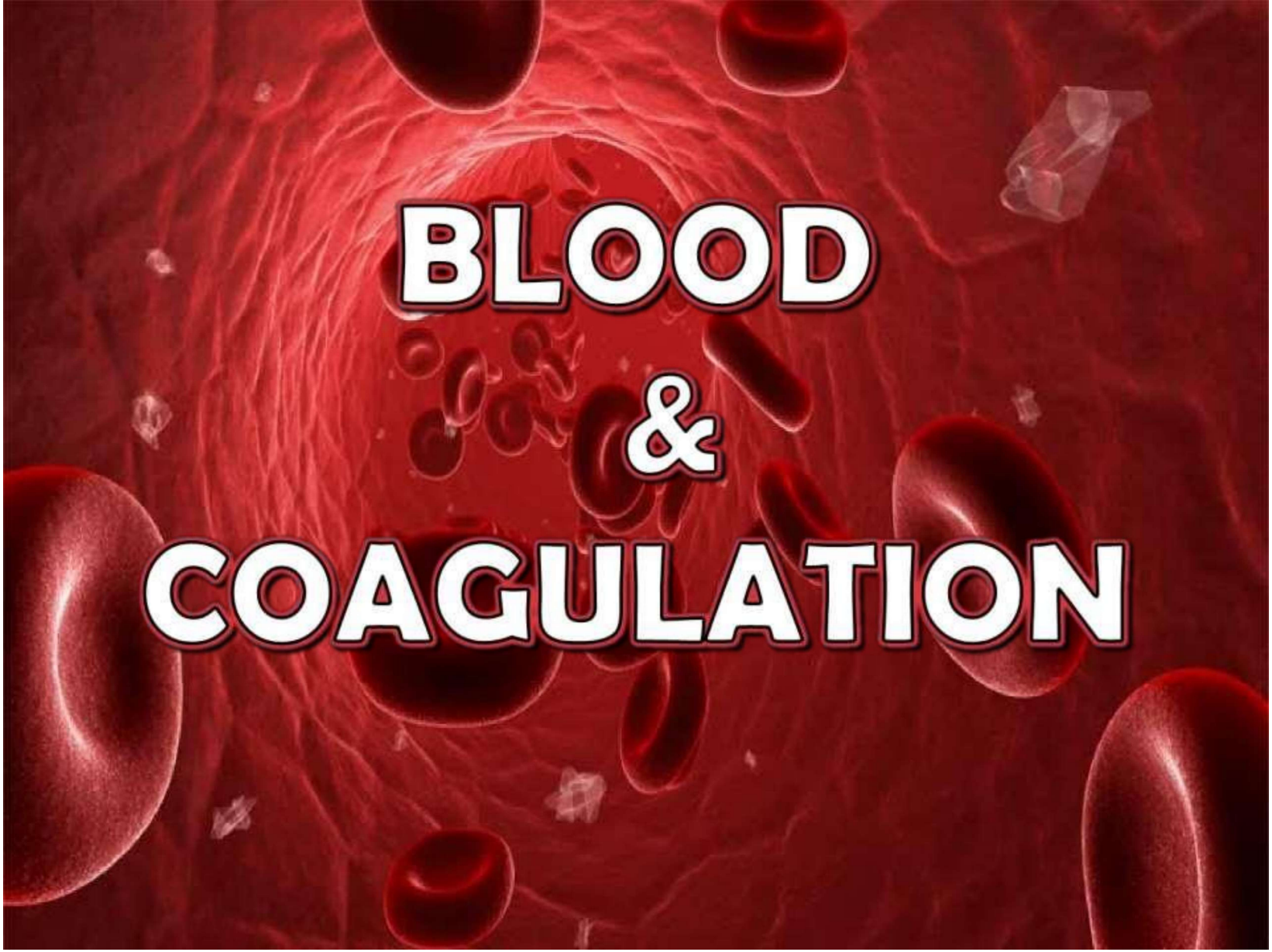
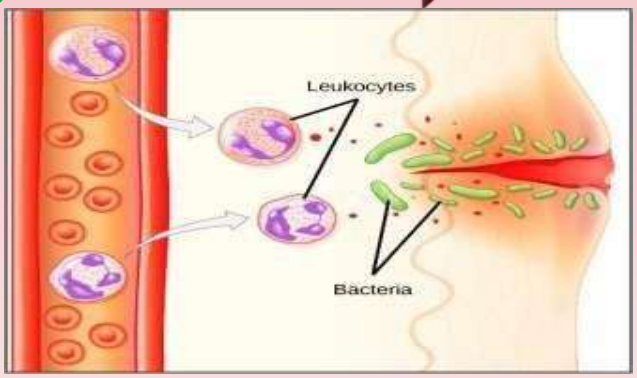
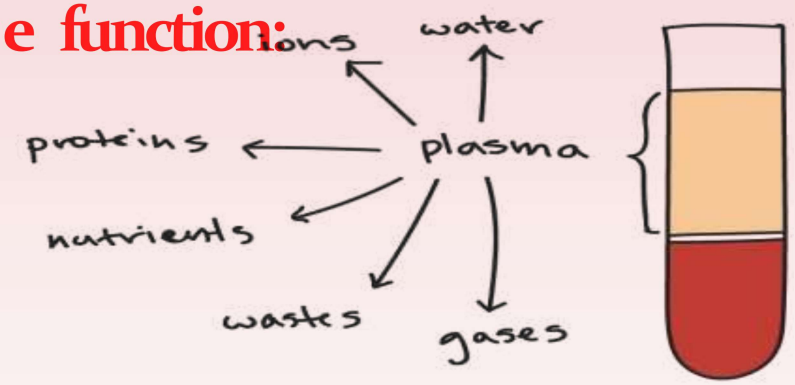

