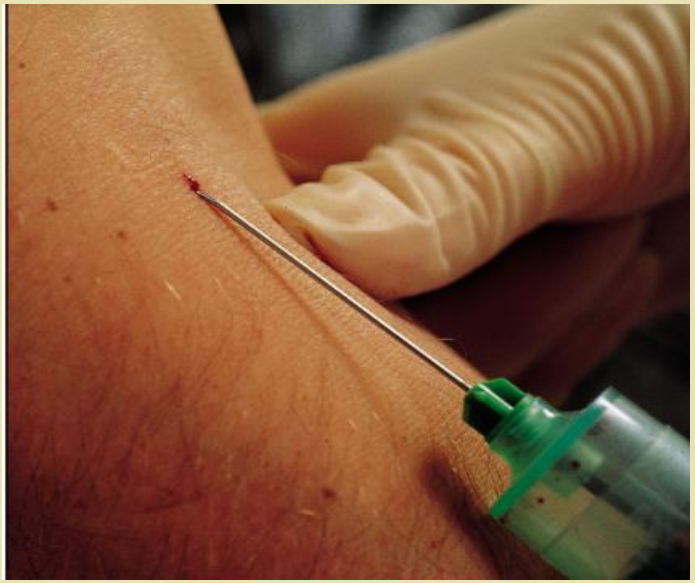
FISIOLOGI DARAH

PENDAHULUAN

SISTEM KARDIOVASKULAR

- Darah
- Jantung
- Pembuluh darah



BLOOD FUNCTION

- *The transportation of dissolved gases, nutrients, hormones, and metabolic wastes.*
- *The regulation of the pH and ion composition of interstitial fluids.*
- *The restriction of fluid losses at injury sites.*
- *Defense against toxins and pathogens.*
- *The stabilization of body temperature.*

KOMPOSISI DARAH

- Plasma
- *Formed element*
  1. Sel Darah Merah (eritrosit)
  2. Sel Darah Putih (leukosit)
  3. Platelet
- Plasma + Sel Darah : Whole Blood

WHOLE BLOOD

- Darah arteri maupun vena
- Memiliki karakteristik yang sama
  1. Temperatur rata2 38^0 C
  2. Viskositas lima kali lebih besar dari viskositas air.
  3. PH alkali, 7.35 – 7.45
- Volume : 5-6 L (pria)., 4-5 (wanita)

PLASMA

- Plasma memiliki komposisi yang mirip dengan cairan interstitial, karena adanya fluid exchanged melalui dinding kapiler.
- Perbedaan yg mendasar antara keduanya:
  1. Konsentrasi protein terlarut dalam plasma lebih tinggi.
  2. Level pertukaran gas respirasi pada plasma lebih tinggi.

Plasma ……

- Plasma Protein t.a :

  Protein Utama :

  1. Albumin
  2. Globulin
  3. Fibrinogen

  Protein Lainnya :

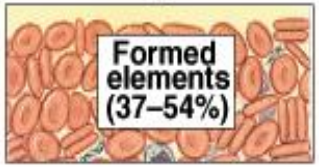
  Hormon Peptida (PRL, TSH, FSH, LH)

Sample of whole blood

consists of

Plasma (46–63%)

