Samved
ORTHOPAEDIC HOSPITAL

BODY FLUIDS AND CIRCULATION

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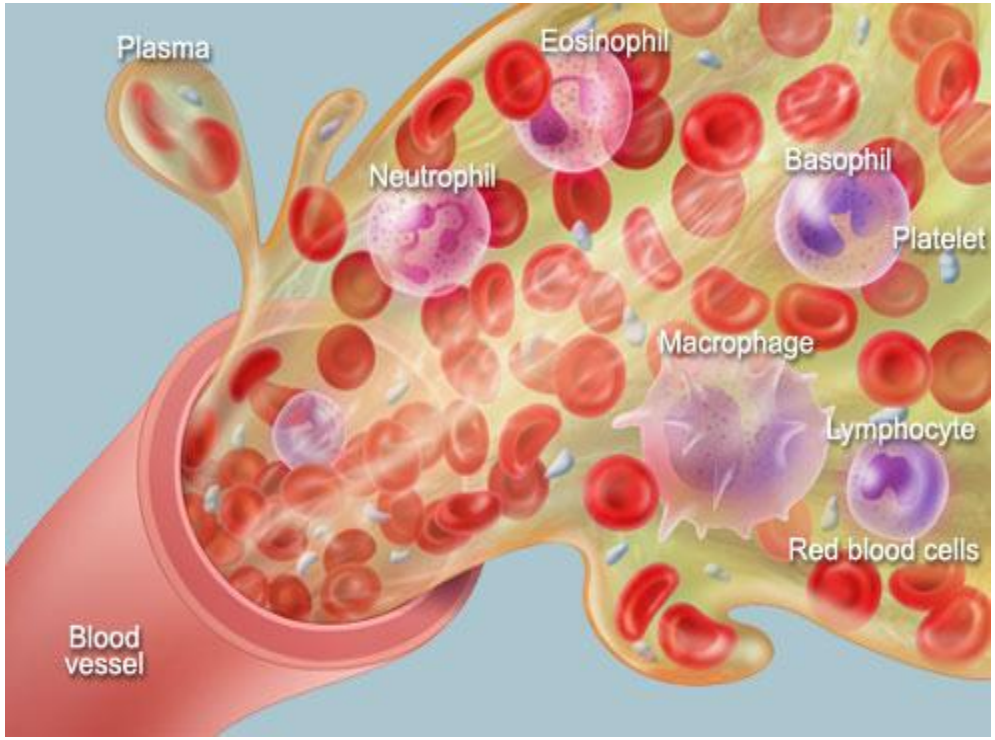
Blood and its components



INTRODUCTION

- Every cell of Human Body needs:
  1. Oxygen
  2. Nutrients

  } For Metabolic Activities

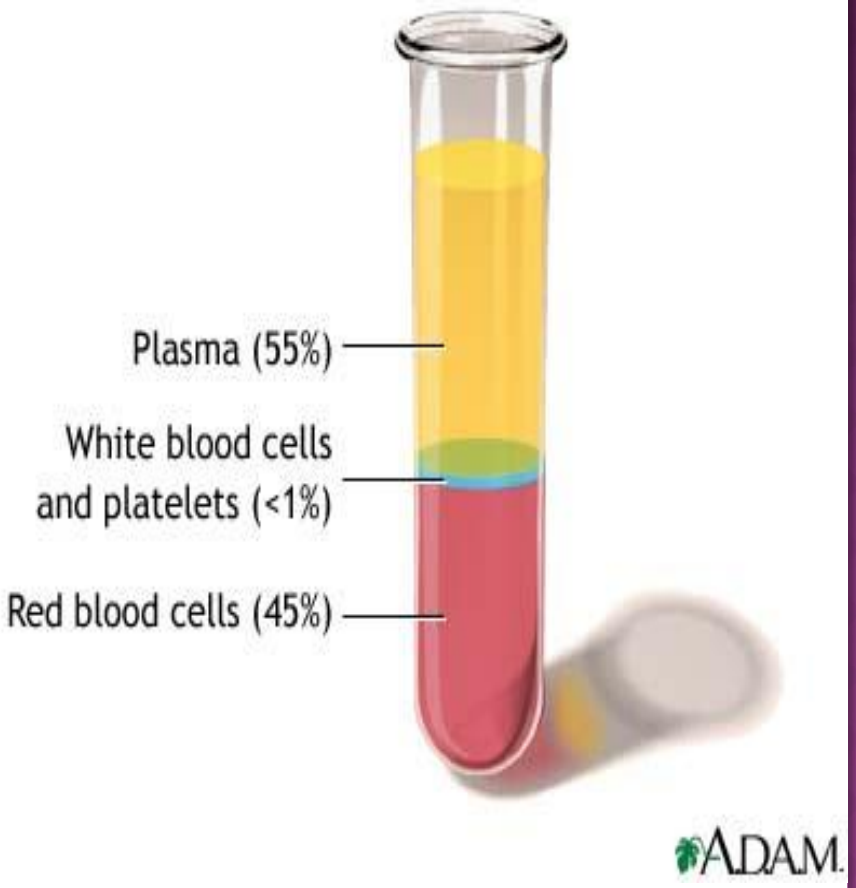
- Body Fluid as a Carrier is needed

- This flow of body fluids in specific canal is known as circulation

BLOOD

- Blood has 2 main components:

1. Blood Plasma
2. Formed Elements



BLOOD PERCENTAGE

- 55 % Plasma
  - Straw-colored liquid in which the blood cells are suspended.