BLOOD
&
COAGULATION

- **Homeostasis:**

- **Defensive function:**

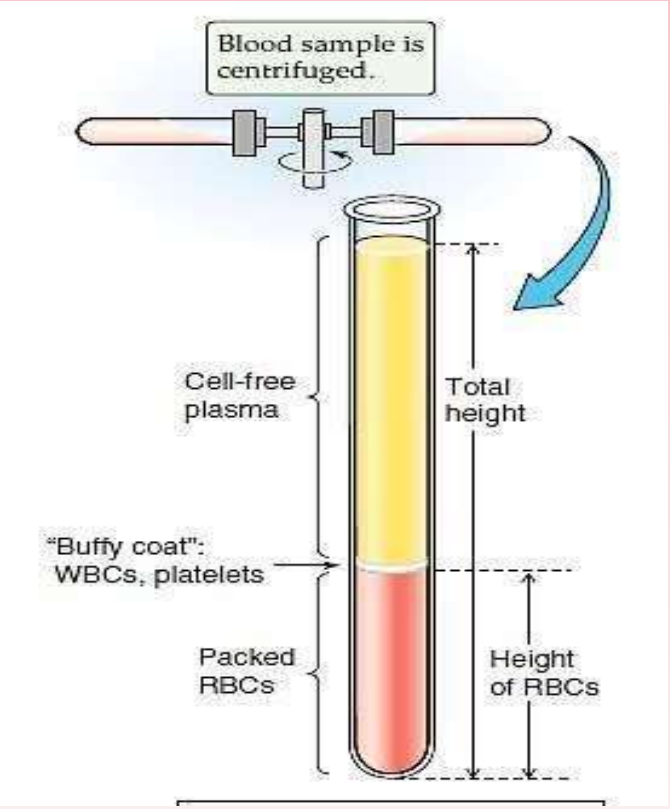


- **Storage function:**



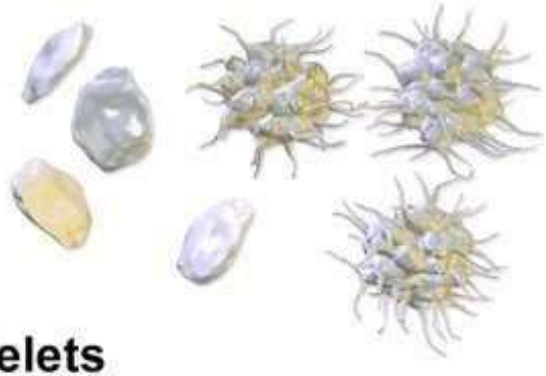
COMPOSITION OF BLOOD

- Blood contains the **blood cells - formed elements** and the **liquid portion - plasma.**