+

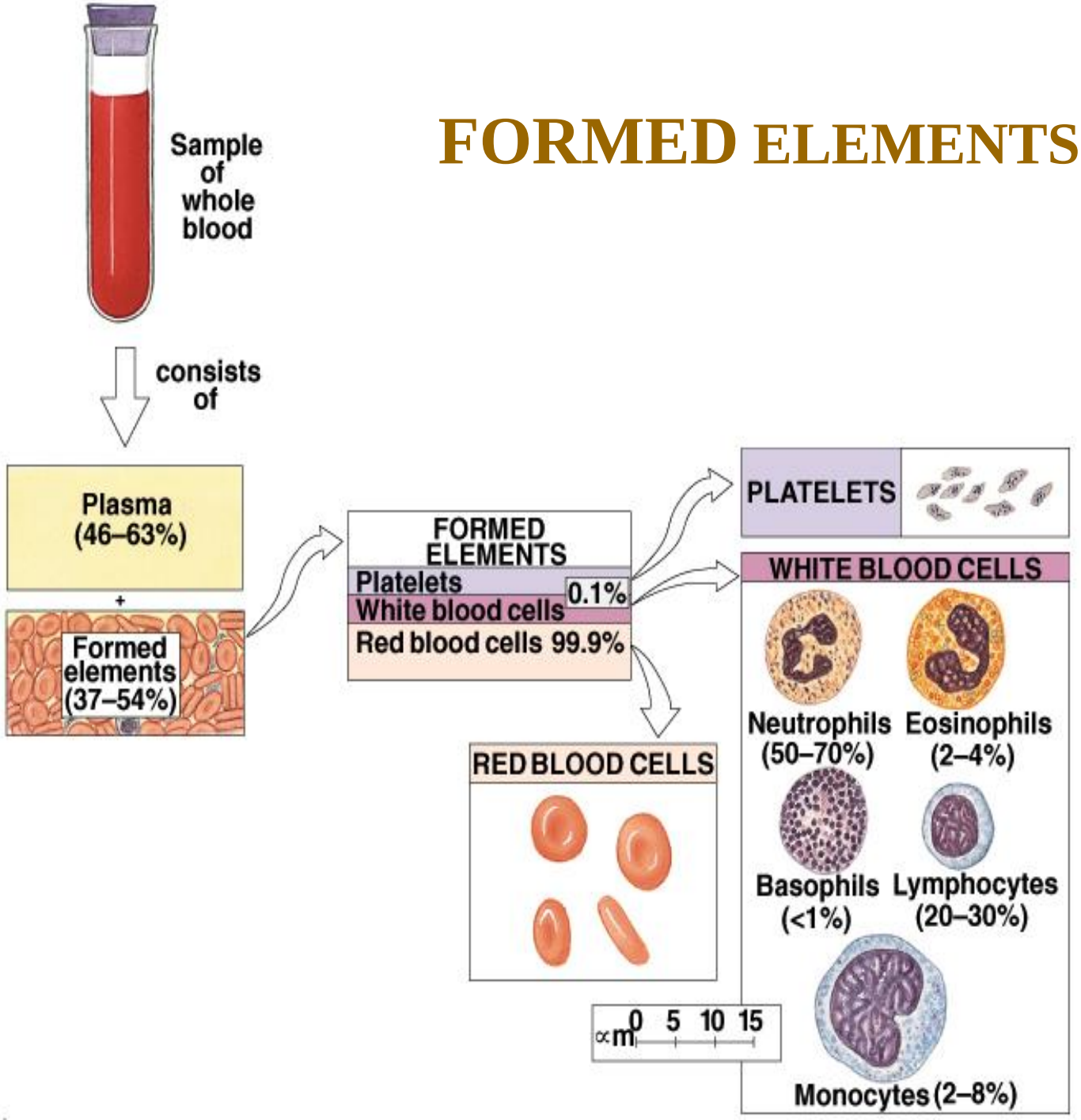


PLASMA COMPOSITION	
Plasma proteins	7%
Other solutes	1%
Water	92%
Transports organic and inorganic molecules, formed elements, and heat	

PLASMA PROTEINS	
Albumins (60%)	Major contributors to osmotic pressure of plasma; transport lipids, steroid hormones
Globulins (35%)	Transport ions, hormones, lipids; immune function
Fibrinogen (4%)	Essential component of clotting system; can be converted to insoluble fibrin
Regulatory proteins (<1%)	Enzymes, proenzymes, hormones

OTHER SOLUTES	
Electrolytes	Normal extracellular fluid ion composition for essential vital cellular activities. Ions contribute to osmotic pressure of body fluids. Major plasma electrolytes are Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, HCO_3^-, HPO_4^{2-}, SO_4^{2-}
Organic nutrients	Used for ATP production, growth, and maintenance of cells; include lipids (fatty acids, cholesterol, glycerides), carbohydrates (primarily glucose), and amino acids
Organic wastes	Carried to sites of breakdown or excretion; include urea, uric acid, creatinine, bilirubin, ammonium ions