- 45 % formed elements
  - Red blood cells (Erythrocytes)
  - White blood cells (Leukocytes)
  - Platelets (Thrombocytes)

BLOOD PLASMA COMPONENTS

- **90% Water**
- **8% Solutes:**
  - Proteins –

    Albumin - Osmotic balance

    Globulins - Involved in defense mechanism

    Fibrinogens - Helps in coagulation of blood

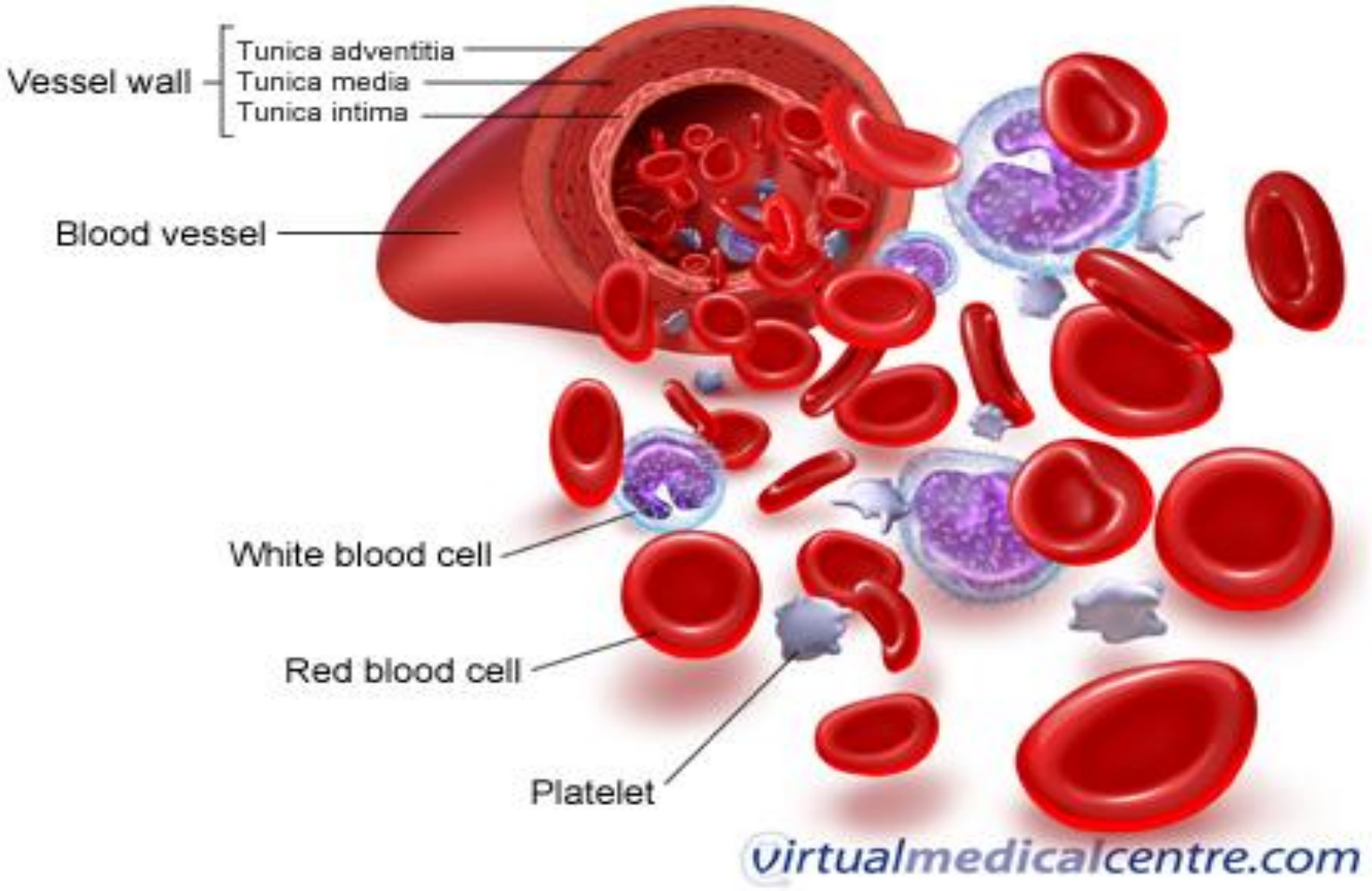
CONT….

