Lecture #3
Innate immunity (non-specific)

Objectives

By the end of this lecture, the students will be able to

1- Definition
2- Characters
3- Mechanisms

Define innate immunity

Host defense mechanisms against any foreign body. Innate immunity is natural inborn barriers against invasion by any foreign body

Characters of innate immunity
1- Rapid
2- Natural inborn barriers
3- Does not require previous exposure
4- Non specific or low specificity
5- No memory
6- Effective

Mechanisms of innate immunity
1- Physiological
2- Humoral
3-Inflammatory
4- Cellular

1- Physiological barriers at the portal of entry

A- The skin

- Intact
- Epidermis (tight junctions)
- Dermis
- Sebaceous gland (Fatty acids-prevent bacterial colonization)
- Sweat gland secrete lactic acid and ammonia
- Epithelial skin cells produce defensins that destruct microbes

B- Conjunctiva

Blinking reflex generate thin tear (lysozyme break down peptidoglycan)

C- Respiratory tract

- Mucous (sticky) that cover epithelial cells and trap microbes. Mucous found in conjunctiva, RS, GIT, urogenital
- Cilia
- Coughing
- Sneezing
- Hairs in the nose
- Ear secrete waxes

D- GIT

- Saliva rich of hydrolytic enzymes
- Low pH of the stomach
- The digestive enzymes
- Peristaltic movement of the intestine
- Normal flora
- Defensins
- Diarrhea and vomiting

E- Genitourinary tract

- Flushing of urine
- Lactobacilli in vagina-Acid from glycogen as well as the thick stratified epithelia of adult vagina

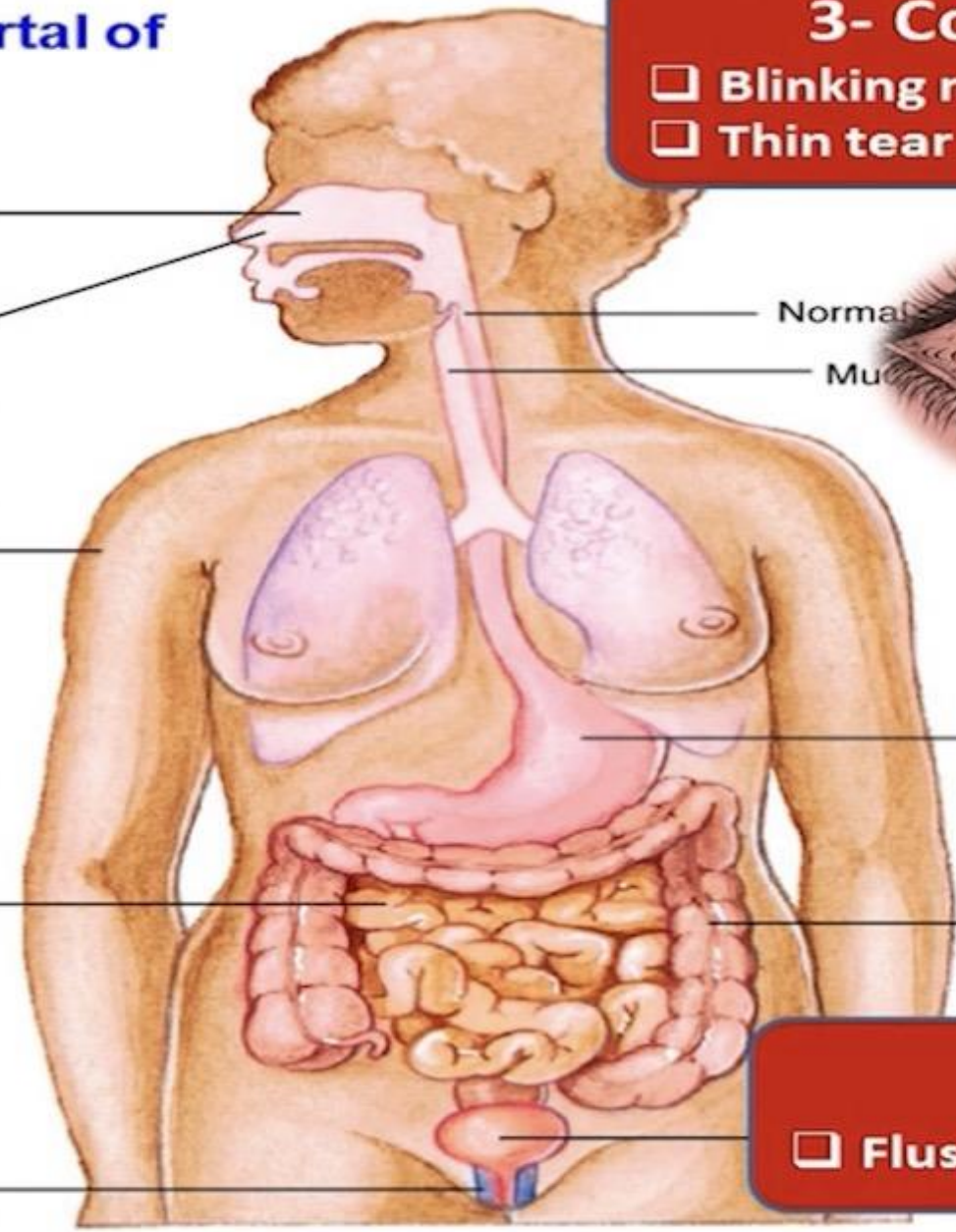
I-Physiologic barriers at the portal of entry

