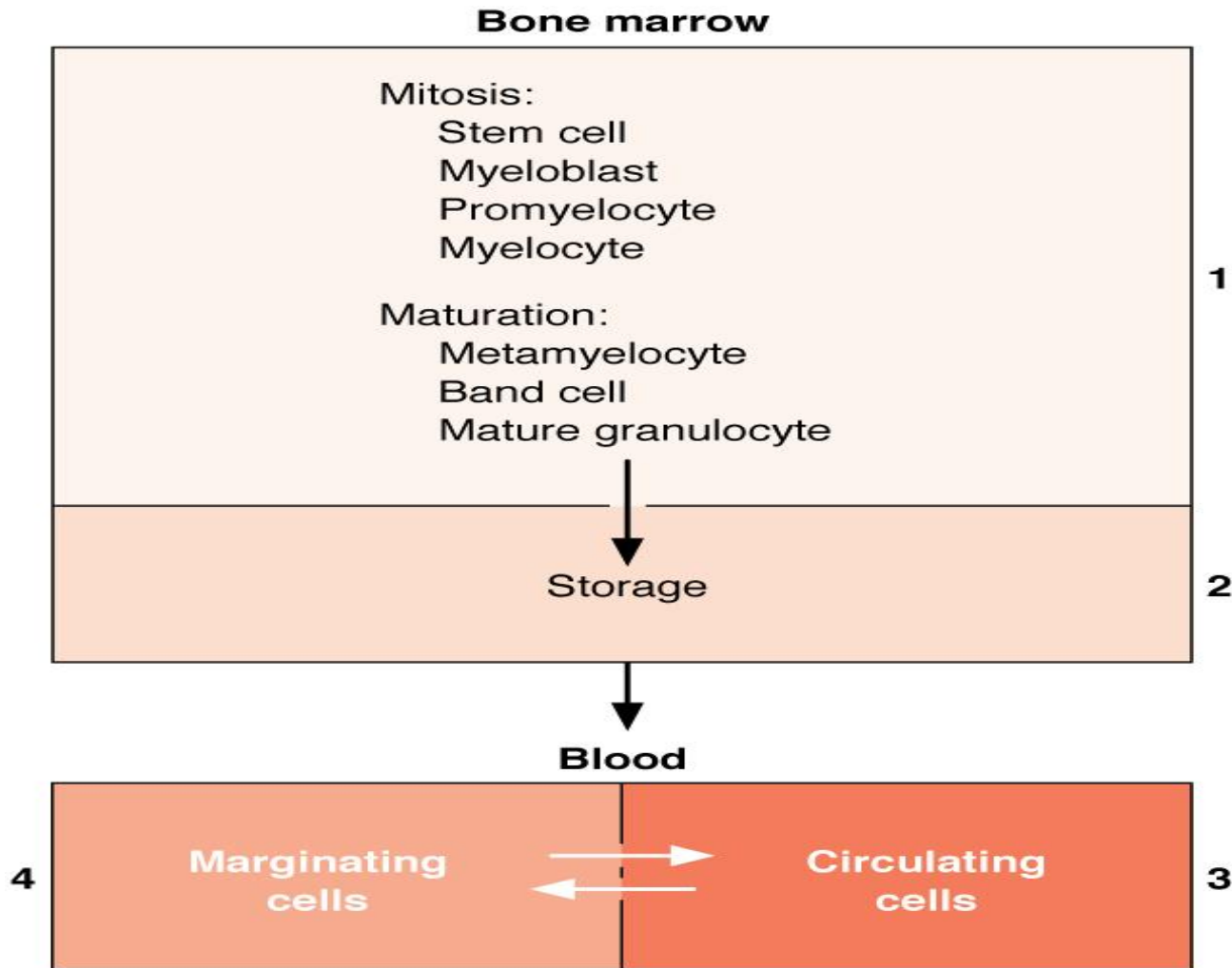


Granulopoiesis

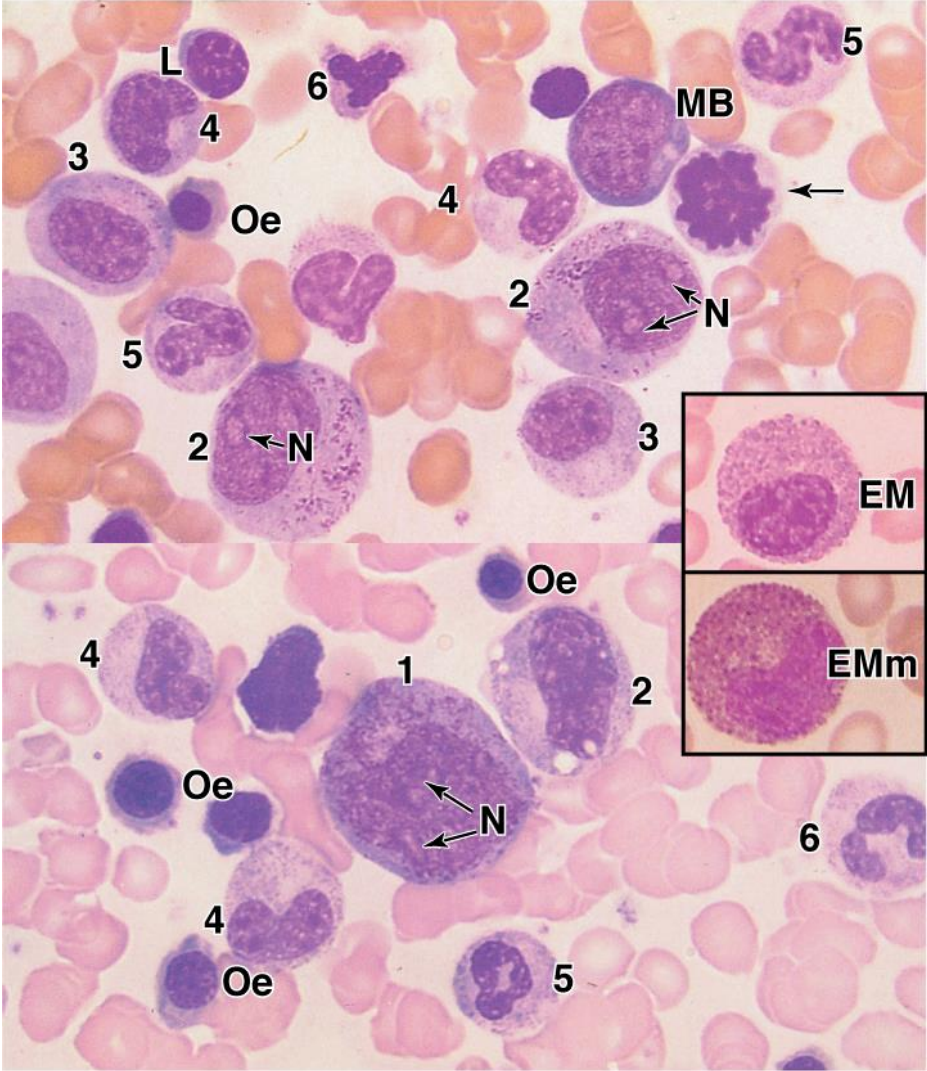