FORMED ELEMENTS

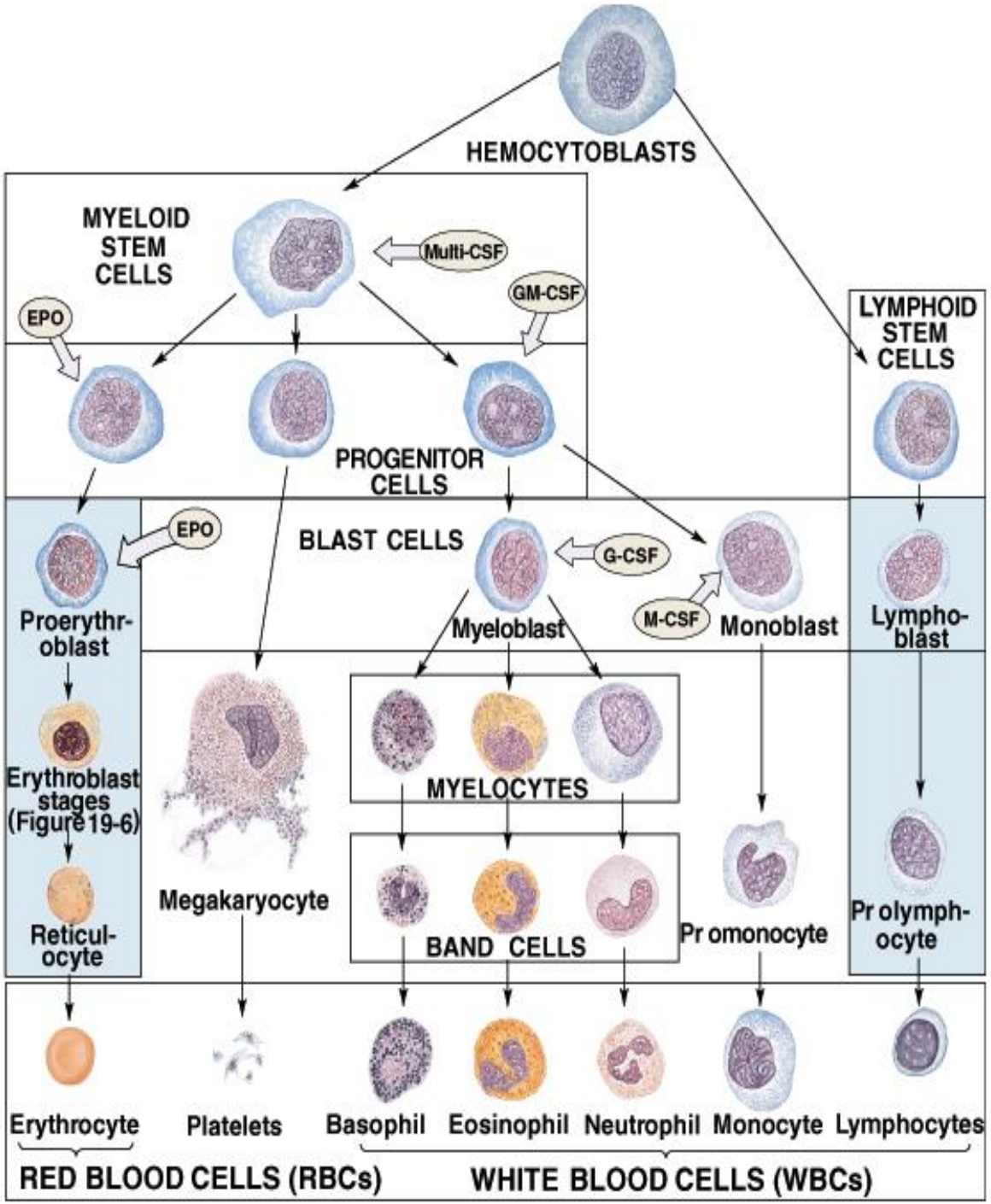


HEMATOPOEISIS

- Tahap perkembangan 8 minggu I : Embryonic yolk sac
- Tahap perkembangan bulan 2-5 :

  Hati dan Limpa
- Setelah 5 bulan perkembangan :

