

## Inflammation

- Derived from latin word Inflammare [ to set on fire]
- Protective response needed for survival
- May be occur because of any agent
- local response of living tissue to any Injurious agent.

[DEPTH OF BIOLOGY]

- It is the 1st and essential process for the healing step.

### Types

- ① Acute [ lead to fever] ← → ② Chronic [ lead to wt. loss]

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Onset Action [ Rapid. In Min/Hrs]</li><li>• Cell involved are Neutrophils / Mastcells.</li><li>• Here tissue injury is mild, self limited</li><li>• local and systemic sign in case of acute inflammation is very prominent. [DEPTH OF BIOLOGY]</li><li>• Most time is beneficial</li><li>Ex → Common cold, Headache.</li></ul> | <ul style="list-style-type: none"><li>• Slow [ Days]</li><li>• lymphocyte, Monocyte, or macrophage</li><li>• Severe and Progressive.</li><li>• less prominent.</li><li>• Bad inflammation</li><li>• Can develop several ways → Auto immune disorder.</li></ul> |
|---|--|



## # Clinical Sign of Inflammation :-

If a tissue damage locally lead to release of inflammatory mediator into blood called systemic inflammatory. Acute phase response sometime called systemic inflammatory response syndrome. [DEPTH OF BIOLOGY]

- Inflammation is a body defence reaction in order to eliminate or limit the spread of injurious agent as well as to remove the necrosed tissue or cell.
- It involve host cell blood vessel and protein of our own body in order to eliminate the initial cause of cell injury. [DEPTH OF BIOLOGY]

## # Cardinal Feature of inflammation are :-

- Heat [Calor]
  - Pain [Dolor]
  - Redness [Rubor]
  - Swelling [Tumor]
  - Loss of function [Laesa]
- [DEPTH OF BIOLOGY]

## # Cause of Inflammation

Heat, Chemical irritant, X-ray, Trauma, Infection by Pathogen, Hypersensitivity reaction, Burn, Radiation.



## # Sign and Symptoms :-

Anorexia → Fever  
Weight loss → Restlessness  
Weakness

Inflammatory [Due to any Cause]

↓  
Mast Cell activated

↓  
release neurotransmitter such as :-

Histamine ← —————→ Prostaglandin

↓  
Serotonin

↓  
leukotriene

lead to increase Capillary Permeability

↓  
Oedema

- Inflammation may protect our body by diluting, destroying or neutralizing the Harmful agents. (eg → microbes, toxins) and finally they act to build a path for the other event that eventually heal and repair the sites of injury. [DEPTH OF BIOLOGY]

- The main component of inflammation are ⇒

① A vascular reaction ← —————→ ② A cellular response

[DEPTH OF BIOLOGY]



- Both are activated by mediator derived from plasma protein various cells. [DEPTH OF BIOLOGY]

### # Types :-

① Acute → This inflammation occurs immediately response to any injury.

- The acute of inflammation delivers leucocytes to the site of injury. It exist for short duration of time.
- Characterised by classical sign like Heat, redness, swelling, pain. [DEPTH OF BIOLOGY]

② Chronic → Exist for prolonged duration [week or year]

- Such inflammation occurs at that time when the acute inflammation fails to resolving the problem.

### # Mediators of inflammation :-

Mediators may be produce locally by cells at the site of inflammation or may be derived from circulating inactive precursors [typically synthesis by liver] that are activated at the site of inflammation. [DEPTH OF BIOLOGY]

- Chemical mediator of inflammation is defined as a substance which may be release from the cells, plasma [DEPTH OF BIOLOGY]



or damage tissue itself.

# The chemical mediators are broadly classified into following types :-

① Cell derived Mediators

Ⓐ vasoactive amine

- ① Histamine
- ② Serotonin

Ⓑ lysosomal Component

Ⓒ Platelet activating factor

Ⓓ Cytokines

Ⓔ Nitric oxide and oxygen

metabolites.