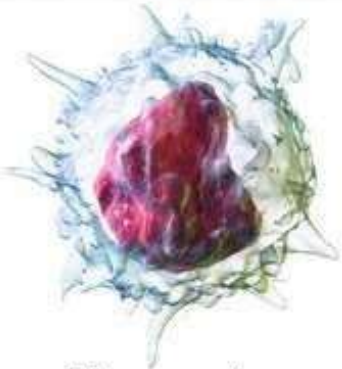


Formed Elements of Blood

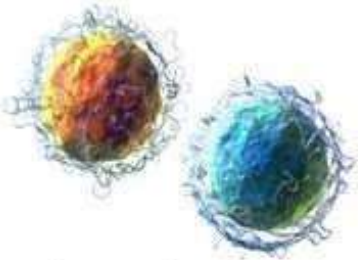
Red Blood Cells



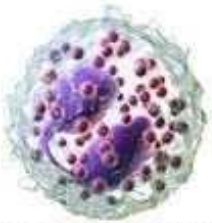
Platelets



Monocyte



Lymphocytes

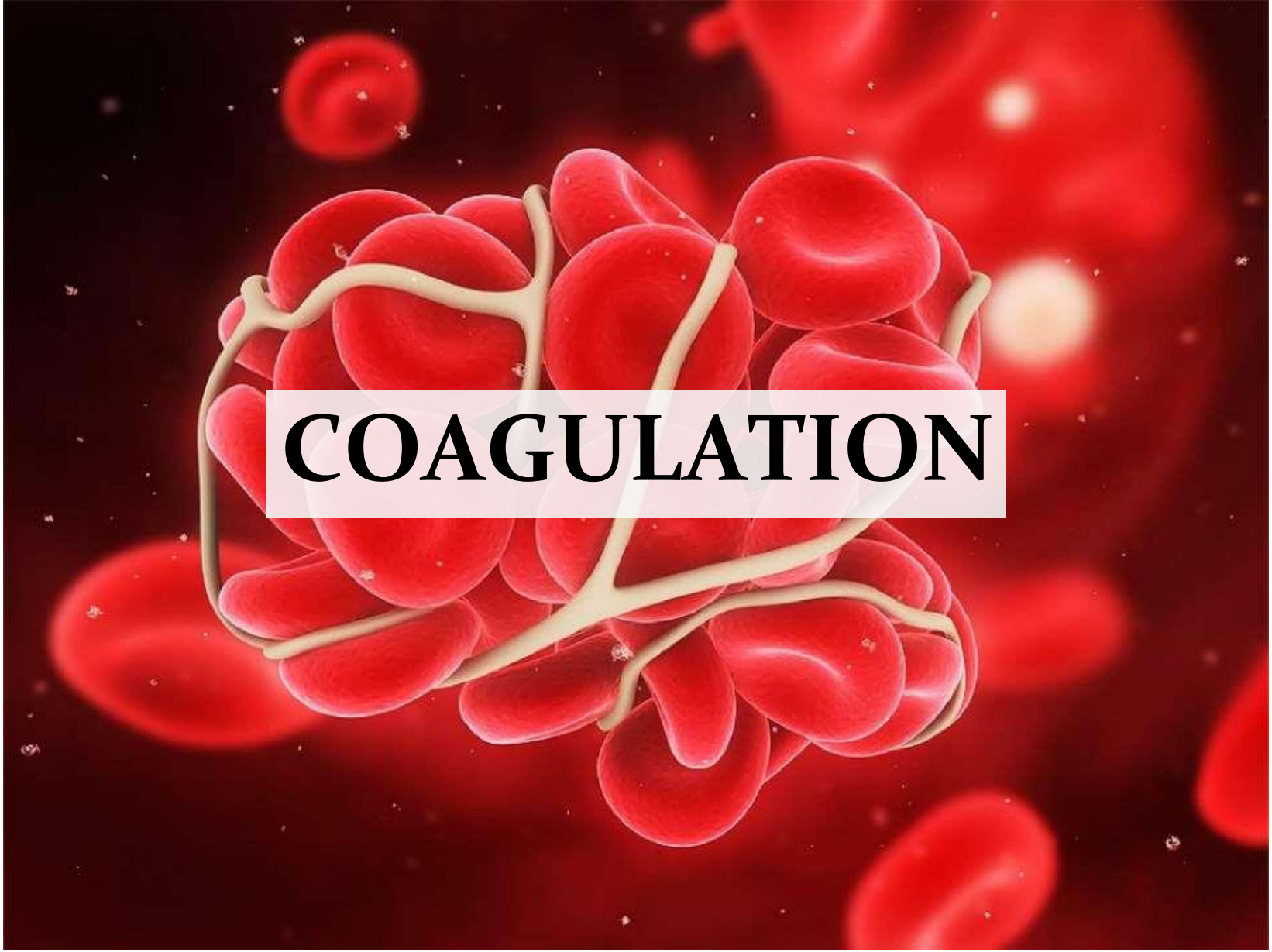


Eosinophil

Basophil

Neutrophil