2- Respiratory tract
- ❑ Hairs in the nose
- ❑ Cilia
- ❑ Cough
- ❑ Sneezing

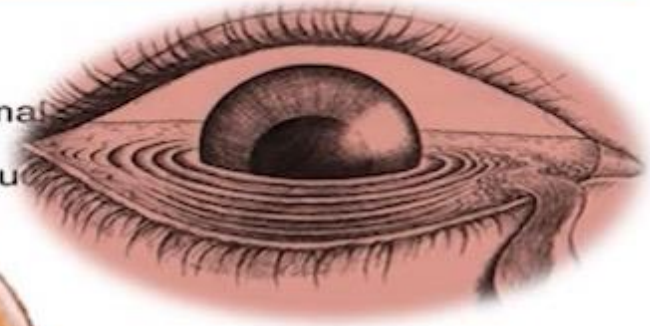
1- Skin
- ❑ Intact
- ❑ Sebaceous gland

3- Gastrointestinal tract
- ❑ Normal flora
- ❑ Low pH of the stomach
- ❑ The digestive enzyme

5- Genital tract
- ❑ Normal flora
- ❑ Lactobacilli



3- Conjunctiva
- ❑ Blinking reflex
- ❑ Thin tear



6- UTI
- ❑ Flushing of urine

2- Humoral barriers or defense mechanism

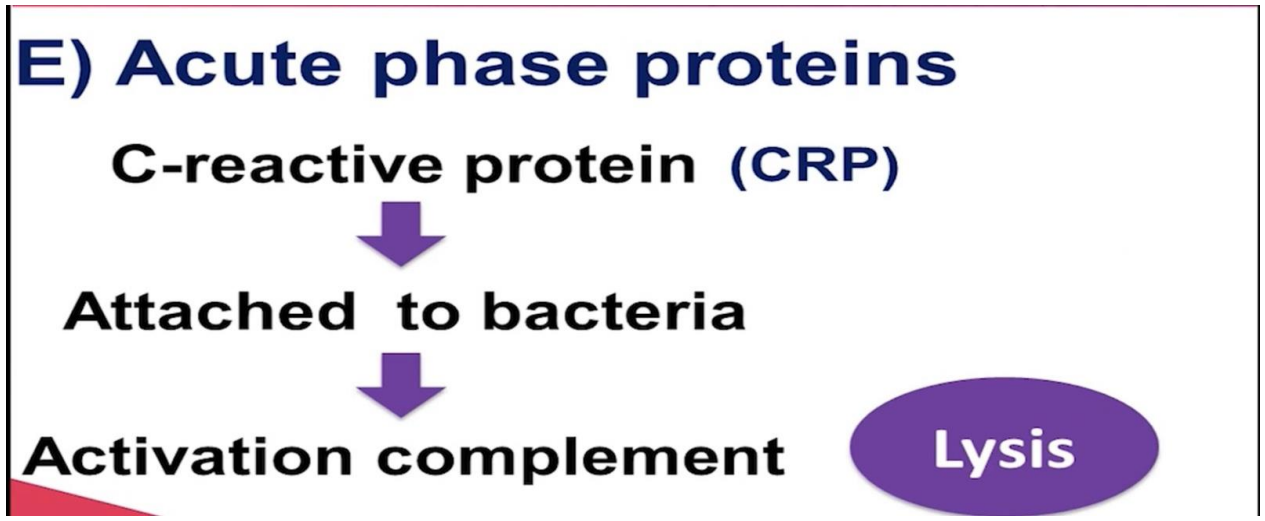
A- Lysozymes (Destruct bacterial cell walls) in body secretion