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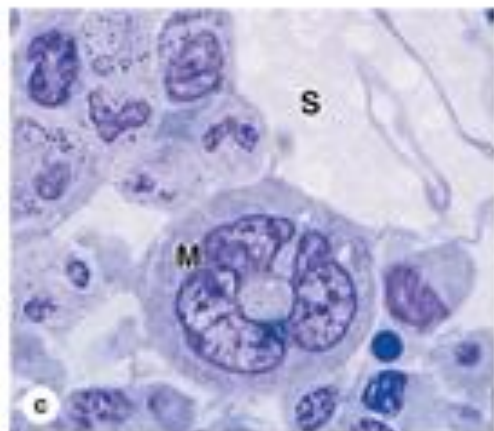
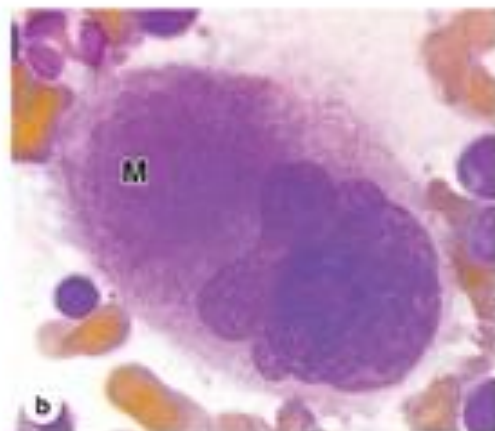