Ⓕ Arachidonic acid metabolites



Ⓐ ① Histamine [receptor GPCR (H<sub>1</sub>R, H<sub>2</sub>R, H<sub>3</sub>R, H<sub>4</sub>R) and H<sub>1</sub> receptor]

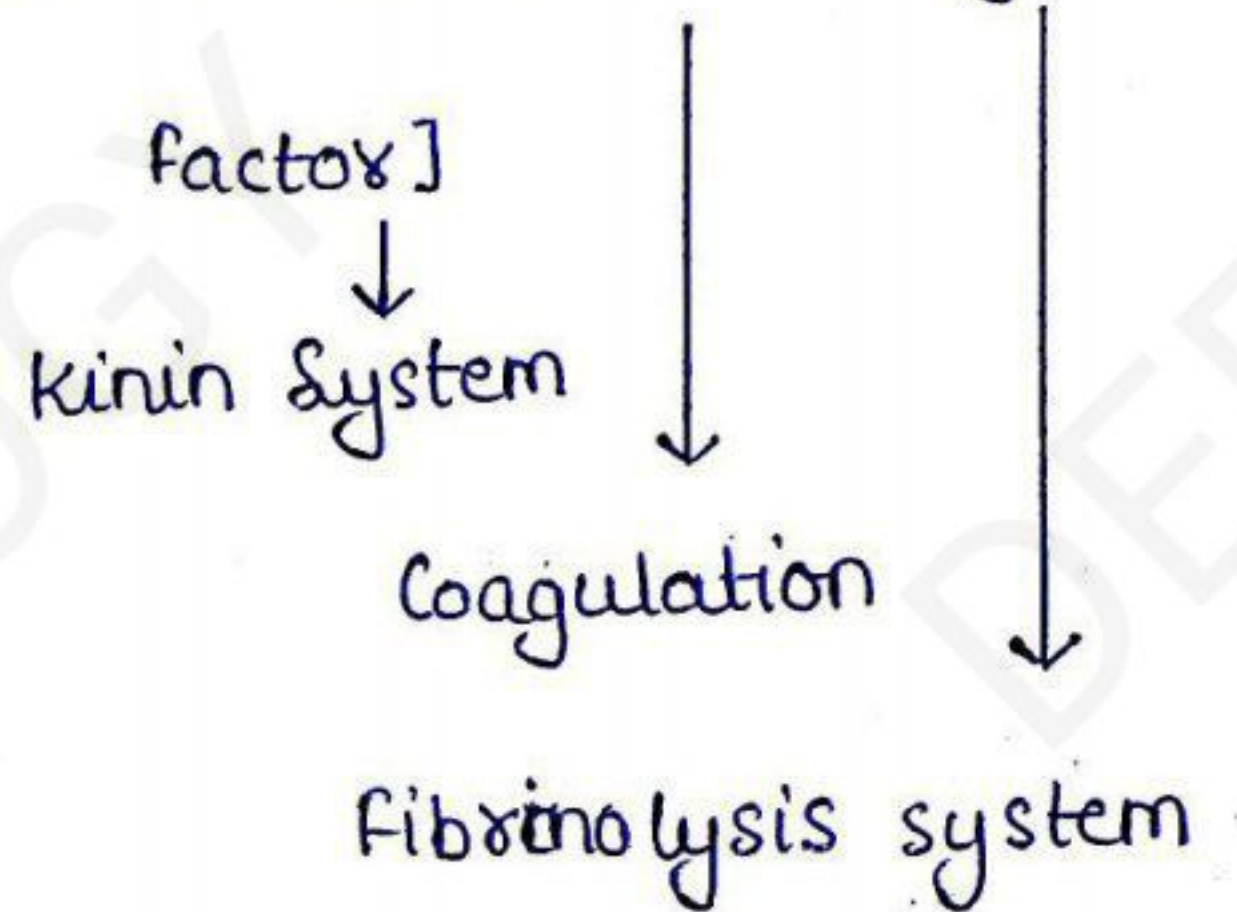
- store in the form of granule in Mast cell, basophils and platelets. [DEPTH OF BIOLOGY]

Functions → Vasodilation, (↑)se Vasular Permeability,

② Plasma derived Mediators

Ⓐ Complement activation

Ⓑ Factor twelve [Hagman



[DEPTH OF BIOLOGY]



Itching and Pain.

(i) Serotonin → It is present in tissue like chromaffin cell of G.I.T., spleen, Nervous tissue, Mast cell and platelets.