White Blood Cells


COAGULATION

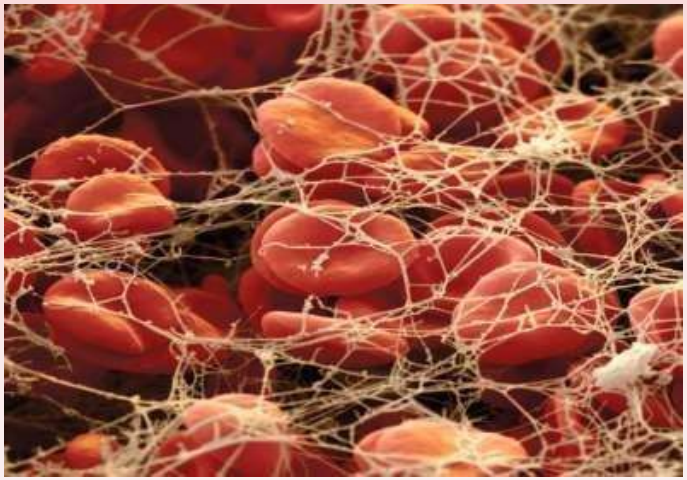
- **Hemostasis:**

  Hemostasis is defined as arrest or stoppage of bleeding.

- **Coagulation:**

  The process by which blood changes from a liquid to a gel‹ forming a blood clot, resulting in hemostasis.