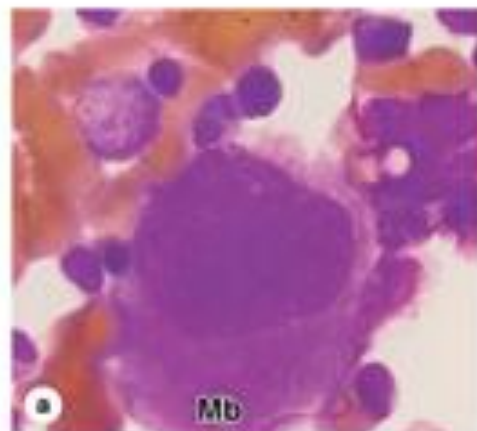
Functional compartments of neutrophils



Granulopoiesis



Megakaryoblast and megakaryocytes



Sinusoidal endothelium in active marrow

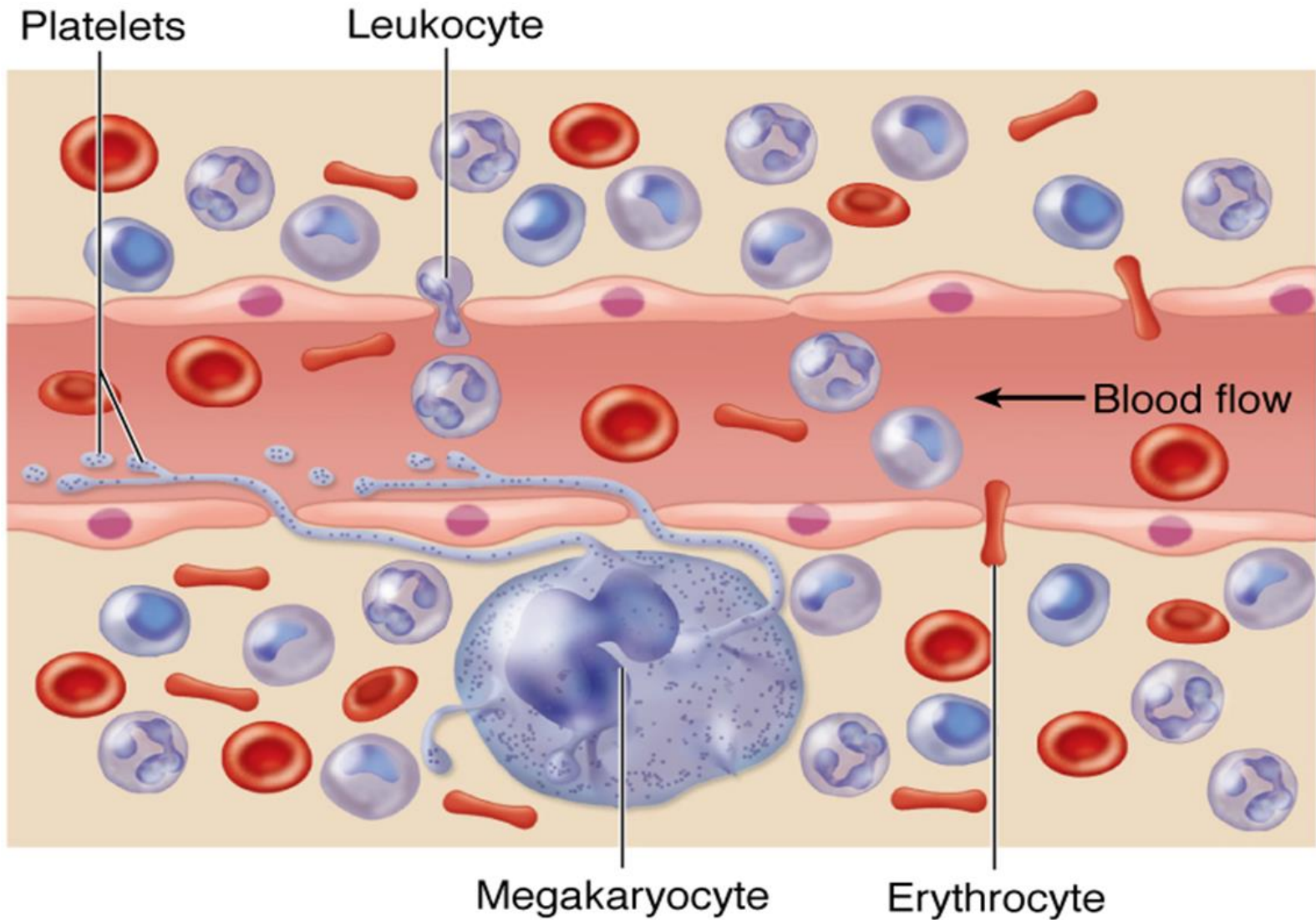