• It is a less potent mediator of inflammation as compared to Histamine.

[DEPTH OF BIOLOGY]

(b) Lysosomal Component → The inflammatory cell Neutrophil and monocyte contain lysosomal granule. When the lysosomal granule are released then it elaborate a variety of mediator of inflammation.

(i) Granule of Neutrophils :-

Primary → lactoferrin, lysozyme, Alkaline Phosphate

Secondary → Acid Hydrolase, Neutral Protease.

(ii) Granule of Monocytes :-

Acid Proteases, Collagenases, elastases,

Plasminogen activator. [DEPTH OF BIOLOGY]



7  
© Platelet Activating Factor → It is released from

[DEPTH OF BIOLOGY]

antibody - sensitised basophils, mast cell, Endothelium and platelets.

Function → [↑]se vascular permeability, Bronchoconstriction  
vasodilation [in low conc.] otherwise Vaso  
constrictor, Adhesion of leucocyte to endothelium.

© Cytokines → They are polypeptide substance that is  
produced by activated lymphocytes and  
activated monocytes. [DEPTH OF BIOLOGY]

Types →

- $\gamma$  - Interferon
- Interleukin
- Alpha and beta tumour necrotic factor

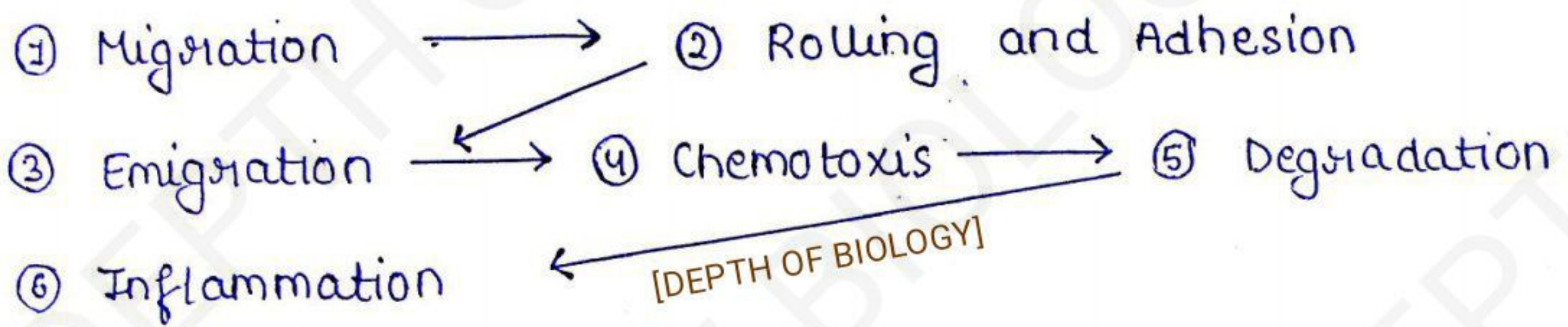
© Nitric Oxide → Vascular relaxation factor produced by  
[DEPTH OF BIOLOGY] Endothelium cell.