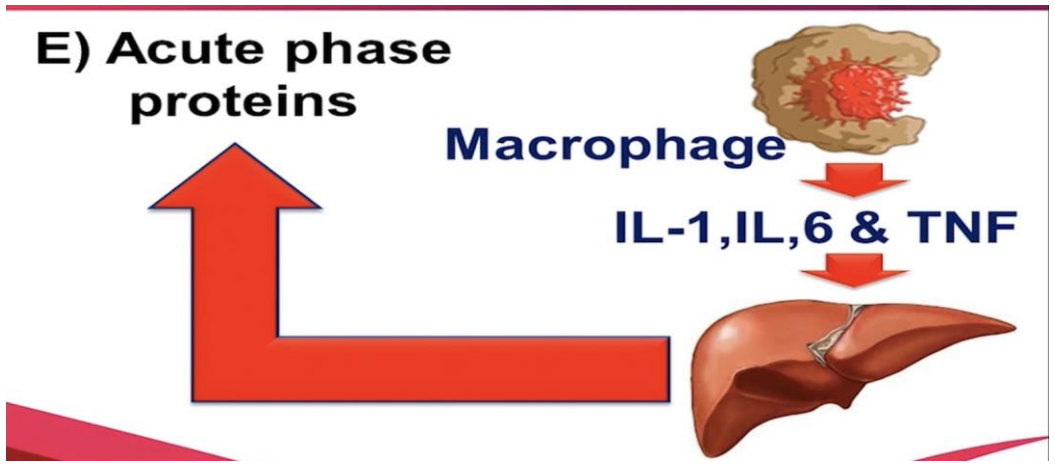
B- Lactoferrin, transferrin and ferritin (Iron binding proteins). Invasive pathogens usually require iron for their pathogenesis

C- Interferons (IFNs) (cytokines which interfere viral replication)
Type I (IFN-α produced from macrophages and monocytes, IFN –beta from fibroblast = both antiviral infection).
Type II includes IFN–γ produced mainly by T cells and has a role in cellular immunity

D- Complement (Alternative and lectin pathways) lysis of bacteria

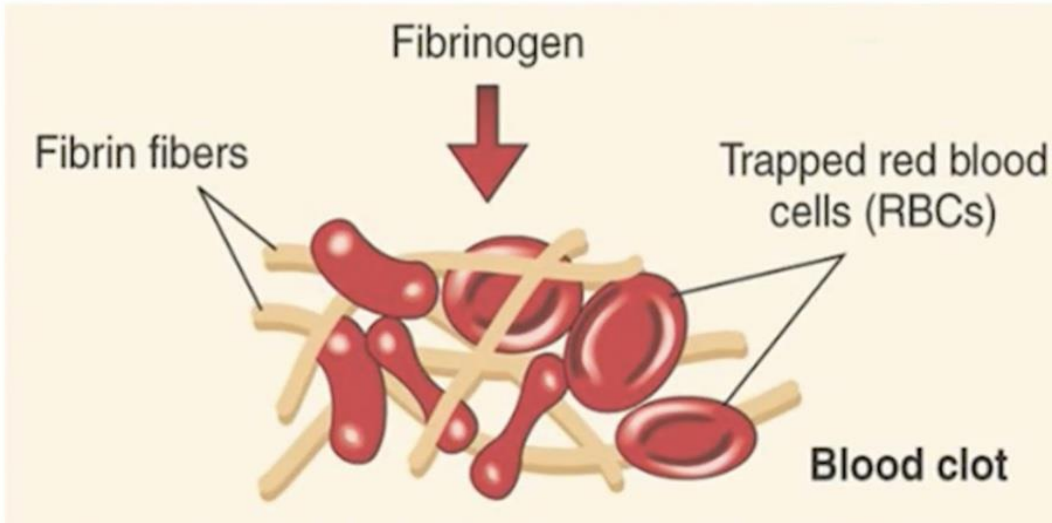
E- Acute phase proteins like CRP, fibrinogen . When MO engulf pathogens, secrete IL-1, IL-6 and TNF which go via blood to liver which produce these proteins.