- Dissolved Gases- O_2 , CO_2 , N_2
- Electrolytes - Sodium , Calcium, Magnesium, Potassium, Chloride, Bicarbonate
- Organic Nutrients – Carbohydrates , Amino Acids, Lipids , Vitamins
- Hormones
- Metabolic waste

BLOOD PLASMA

- Clear liquid water , sugar, fat, protein and salt solution
- Carries the red cells, white cells, platelets, and some other chemicals.
- 55% of blood's volume
- About 95% of it consists of water.
- It brings nourishment
- Removes the waste products of metabolism

FORMED ELEMENTS OF BLOOD

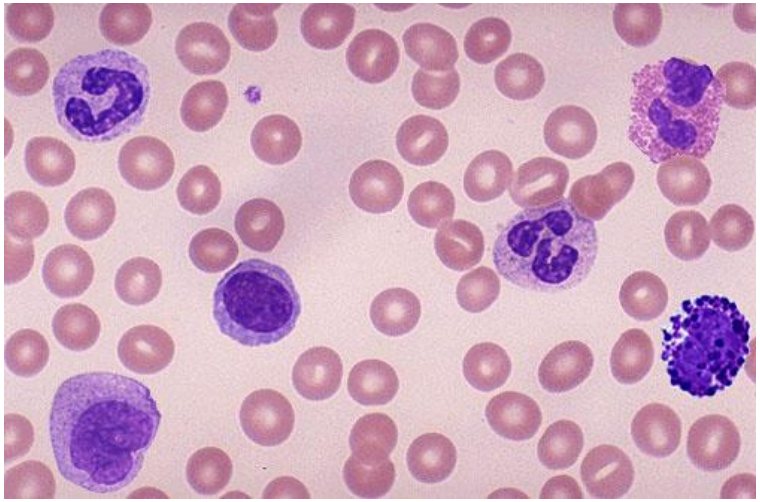


FORMED ELEMENTS OF BLOOD

- Red blood cells (Erythrocytes)
- White blood cells (Leukocytes)
- Platelets (Thrombocytes)

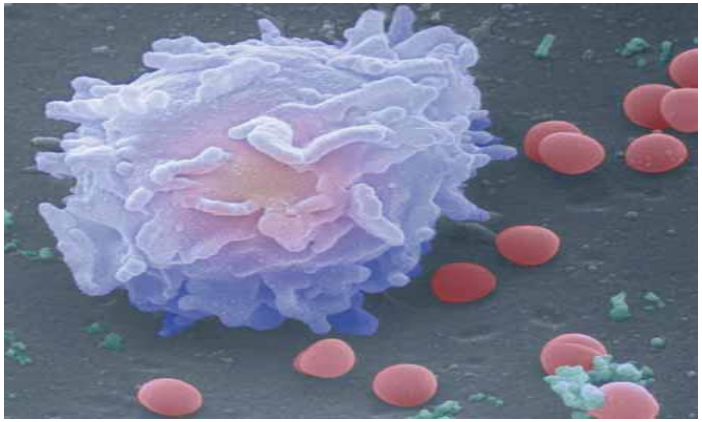
ERYTHROCYTES(R.B.C)

- Human RBC is devoid of nucleus
- Biconcave in shape.
- RBC contains Hemoglobin.
- Life span is 120 days.
- Total count of RBC is 5-5.5 millions.
- Transport of respiratory gases.



WHITE BLOOD CELL (LEUKOCYTES)

- Exist in variable numbers and types
- Very small part of blood's volume
- Leukocytes – **blood**, spleen, liver, and lymph glands.



- Produced in bone marrow , thymus gland
- Individual white cells usually only last 18-36 hours.
- Some types live as much as a year.

TYPES OF WHITE BLOOD CELL

- Granulocytes
  - Neutrophils- 40-70%
  - Eosinophils- 1-4%
  - Basophils- <1%

- Agranulocytes
  - Monocytes- 4-8%
  - Lymphocytes- 20-45%

GRANULOCYTES

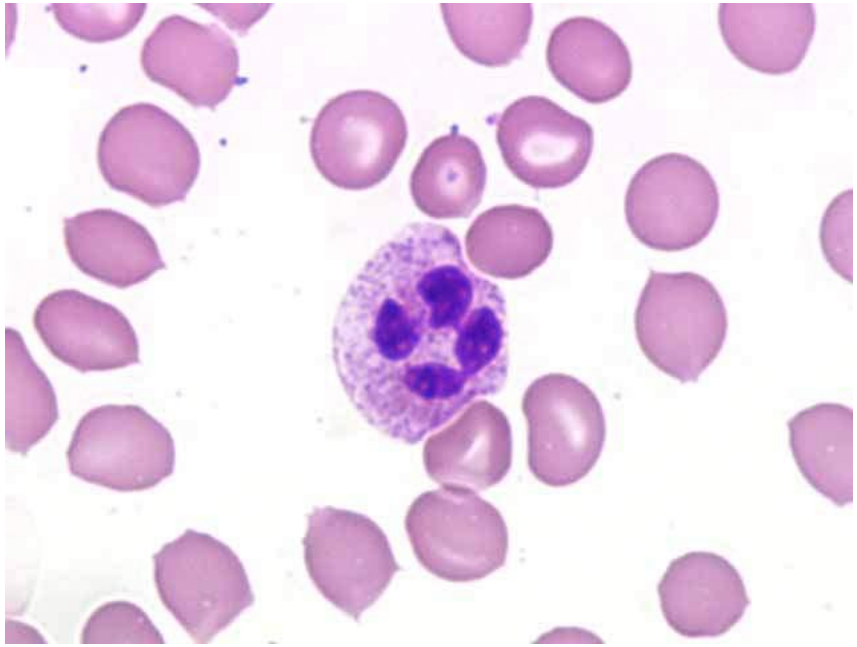
- Granulocytes are white blood cells whose cytoplasm contains tiny granules.
- Cells are named according to the staining characteristics of the granules.