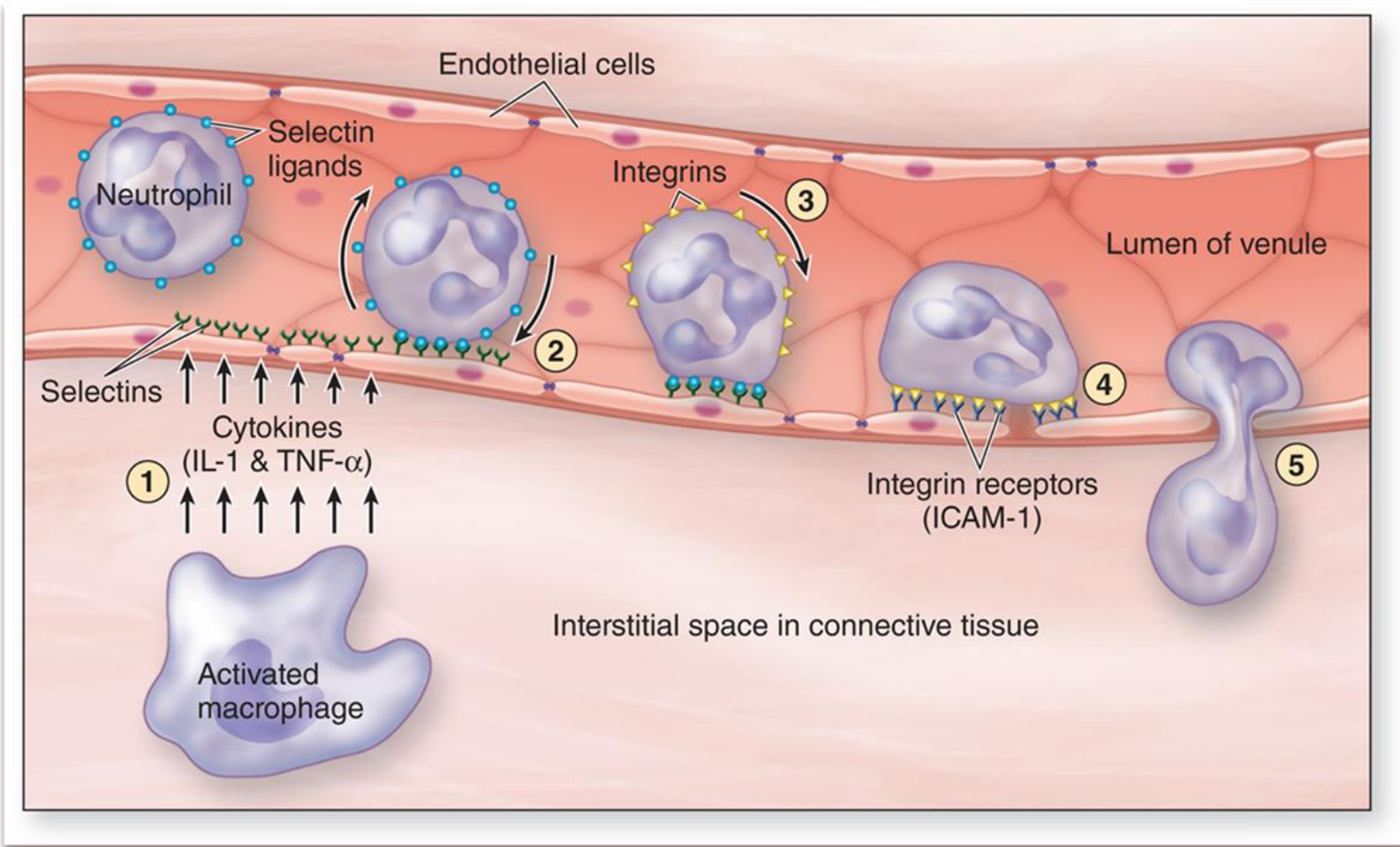
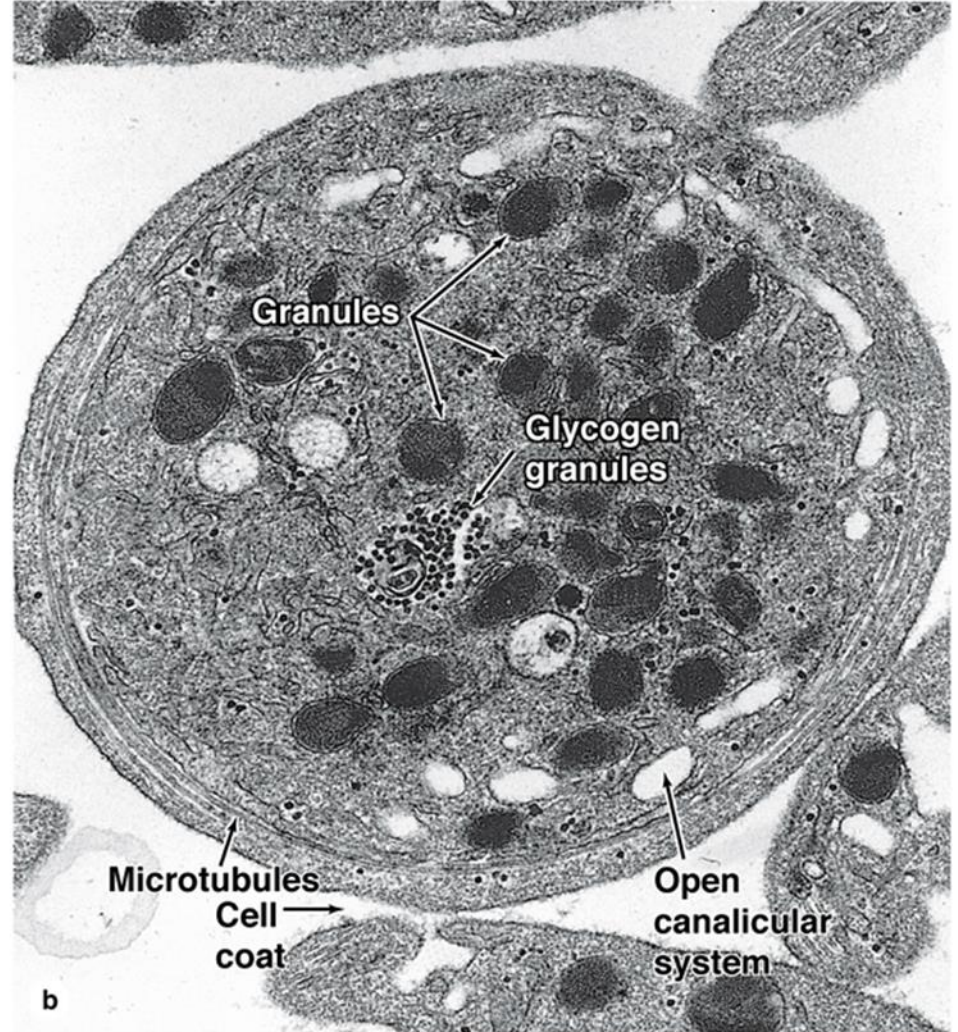
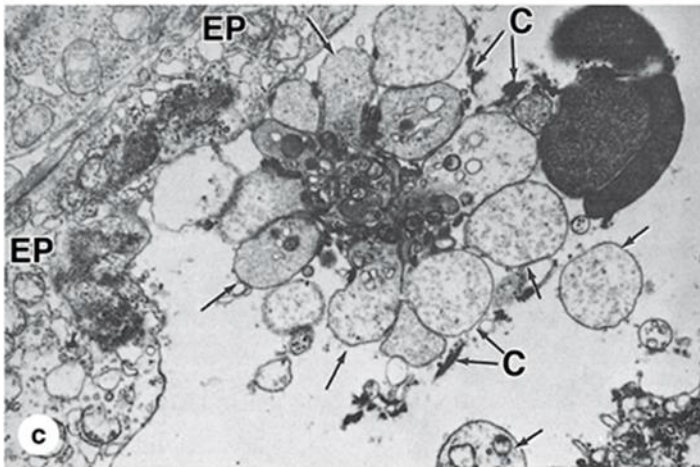