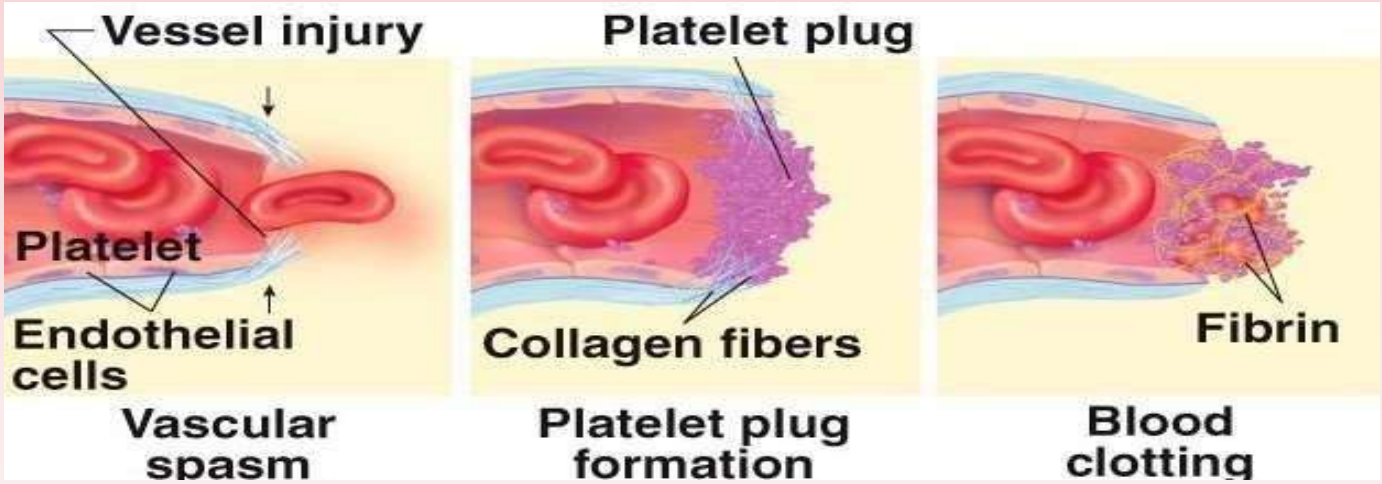
- **Clot:** Blood clot is defined as the mass of coagulated blood which contains RBCs, WBCs and platelets entrapped in fibrin meshwork.



STAGES OF HEMOSTASIS:

When a blood vessel is injured, the injury initiates a series of reactions, resulting in hemostasis. It occurs in three stages.

1. Vasoconstriction.
2. Platelet plug formation.
3. Coagulation of blood.



ANTICLOTTING MECHANISM IN THE BODY

Under physiological conditions, intravascular clotting does not occur. It is because of the presence of some physicochemical factors in the body.

1. Physical Factors

i. Continuous circulation of blood.

ii. Smooth endothelial lining of the blood vessels.

2. Chemical Factors – Natural Anticoagulants

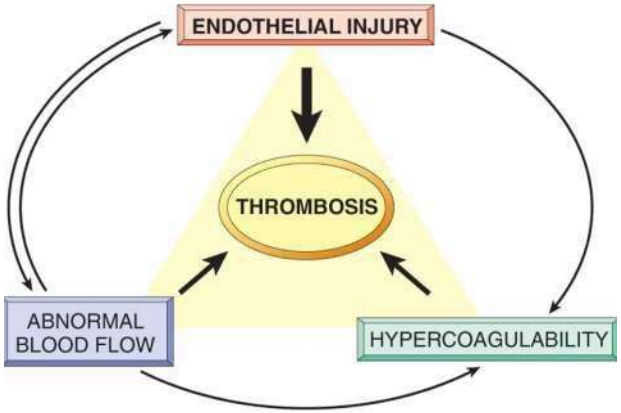
i.Presence of natural anticoagulant called heparin produced by liver.

ii. Production of thrombomodulin by endothelium

iii. All the clotting factors are in inactive state.

Thrombosis is:
The formation of a blood clot inside a blood vessel.
Both hemostasis and thrombosis involve three components:
- **Vascular wall.**
- **Platelets.**
- **Coagulation cascade.**

Pathogenesis of Thrombosis:
Three predisposing factors for thrombus formation (Virchow's triad):
1. Endothelium injury: This is a dominant predisposing factor, since endothelial loss by alone can lead to thrombosis.
.