AGRANULOCYTES

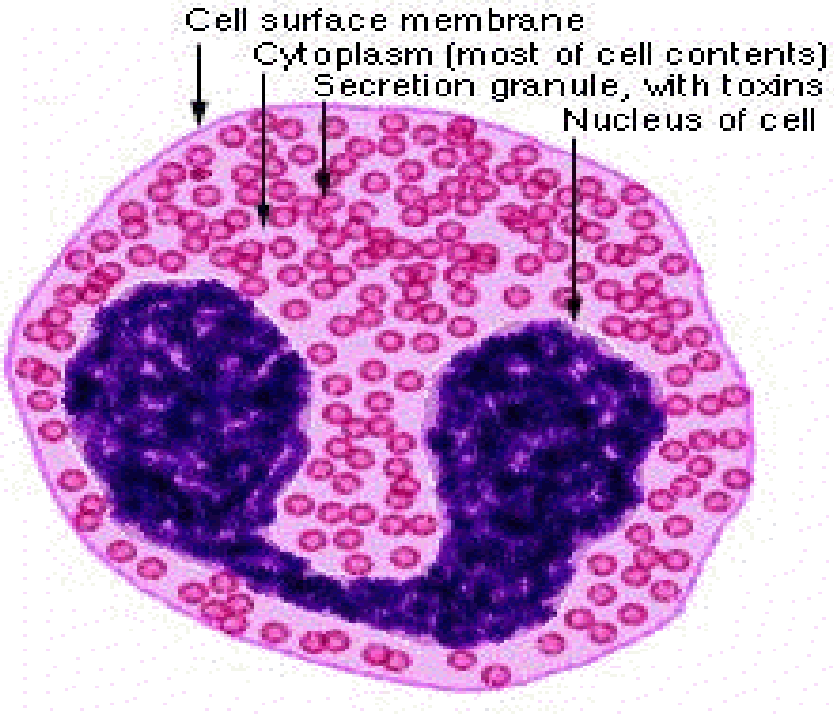
- Agranulocytes are white blood cells that have no distinct granules in their cytoplasm.

NEUTROPHILS

- 40-70%
- Multilobed nucleus
- Phagocyte in nature
- Engulf foreign material
- Life Span 6 hours to few days



EOSINOPHILS



- 1-4% of Leucocytes
- Red-staining granules
- Associated with allergic reactions
- Life span about 5 days

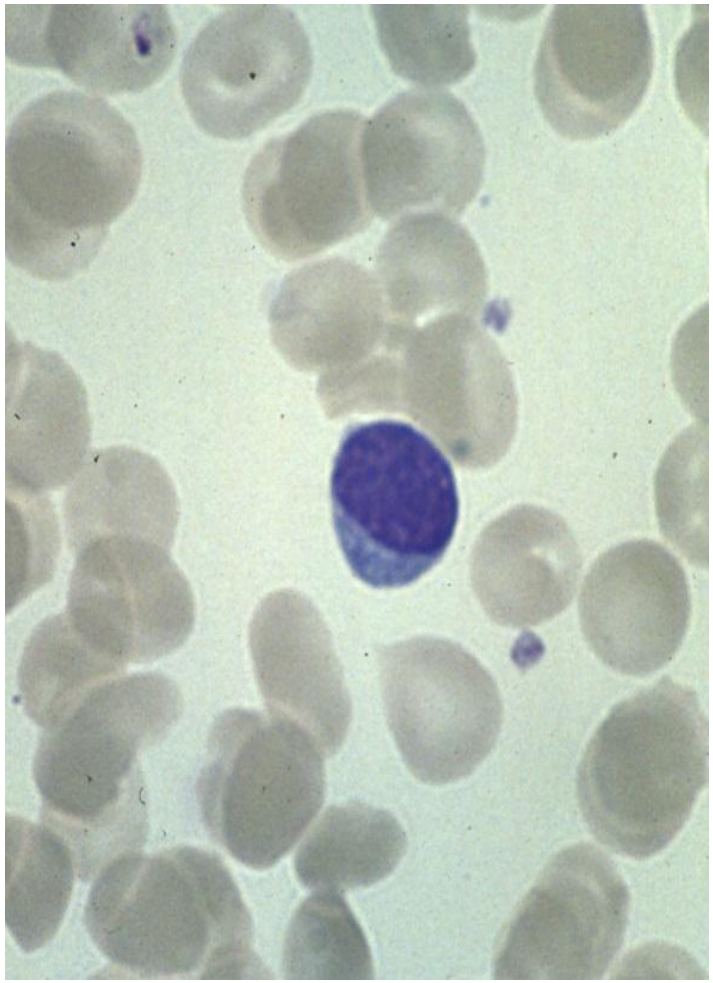
BASOPHIL

- Least numerous blood cells ,0- 1 %
- Secretes histomine, serotonin & heparin
- Involved in inflammatory reactions
- Life Span- few hours to few days