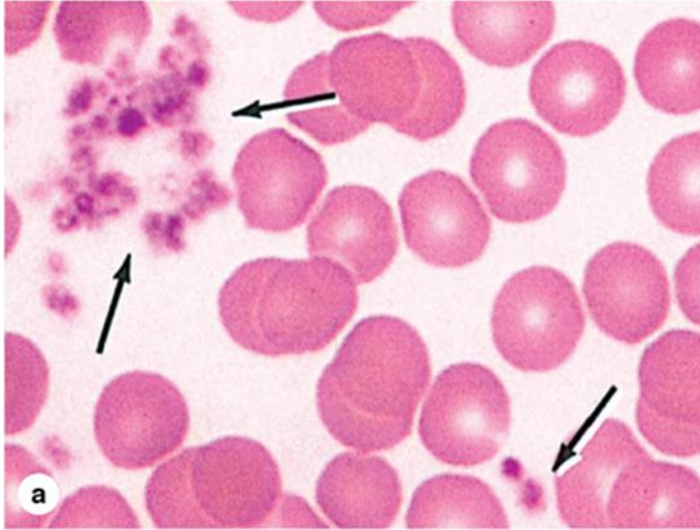


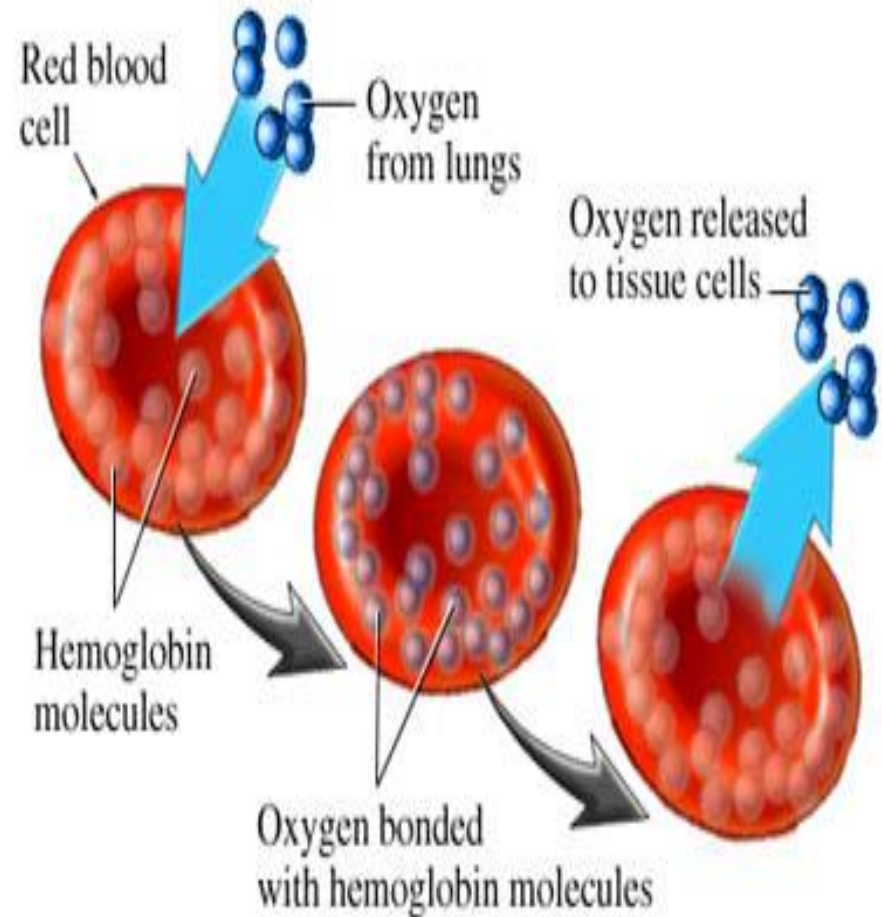