.2Alterations in Normal Blood Flow:

3. Hypercoagulability:

Hypercoagulability generally contributes less frequently to thrombosis.

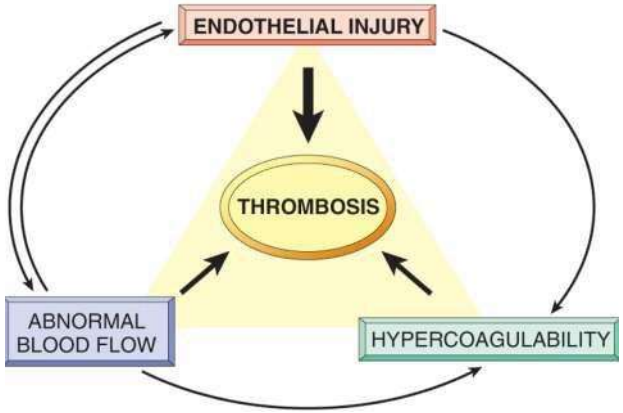
It is defined as:

Any alteration of the coagulation pathways that predisposes to thrombosis.

It is be divided into:

●Primary (Genetic).

●Secondary (Acquired).



Fate of the Thrombus

Thrombi undergo some combination of the following four events:

●Propagation:

Thrombi accumulate additional platelets and fibrin, eventually causing vessel obstruction.

●Embolization:

Thrombi dislodge or fragment and are transported elsewhere in the vasculature.

●Dissolution:

Is the result of fibrinolytic activation, which leads to rapid shrinkage and even total lysis of recent thrombi.