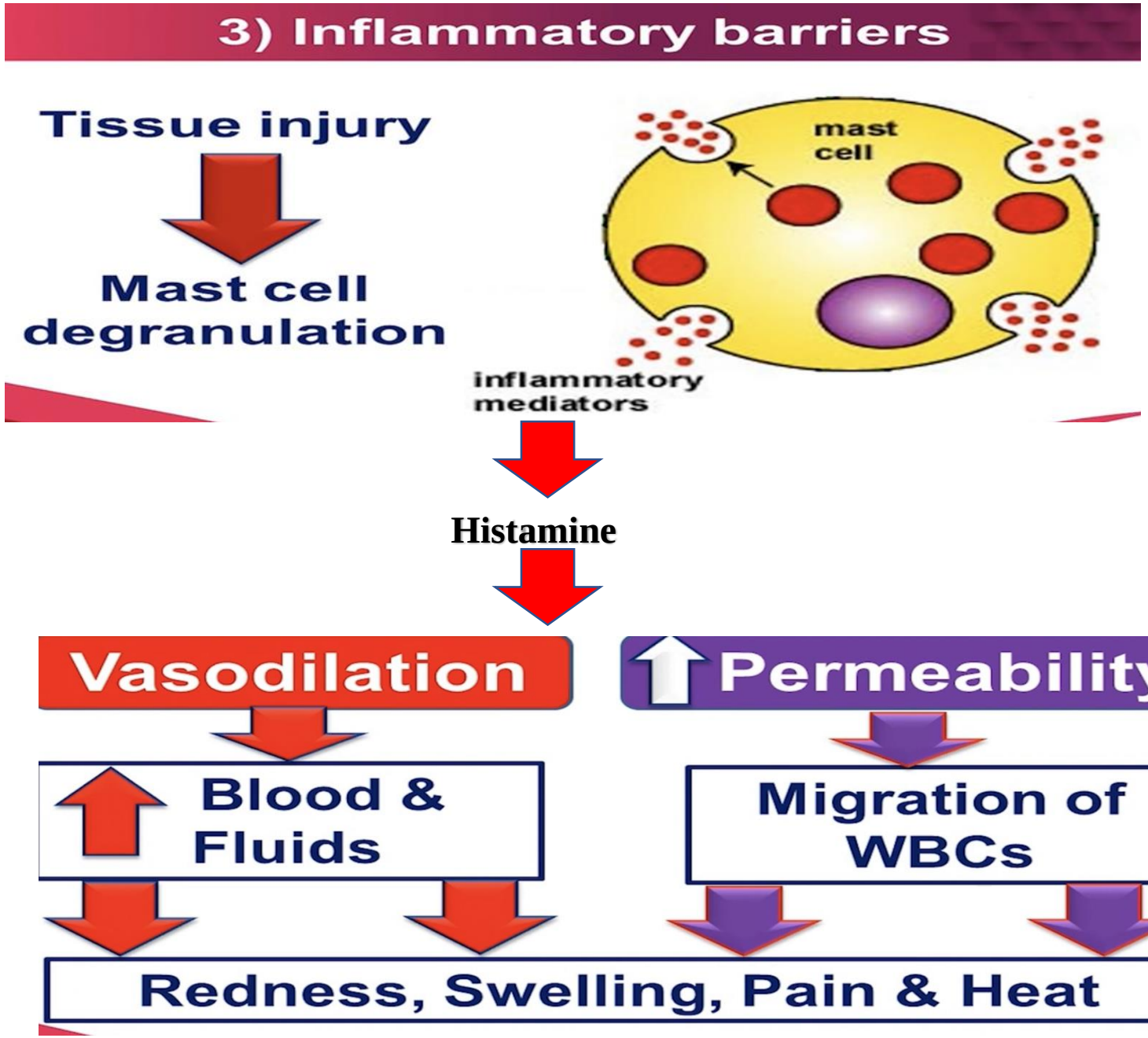


❑ Fibrinogen

Prevent spread of infection