  Bone Marrow (sumsum tulang)
- Dewasa : Sumsum tulang


HEMOCYTOBLASTS
MYELOID STEM CELLS
Multi-CSF
GM-CSF
EPO
LYMPHOID STEM CELLS
PROGENITOR CELLS
EPO
BLAST CELLS
G-CSF
M-CSF
Proerythr-oblast
Myeloblast
Monoblast
Lympho-blast
Erythroblast stages (Figure 19-6)
MYELOCYTES
Megakaryocyte
Pr omonocyte
Pr olymph-ocyte
Reticul-ocyte
BAND CELLS
Erythrocyte
Platelets
Basophil
Eosinophil
Neutrophil
Monocyte
Lymphocytes
RED BLOOD CELLS (RBCs)
WHITE BLOOD CELLS (WBCs)

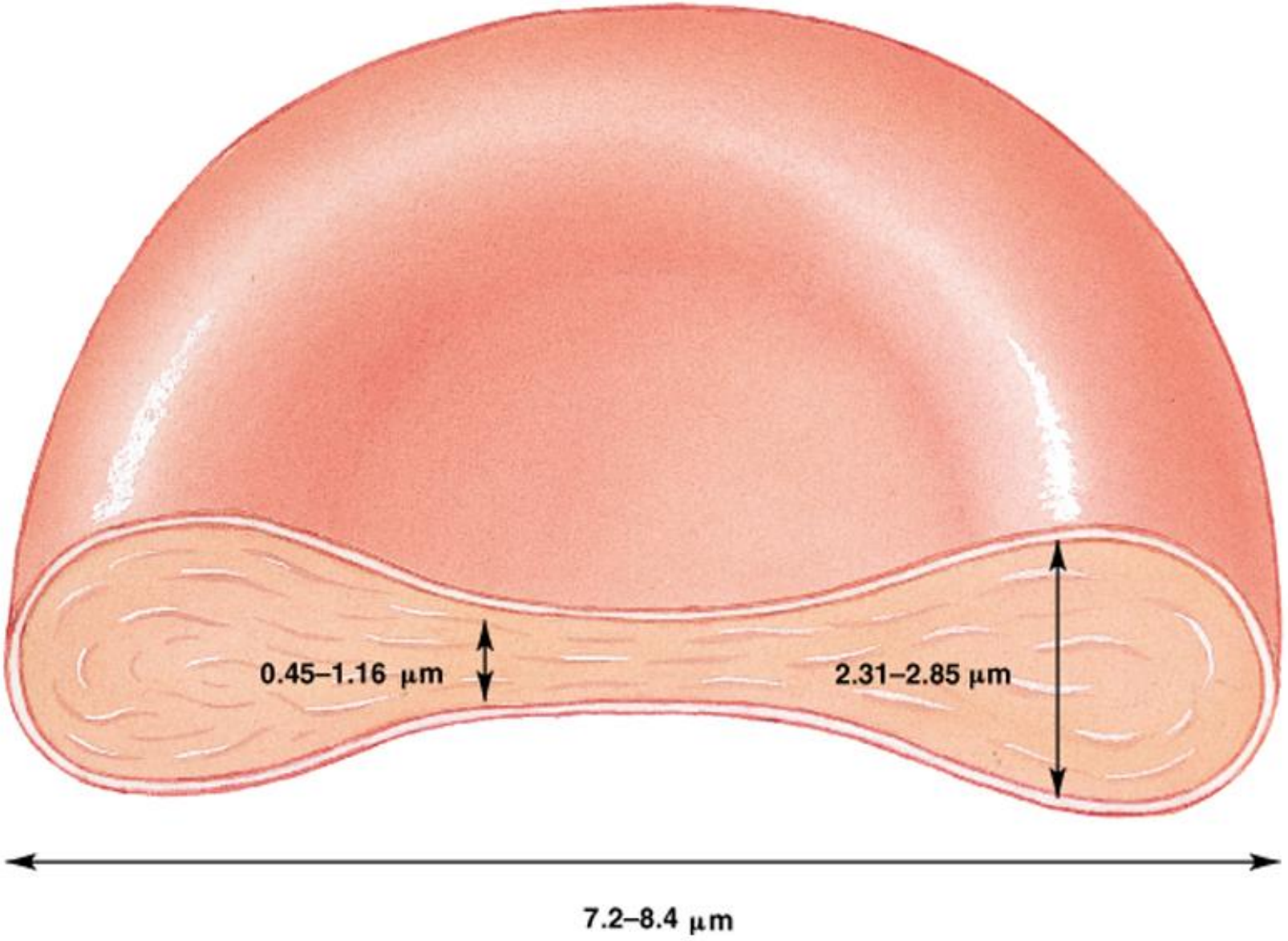
SEL DARAH MERAH

- Mengandung Haemoglobin
- Jumlah sel/ml :

  4.5-6.3 juta/ml (pria dewasa)

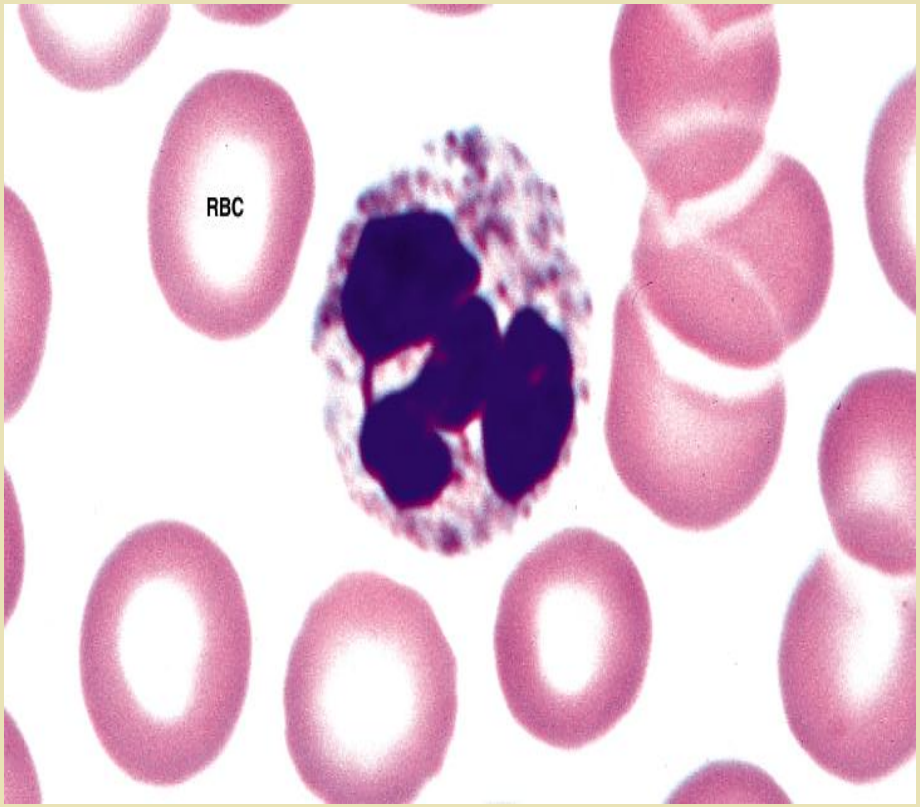
  4.2-5.5 juta/ml (wanita dewasa)
- Hematokrit, persentase jumlah sel dalam darah (N : 40%-45%)

Struktur Sel Darah Merah



SEL DARAH PUTIH

- Dibagi menjadi :
  1. Granulosit
     a. Neutrofil
     b. Eosinofil
     c. Basofil
  2. Agranulosit
     a. Monosit
     b. Limfosit