LYMPHOCYTES

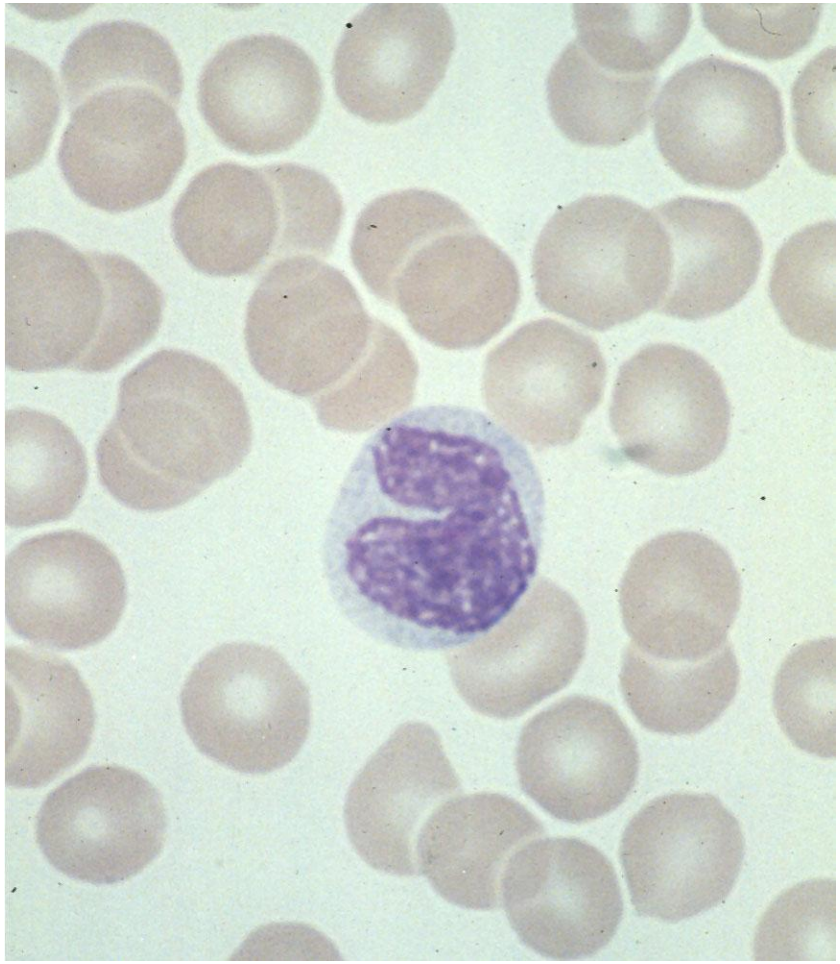
- 20-45 % of formed element
- It is of 2 types

  B-Lymphocytes & T-Lymphocytes
- Responsible for immune responses of the body
- Life Span- hours to years



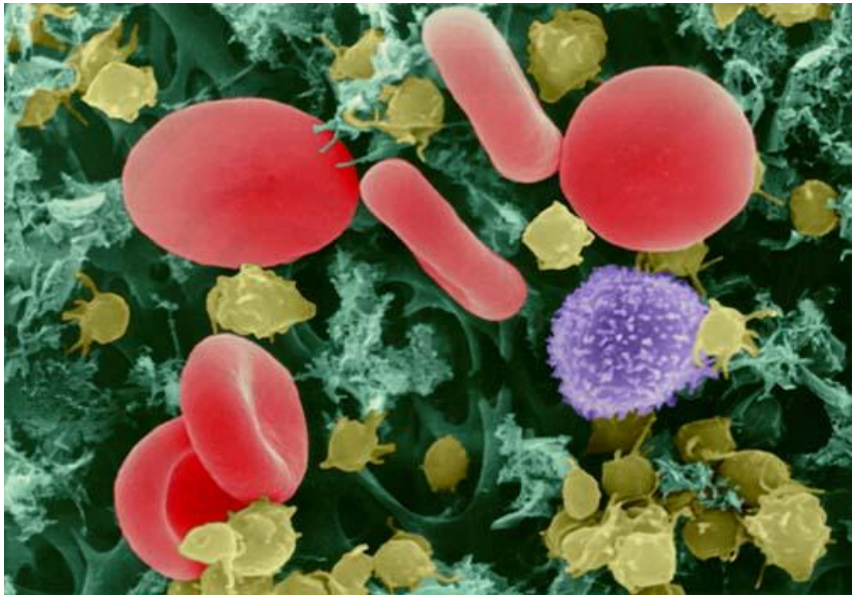
MONOCYTES

- 4-8 %
- Largest of the white blood cells.
- Phagocyte in nature
- Life Span in months



PLATELETS

- Smallest part of blood
- No nucleus
- Live 2-4 days
- Involved in clotting of blood



BLOOD GROUPING

Blood group	Antigens	Antibody	Donor's group	Recipient
A	A	anti-B	A,AB	O, A
B	B	anti-A	B,AB	O, B
AB	A,B	--------	AB	A, B, AB, O (Universal recipient)
O	-------	Anti-A,B	A, B, AB, O (Universal Donor)	