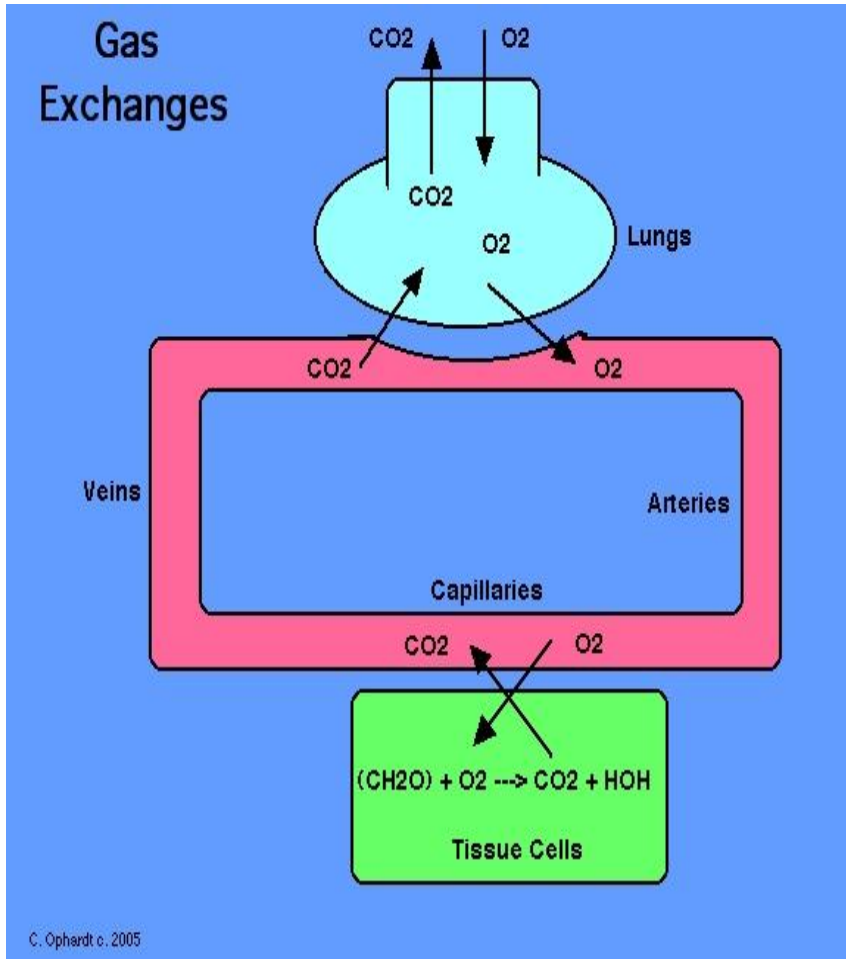
Diagram of events involving leukocytes in a postcapillary venule at sites of inflammation.