●Organization and recanalization

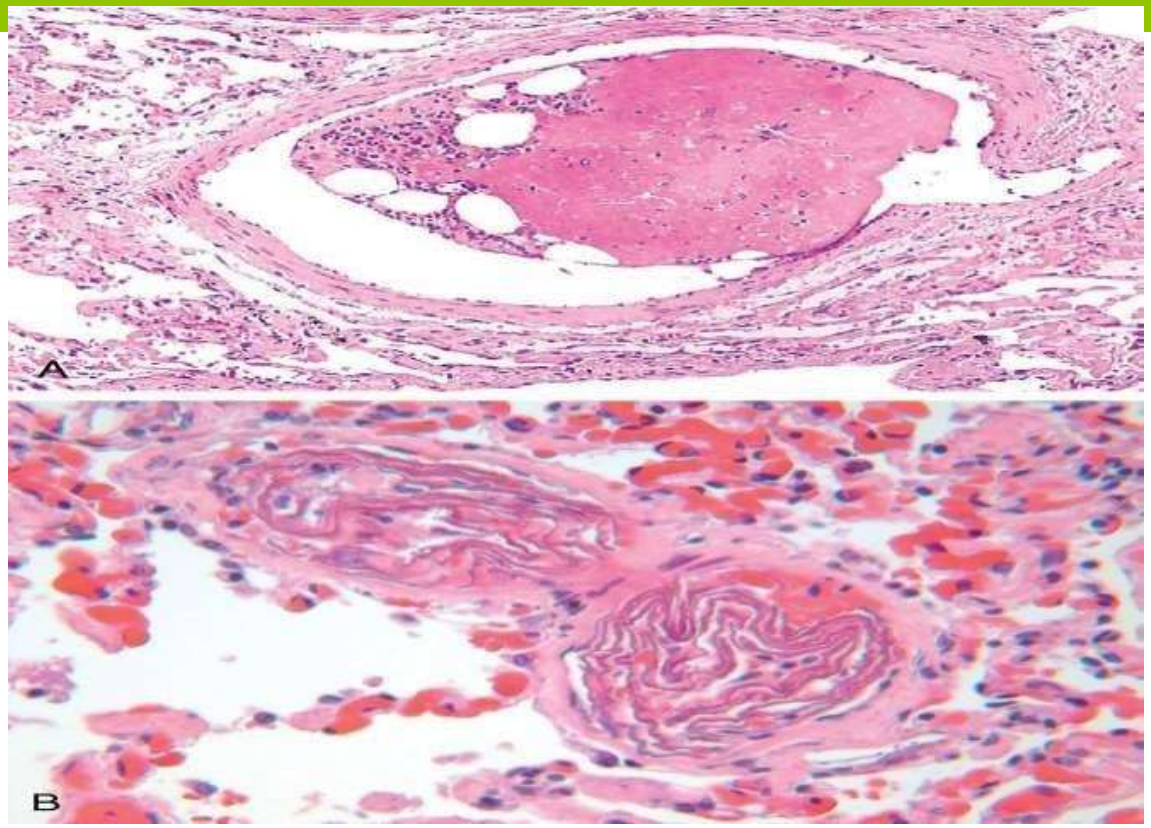
Embolism

- *An embolus is an intravascular solid, liquid, or gaseous mass that is carried by the blood to a site distant from its point of origin.*

- The vast majority of emboli derived from a dislodged thrombus—hence the term *thromboembolism.*

- The primary consequence of systemic embolization is ischemic necrosis (*infarction*) of downstream tissues, while embolization in the pulmonary circulation leads to hypoxia, hypotension, and right-sided heart failure.

Embolus derived from a lower-extremity deep venous thrombus lodged in a pulmonary artery branch.



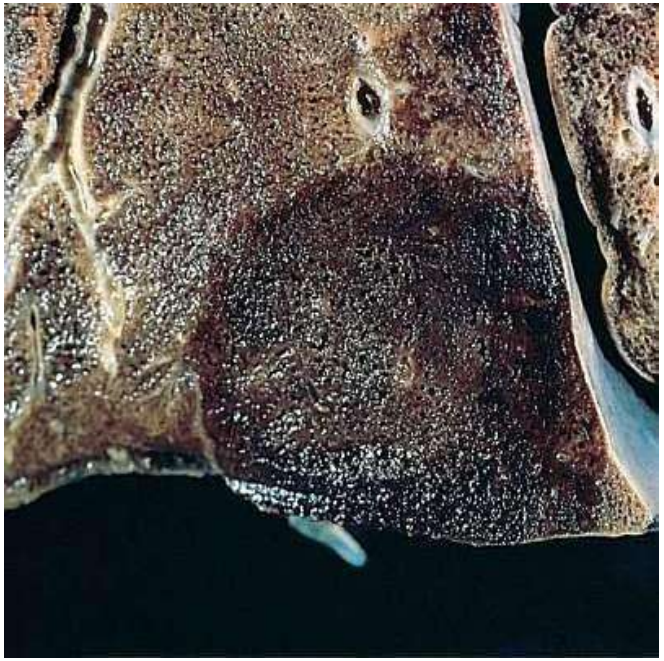
Unusual types of emboli. **A,** Bone marrow embolus. The embolus is composed of hematopoietic marrow and marrow fat cells (*clear spaces*) attached to a thrombus. **B,** Amniotic fluid emboli. Two small pulmonary arterioles are packed with laminated swirls of fetal squamous cells. The surrounding lung is edematous and congested. *(Courtesy of Dr. Beth Schwartz, Baltimore, Maryland(.*

Infarction

- *An infarct is an area of ischemic necrosis caused by occlusion of the vascular supply to the affected tissue.*

- *Arterial thrombosis or arterial embolism underlies the vast majority of infarctions.*

- Other uncommon causes of tissue infarction include vessel twisting (e.g., in testicular torsion or bowel volvulus), traumatic vascular rupture, and entrapment in a hernia sac.



A **B**

Red and white infarcts. **A,** Hemorrhagic, roughly wedge-shaped pulmonary infarct (red infarct). **B,** Sharply demarcated pale infarct in the spleen (white infarct.(