Sel Darah Putih ……

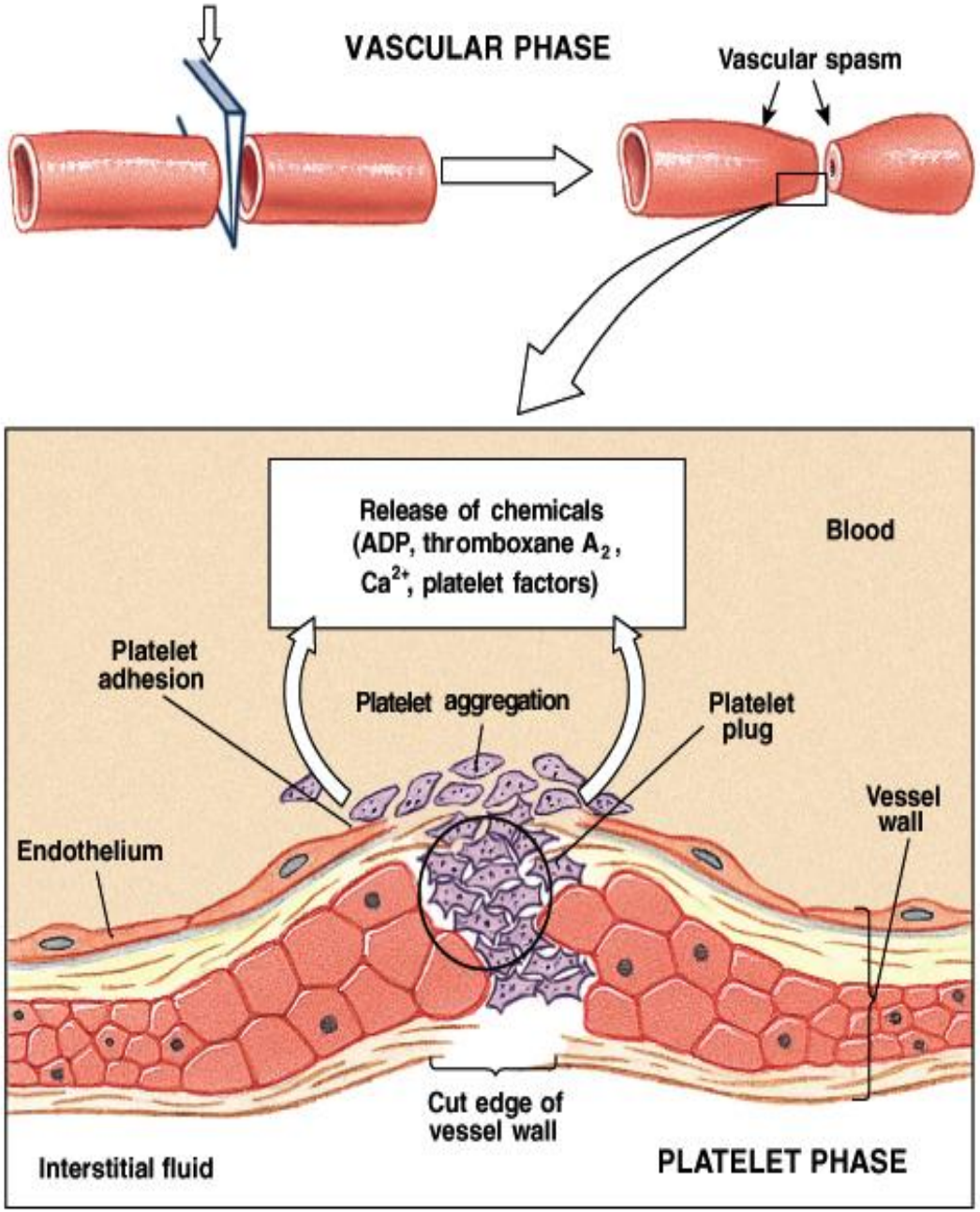
- Karakteristik Sirkulasi
  1. Gerak amoeboid
  2. Dapat bermigrasi keluar dari pembuluh darah
  3. Dipengaruhi oleh stimulus kimia spesifik (positif kemotaksis)
  4. Neutrophils, eosinophils, dan monocytes memiliki peran fagositosis