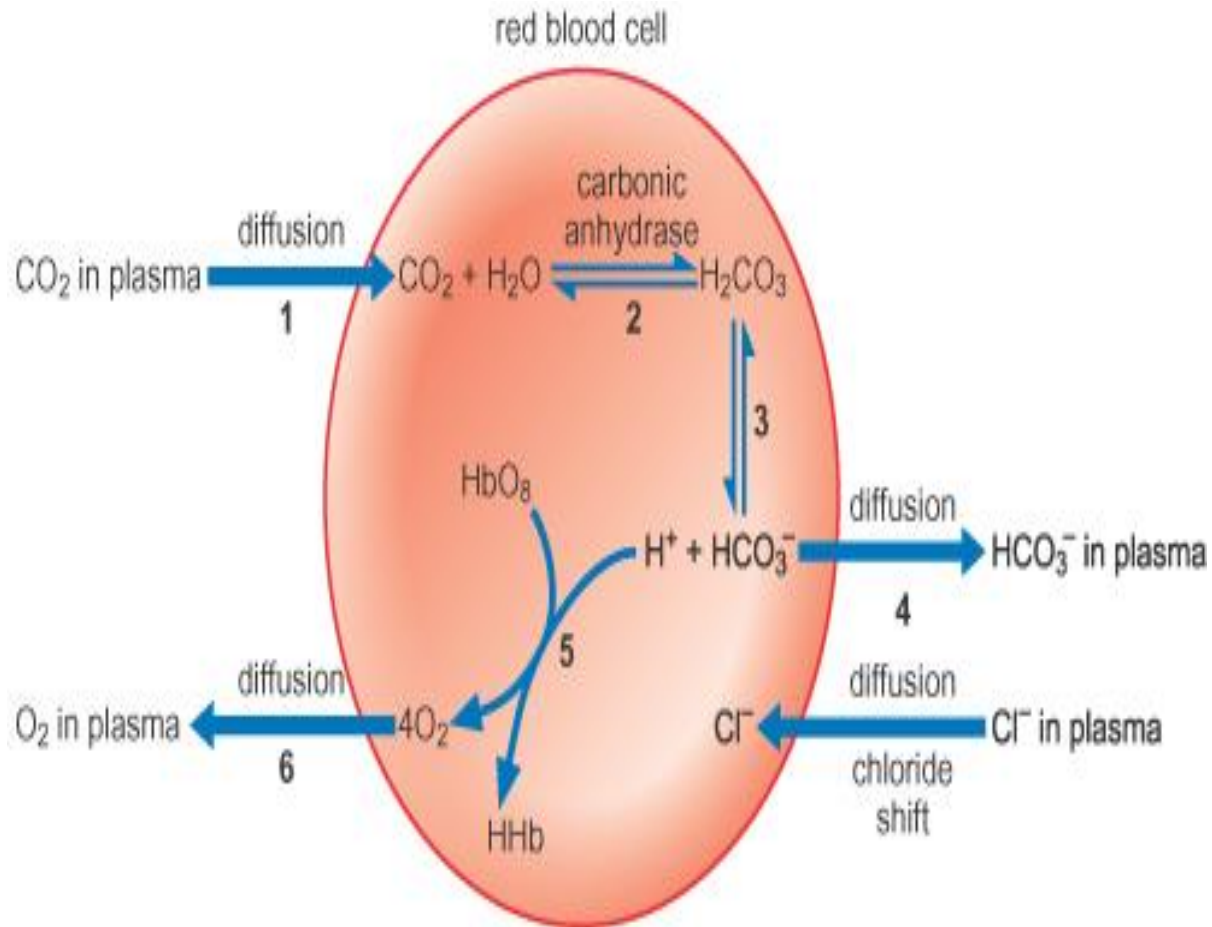
Platelets



How Blood Transport Oxygen



Transport CO₂ & O₂



Conditions InDepth: Anemia

by [Ricker Polsdorfer, MD](#)

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