Role in Inflammation :-

- Vasodilation
- Antiplatelet activating agent
- Microbicidal action



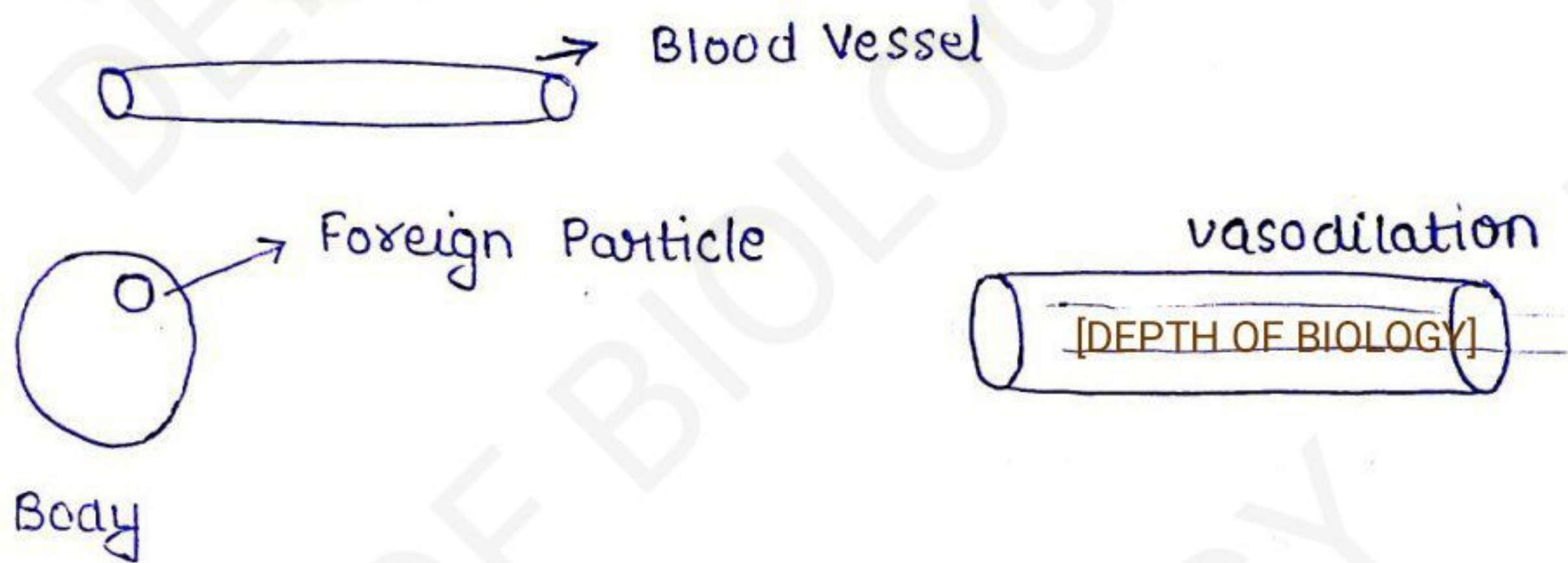
## # Mechanism of inflammation :-



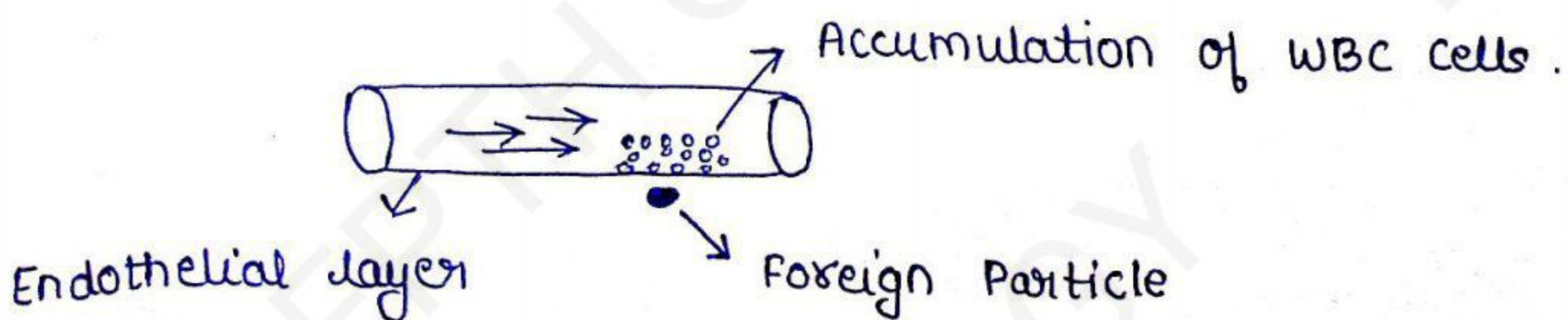
① Migration → In Migration step, the side of body where foreign particle attack.

At this side of infection blood vessel become dilate.

Now Blood flow [↑]se.