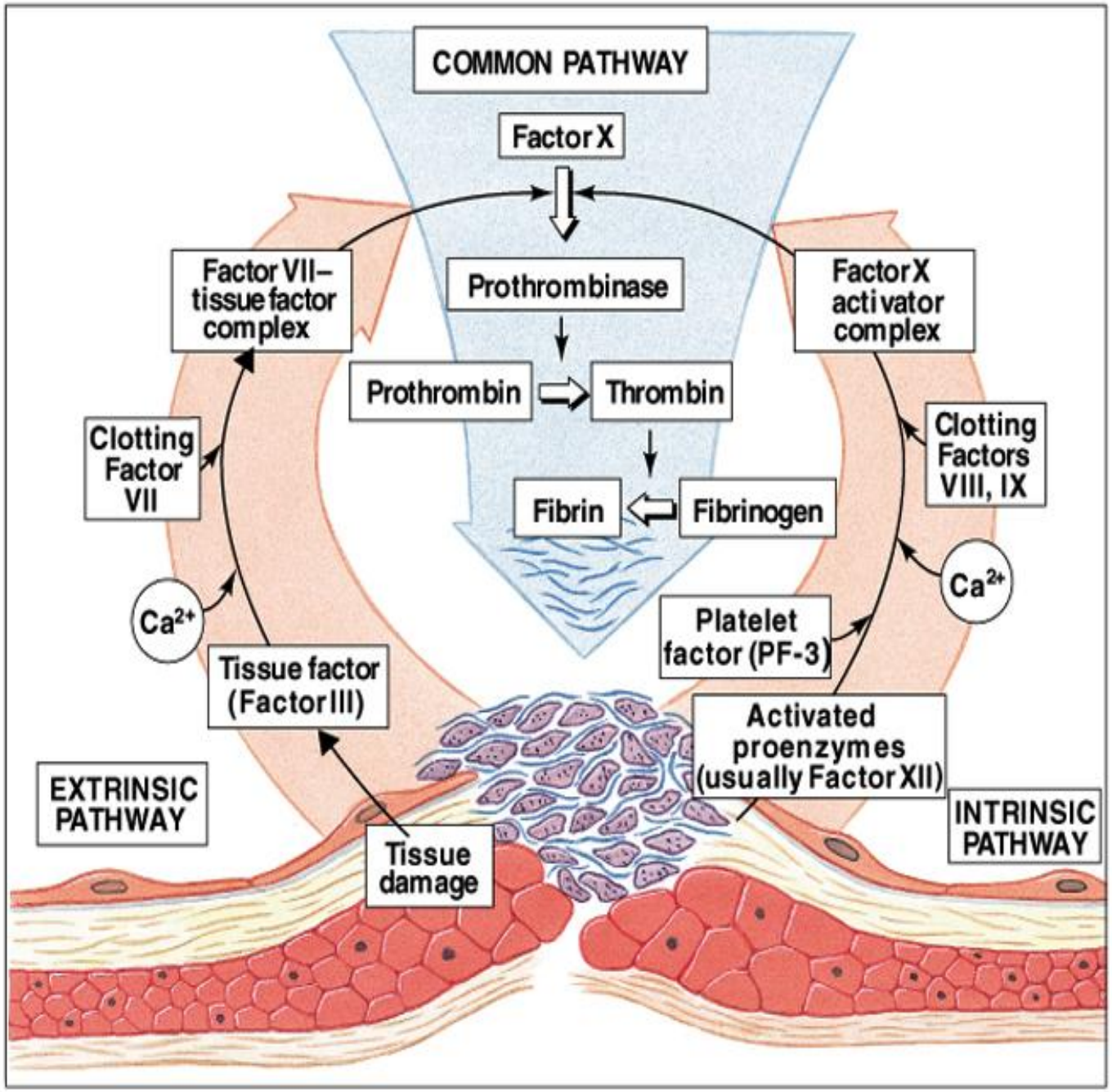
PLATELET

- Platelet disebut juga trombosit
- Berada dalam sirkulasi 9-12 hari
- N : 350.000/µl
- 1/3 berada di limpa
- Fungsi :
  1. Transport zat-zat kimia penting dalam proses pembekuan darah.
  2. Perlindungan sementara dari kebocoran pembuluh darah
  3. Kontraksi aktif setelah terbentuknya bekuan darah.