COAGULATION OF BLOOD

- Conversion of Fluid like blood – jelly like clot

  = blood coagulation

- Blood clotting involves 13 factors

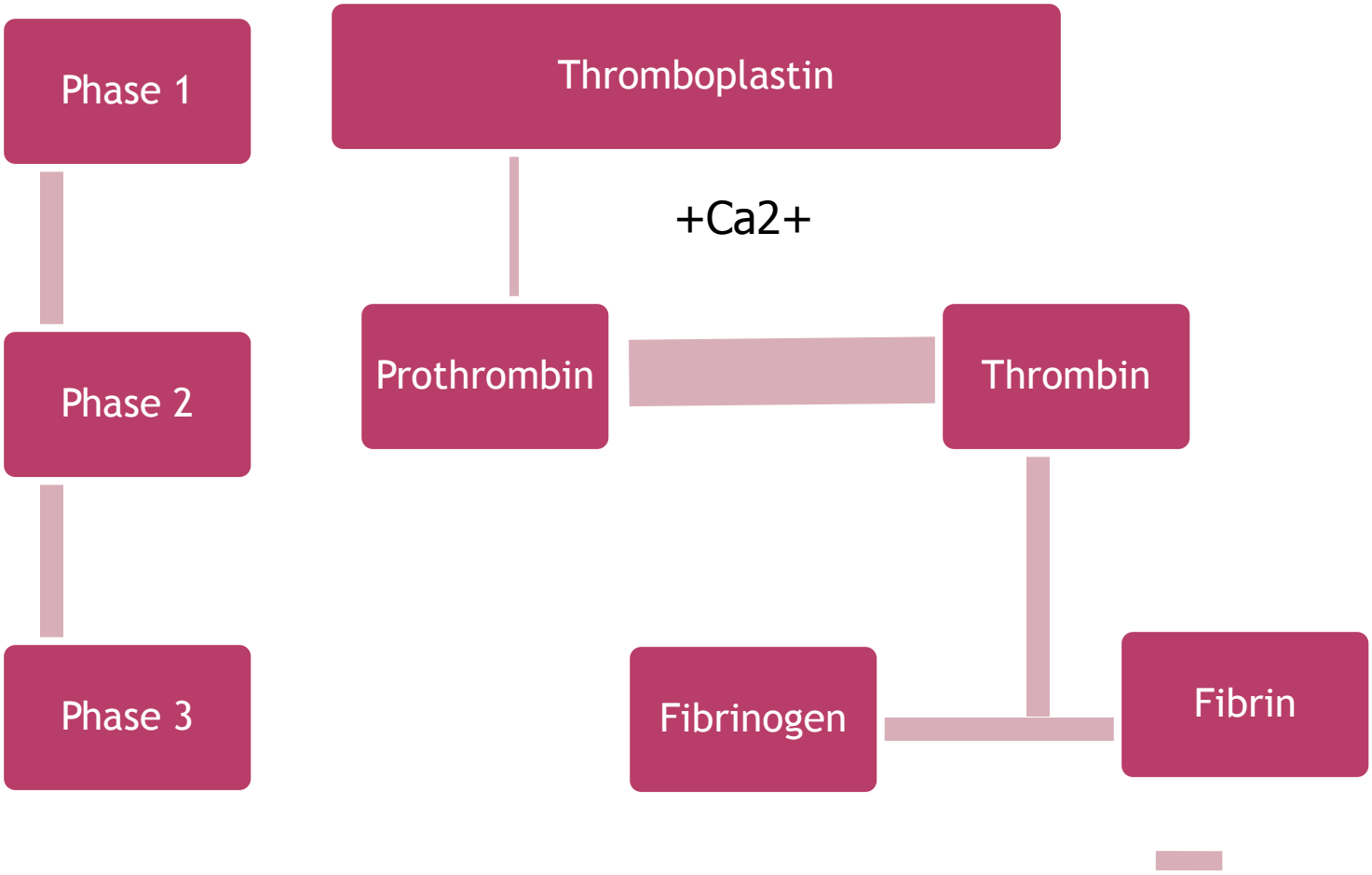
- Process –

  1. **Series of enzymatic reactions leading to thrombin formation**

  2. **Thrombin converts fibrinogen to fibrin**

  3. **Fibrin polymerizes and becomes cross linked**

COAGULATION OF BLOOD : PROCESS



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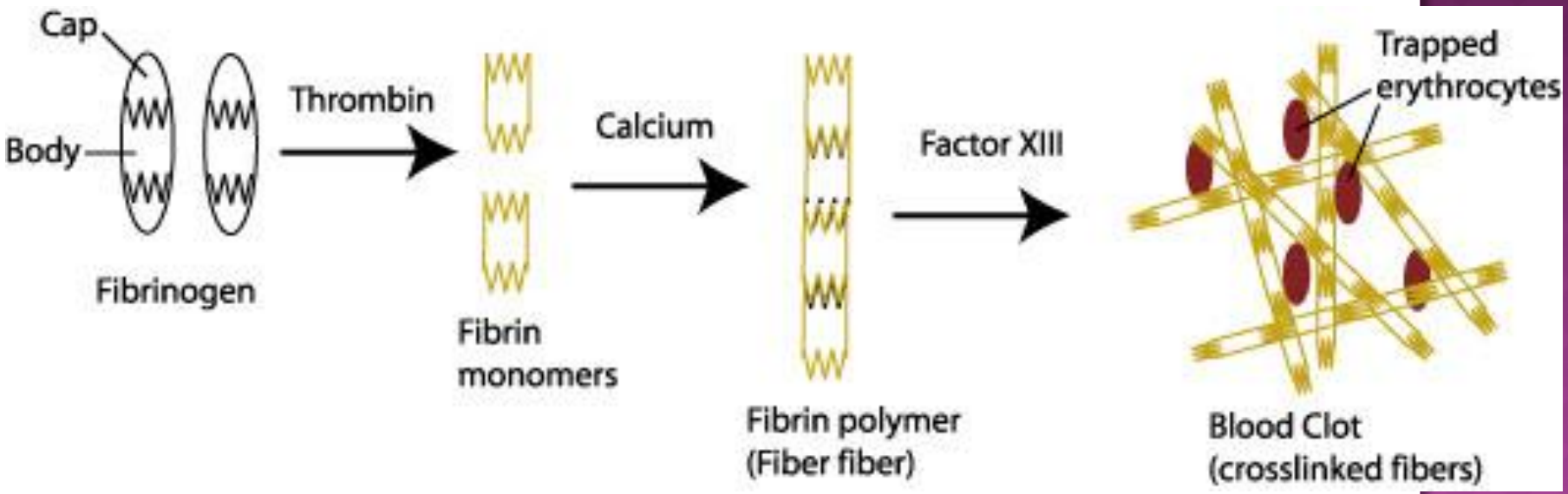