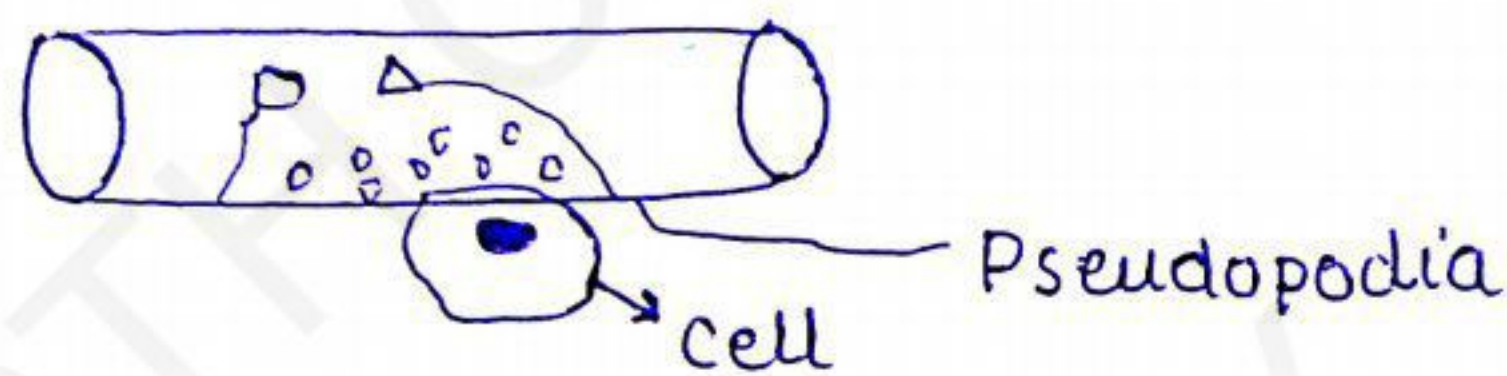
② Rolling and Adhesion → Since in previous step blood flow [↑] lots of WBC cell become flow by rolled and adhesion of WBC on the upper site of blood where the foreign particle attack [DEPTH OF BIOLOGY]





③ Emigration → Our mast cell and basophil cell are come and stick on upper side of endothelial.

Both Mast cell and basophil cell are come at a site of infection through pores present in endothelial known as pseudopodia and enter in cell where foreign particle attack.



④ Chemotaxis ⇒

A hand-drawn diagram of a 'Mast Cell' (labeled on the left) with several small, irregular shapes inside it. One of these shapes is labeled 'Foreign Particle'. An arrow points from the 'Mast Cell' towards the 'Foreign Particle'. Above the cell, the word 'Basophills' is written with an arrow pointing to the cell.

Now here mast cell and basophil cell attack on foreign particle by release ~~particle~~ chemicals → Histamine, Leucotxine to kill the F.P. [DEPTH OF BIOLOGY]

⑤ Degradation → when they release chemical cell degradation takes place.

⑥ Inflammation → when our own cell damage then [DEPTH OF BIOLOGY] inflammation occur in our body.

[swelling, Heat, Pain, Redness, Loss of function]



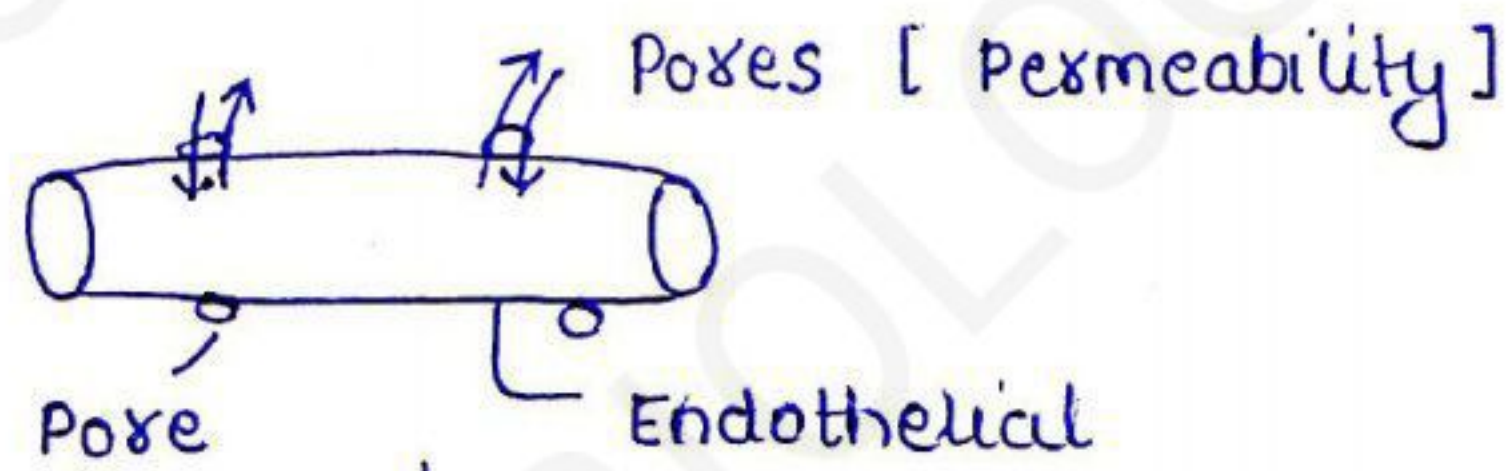
## \*\* Alteration in Vascular Permeability and Blood flow