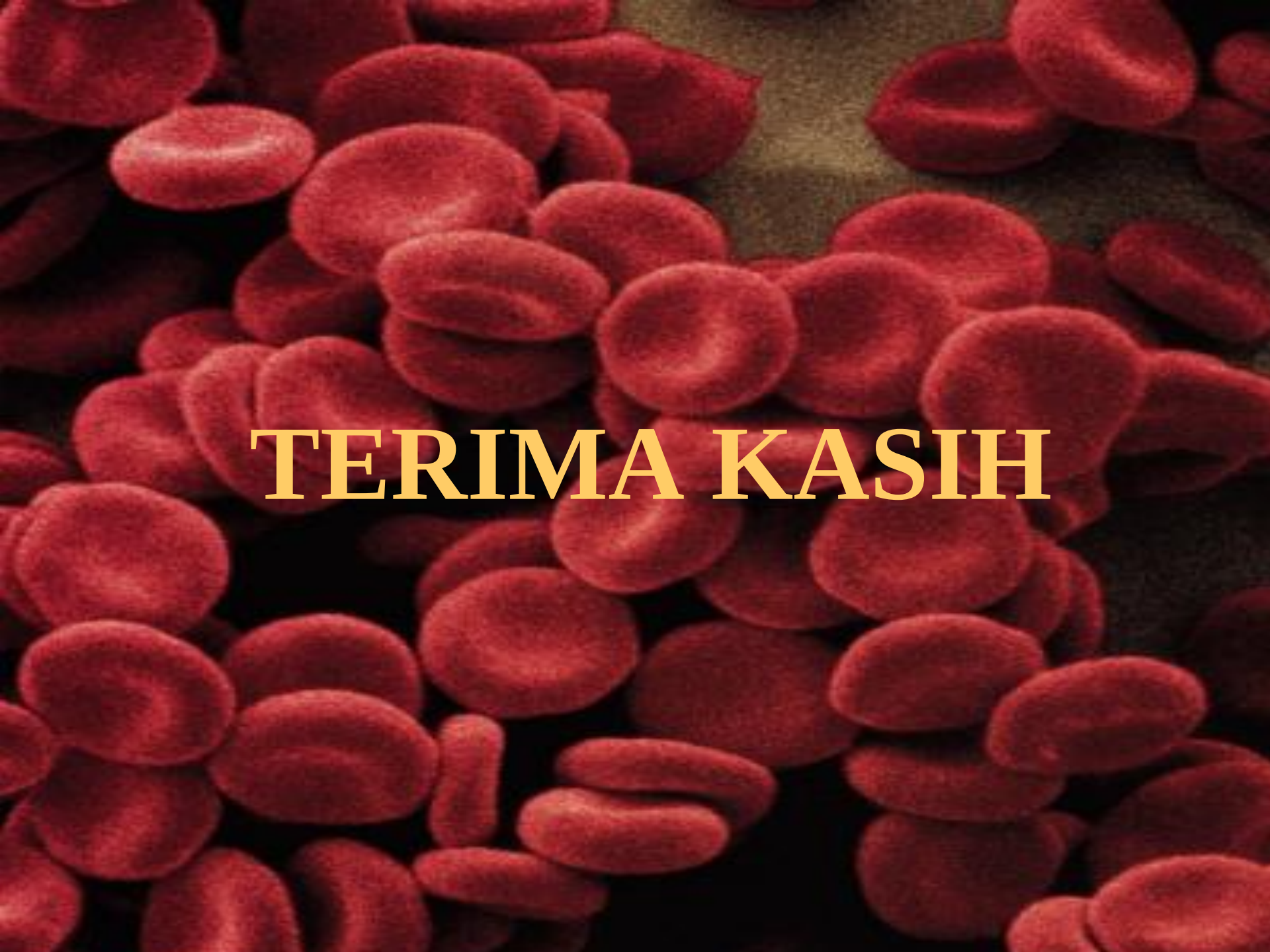
HEMOSTASIS

- Terdiri dari 3 fase :
  1. Fase Vaskular *(vascular phase)*
  2. Fase Platelet *(platelet phase)*
  3. Fase Pembekuan *(coagulation phase)*


VASCULAR PHASE
Vascular spasm
Release of chemicals
(ADP, thromboxane A_2,
Ca^{2+}, platelet factors)
Blood
Platelet
adhesion
Platelet aggregation
Platelet
plug
Vessel
wall
Endothelium
Cut edge of
vessel wall
Interstitial fluid
PLATELET PHASE



The coagulation phase


TERIMA KASIH