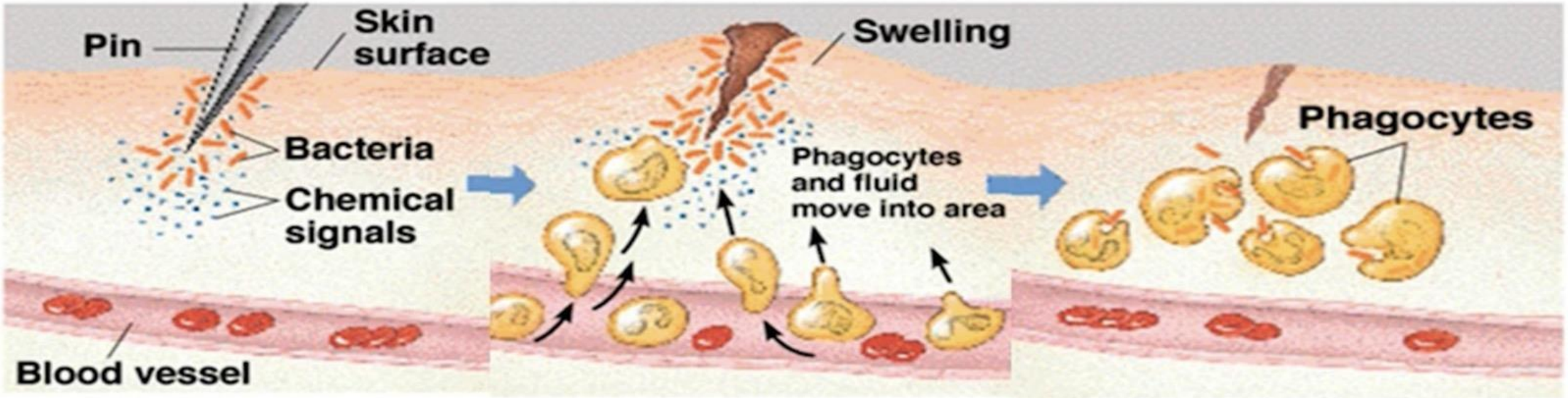
3- Inflammatory barriers



Cardinal features of inflammation (5)