When inflammation occur  
↓

In this case :-

Blood Flow [↑]

Permeability [↑]



→ Pore Size ↑ → Permeab. ↑  
→ Pore Size ↓ → Permeab. ↓

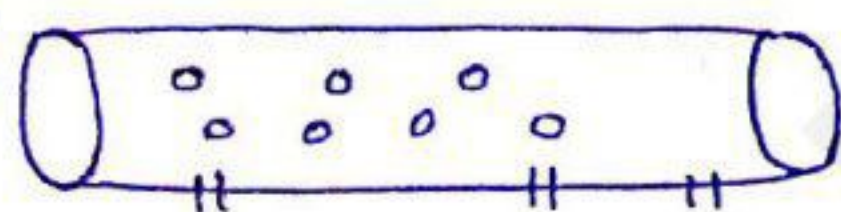
Types :-

- ① Retraction of Endothelial cell and leakage
- ② Direct endothelial injury
- ③ leucocyte dependent cell injury
- ④ Increase Transcytosis
- ⑤ Leakage from new capillary

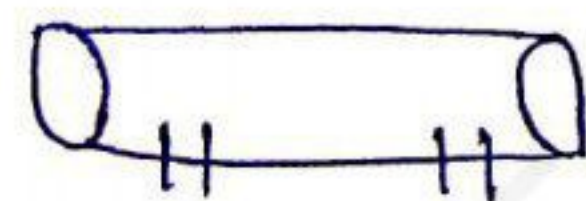
① Retraction of Endothelial Cell and leakage :-

Inflammatory mediators

[Histamine, prostaglandin]



Endothelial



Pore Extend here

When inflammation occur, this mediator are come in

contact and stick with endothelial cells. [DEPTH OF BIOLOGY]





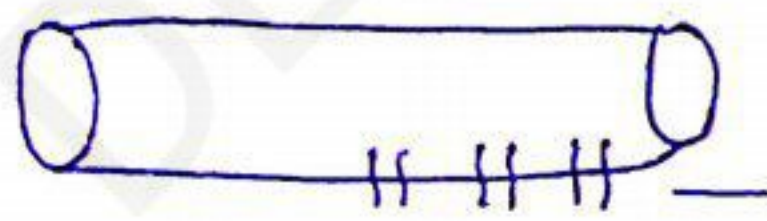
and this inflammation mediator cause constriction in endothelial wall. ↓

and stretch in endothelial wall due to this stretch the size of pore become extend. ↓

Now transfusion, permeability and blood flow, all are [↑] se.

[DEPTH OF BIOLOGY]

### ② Direct Endothelial Injury :-



Here endothelial damage



Due to this size of pore [↑]