Cap
Body
Fibrinogen
Thrombin
Fibrin
monomers
Calcium
Fibrin polymer
(Fiber fiber)
Factor XIII
Trapped
erythrocytes
Blood Clot
(crosslinked fibers)

COAGULATION FACTORS

I Fibrinogen

II Prothrombin

III Thromboplastin

IV Calcium

V Proaccelerin

VI Proconvertin

VIII Antihemophilic globuline

IX Christmas factor

X Stuart-factor

XI Plasma thromboplastin antecedent (PTA)

XII Hageman factor

XIII Fibrin stabilizing factor

CONT....

Fresher's Party Tonight Come Play Party And Call Seniors. Please Have Fun

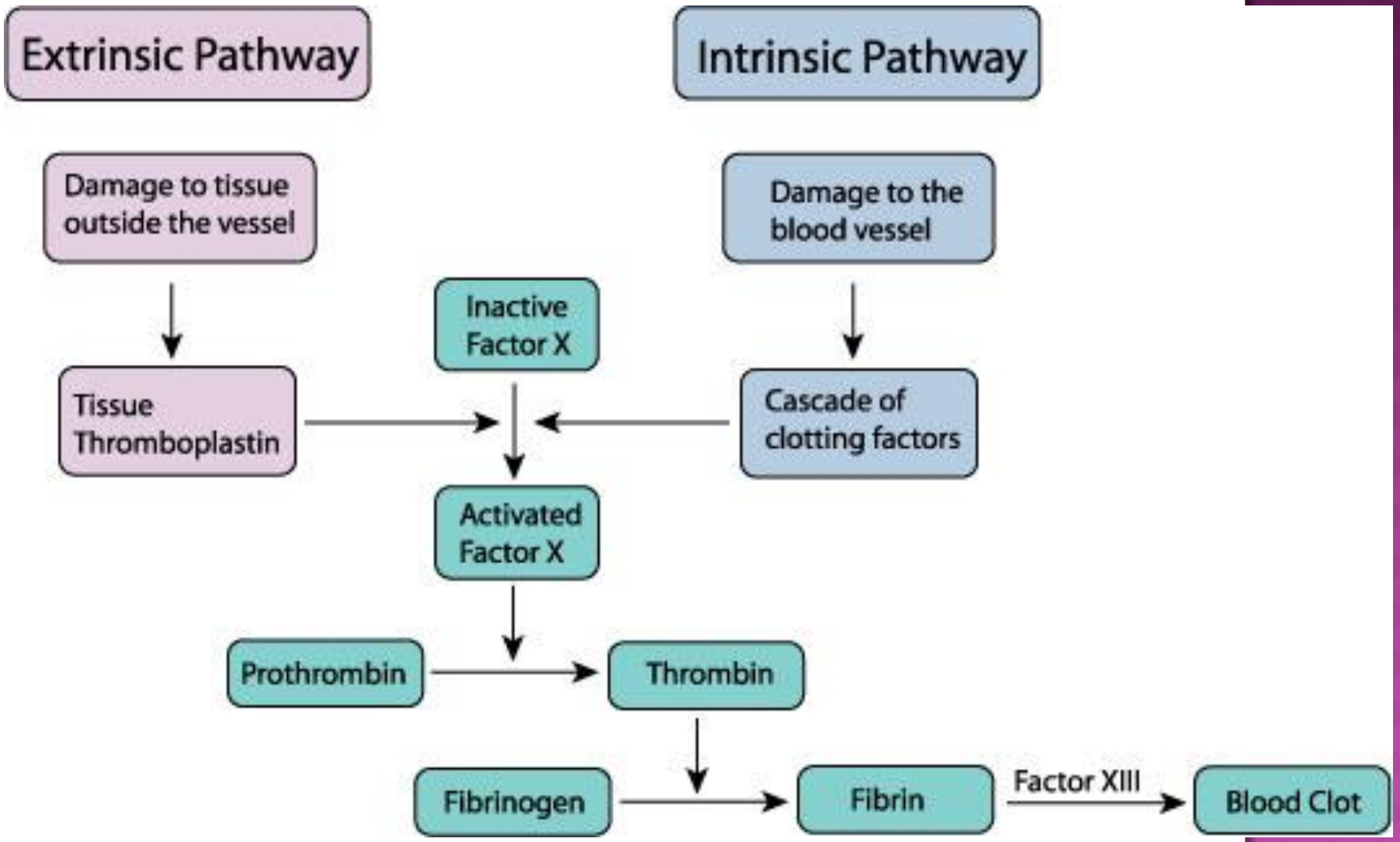
CONT…

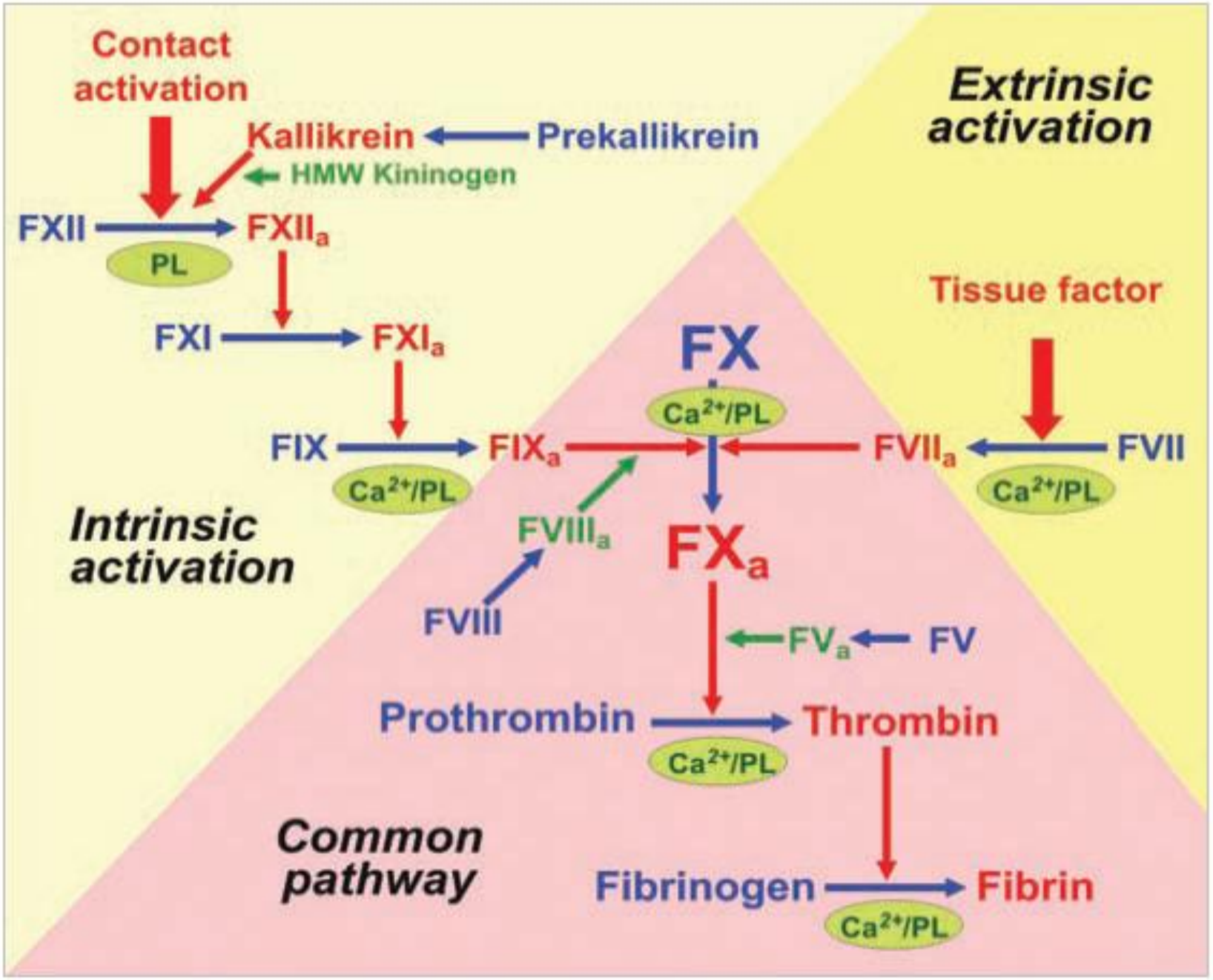
- **Divided into 2 pathways :**

  1. An Intrinsic system

  2. An Extrinsic system

CONT…


Extrinsic Pathway
Intrinsic Pathway
Damage to tissue outside the vessel
Damage to the blood vessel
Inactive Factor X
Tissue Thromboplastin
Cascade of clotting factors
Activated Factor X
Prothrombin
Thrombin
Fibrinogen
Fibrin
Factor XIII
Blood Clot


Contact activation
Kallikrein
Prekallikrein
HMW Kininogen
FXII
FXIIa
PL
FXI
FXIa
FIX
FIXa
Ca2+/PL
Intrinsic activation
FVIIIa
FVIII
FX
Ca2+/PL
FXa
FVa
FV
Extrinsic activation
Tissue factor
FVIIa
FVII
Ca2+/PL
Prothrombin
Thrombin
Ca2+/PL
Common pathway
Fibrinogen
Fibrin
Ca2+/PL