Loss of the function

3) Inflammatory barriers

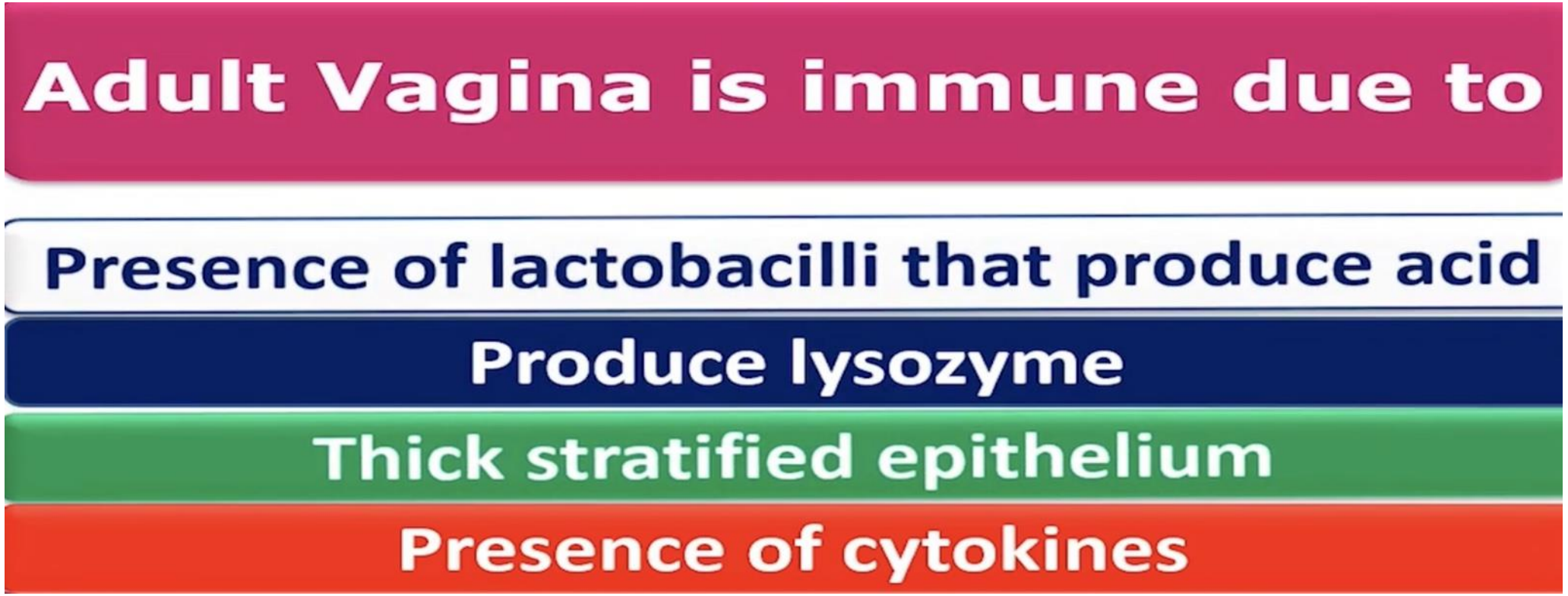


1. Tissue injury; release of chemical signals such as histamine
2. Dilation and increased leakiness of local blood vessels; migration of phagocytes to the area
3. Phagocytes (macrophages and neutrophils) consume bacteria and cell debris; tissue heals

Explain how Normal flora play a role in innate immunity.

Explain how mast cells play a role in inflammatory barrier.

4- Cellular defense mechanism (this will be discussed in lecture #4)



Interferon-I is part of innate immunity and it's character

- Secreted by virus infected cells
- Prevent viral replication
- Secreted by T cells
- Secreted by APC

Normal flora act as innate immunity through

- Produce acid that destroy microorganism
- Produce bacteriocin that destroy microbs
- Compete with pathogens for nutrients
- Produce Interferon that prevent viral inf.

Which of the following substances is produced by the cells in our body and interferes with the multiplication of viruses by stimulating the production of antiviral proteins?

- Complement
- Acute phase protein
- Interferon
- Bacteriocin

Which of the following are mechanisms that protect the respiratory system from infection? 1. mucus 2. mucociliary escalator 3. normal flora 4. lysozyme 5. acidic environment

- 1,2,5
- 1,3
- 1,2,3
- 1,2,3,4
- 2,4

A protein found in neutrophils, mucus secretions, saliva and other body secretions that binds to iron, thus making it unavailable for microbial growth is called

- Complement
- Peroxidase
- Lactoferrin
- Acute phase protein

An enzyme found in our tears, saliva, serum, and mucus that degrades the peptidoglycan of the cell wall of Gram-positive bacteria is called

- lysozyme
- Amylase
- Peptidase
- Coagulase

Which of the following is NOT an example of a nonspecific defense mechanism?

- Intact skin
- Complement (Alternative)
- Antibodies
- Complement (classic)

Which of the following statements are true regards innate immunity

- These responses are not affected by prior exposure to the agent
- These responses are natural inborn barriers
- Acting against all microorganism regardless type of the microorganism

Why is human skin resistant to colonization by E.coli despite exposure it from fecal matter in poor sanitation?

- Lysozyme
- Psoriasin
- Lactoferrin
- Calprotectin