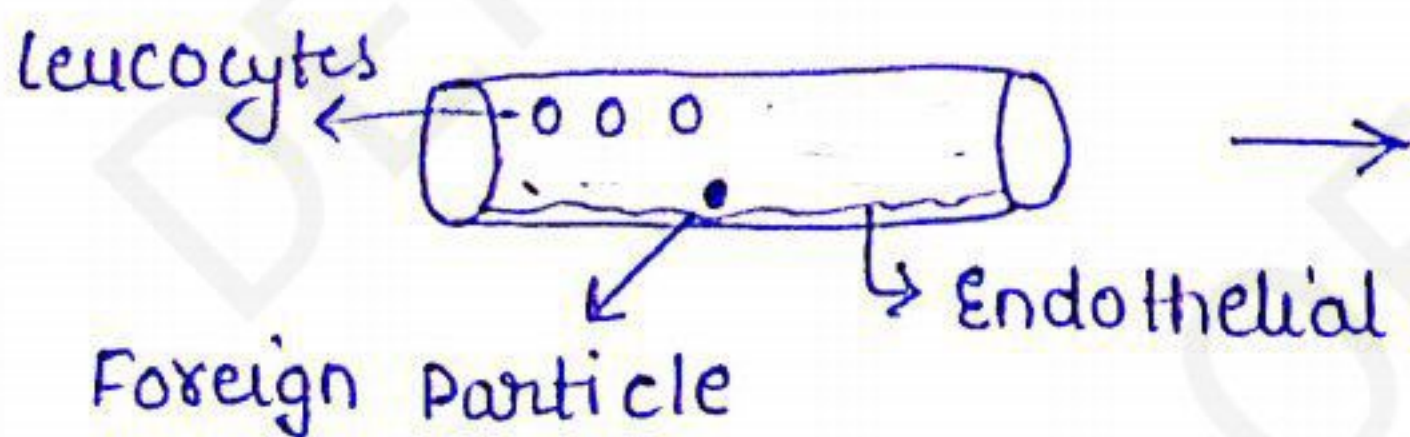


and Vascular Permeab. and

transfusion [↑] se.

[DEPTH OF BIOLOGY]

### ③ Leucocyte dependent cell injury :-



Here leucocytes surrounded the foreign Particle

[DEPTH OF BIOLOGY]



[DEPTH OF BIOLOGY]

due to this constriction ← take place in endothelial wall

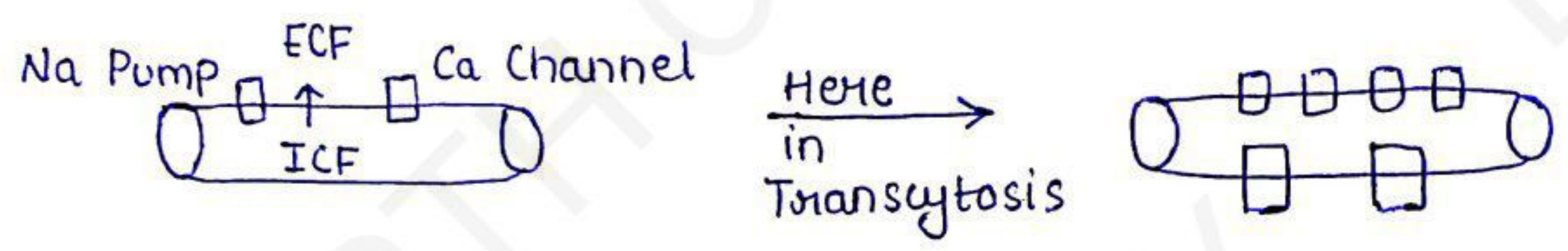


This leucocyte release Inflammation mediators



↓  
 and Retraction takes place in endothelial  
 ↓↓  
 Due to retraction, the pore size become extended  
 ↓↓  
 leads to [↑]se in Vasc. Permeab. and transfusion.

④ Increase Transcytosis :-



[DEPTH OF BIOLOGY]

Called Transcytosis ← Movement of Ion from ICF to ECF or ECF to ICF ← Pump No. [↑] or Pump size [↑].

↓  
 Due to this, Here also transfusion and Blood flow [↑].

⑤ Leakage from new capillary :-

If blood vessel is damage or rupture  
 ↓  
 Our Immune system makes  
 ↓ [DEPTH OF BIOLOGY]  
 Many small blood or capillaries to fill his gap.  
 ↓  
 And this newly formed blood vessel secretes a chemical  
 VEGF [Vascular Endothelial Growth factor]  
 ↓

Due to release of this chemical. The newly formed blood vessel lead Vasc. Permeab. [↑], Blood flow also [↑]se.