INFLAMMATION

L28- CELLS OF INFLAMMATION AND TYPES OF INFLAMMATION

DR. M. TARIQ JAVED
PROFESSOR
DEPARTMENT OF PATHOLOGY
FACULTY OF VETERINARY SCIENCE
UNIVERSITY OF AGRICULTURE, FAISALABAD.

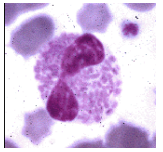
4. NATURAL KILLER CELLS (NK)

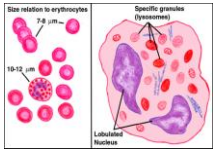
- These are related to CTL but most NK cells do not have TCRs
- They can recognize cells with non-self MHC molecules.

5. PLATELETS

- Coagulation of blood
- Platelets are activated by collagen
- Release the contents, e.g., ADP, serotonin, PAF, fibrinogen, hydrolytic enzymes and AA metabolites.
- The released ADP, TXA2, PGs leads to aggregation of platelets and eventually plug the damaged vessel.
- Platelets secrete permeability enhancing protein — push neutrophils out of vessel.

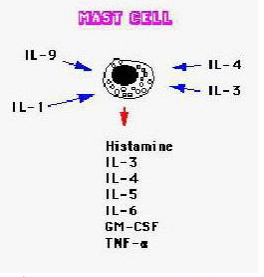
6. EOSINOPHILS



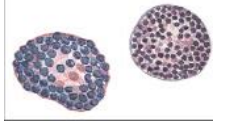


- Reside predominantly in sub-mucosal tissue
- Contains large ellipsoid granules
- They contain four distinct cationic proteins those exert a range of biological effects on host cells and microbial targets:
  - *major basic protein (MBP) -- Parasite killing*
  - *eosinophil cationic protein (ECP)*
  - *eosinophil derived neurotoxin (EDN)*
  - *eosinophil peroxidase (EPO).*
- These contents act mainly on extracellular target structures such as **parasites**
- Have **limited phagocytic** activity
- Contribute to **chronic** inflammation, including **fibrosis**
- Have a short life span.
- Have receptors for **IgE**

7. BASOPHILS AND MAST CELLS



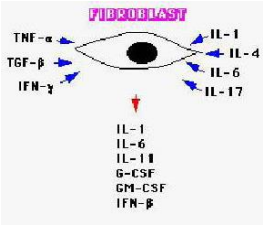
- Basophils are circulating cells (<1%),
- Mast cells are present in perivascular sites in **skin**, **GIT** and **Respiratory tract**.
- Both – similar in function and contents.
- The granules of the cells contain heparin, histamine**,** proteases and other mediators**.**
- Both cells have receptors for **IgE**
- Mast cells and basophils play a central role in inflammatory and immediate allergic reactions.
- Newly generated mediators are produced during IgE-mediated activation including **AA metabolites (**principally **LTC** and **PGD)** and other cytokines.



7. ENDOTHELIAL CELLS AND FIBROBLASTS

- **Endothelial** cells interact with leukocytes
- Adherence and emigration process
- Healing and repair responses.

- **Fibroblasts** participate in the healing and repair process
- Products of fibroblasts activate leukocytes and induce locomotion.



5

TYPES OF INFLAMMATION

- **Inflammatory Reaction/Response Depend On:**
  - –inciting agent
  - –the host factors

6

Inflammatory Reaction Varies On Basis Of :

EXTENT	DURATION	DISTRIBUTION	EXUDATE
Mild	Peracute	Focal	Serous/Heamorrhagic
Moderate	Acute	Multifocal	Catarrhal
Severe	Subacute	Diffuse	Fibrinous
	Chronic		Purulent
			Proliferative
			Granulomatous

7

1. DEGREE OF SEVERITY

- inflammatory reaction can be
  - mild,
  - moderate and
  - severe.

MILD

- Little or no tissue destruction
- Have slight evidence of vascular involvement (hyperaemia and oedema)
- Little exudation, non-suppurative, e.g., mild bronchitis, mild catarrhal enteritis, mild stomatitis as in FMD.

MODERATE

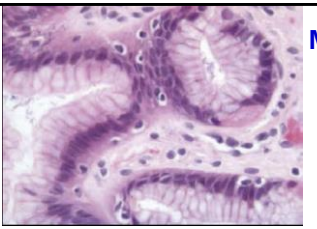
- Some damage to tissue
- Visible host reaction (hyperaemia, oedema and leukocyte accumulation), e.g., moderate enteritis, moderate bronchitis.

8

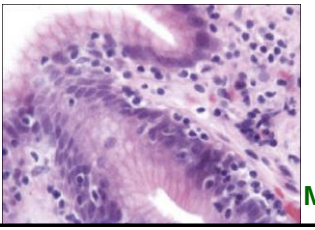
SEVERE

- Considerable tissue destruction
- Abundant exudation of plasma and leukocytes, e.g., severe bronchopneumonia as occurs in **Pasturella** infection in sheep and buffalo, severe hepatitis in **canine distemper**.

9

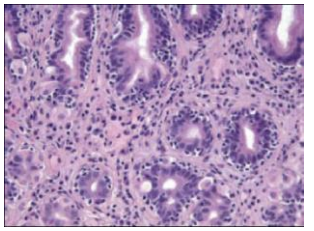


Mild



Moderate

Severe



10

2. DURATION

- On the basis of time factor,
- With increase in time the inflammatory reaction changes and can be:
  - Per-acute
  - Acute
  - Sub-acute
  - Chronic

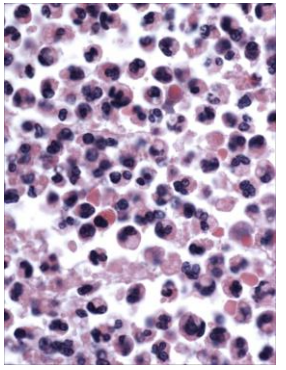
PERACUTE

- Manifestation developing in short time, i.e., in only few hours (~less than 4 hours)
- Usually caused by potent stimuli.
- Host response is minimal and without much exudation.
- The tissue damage variable
- Very less vascular involvement (slight oedema, hyperaemia, haemorrhage with few leukocytic infiltrates).
- Per-acute inflammatory response is less frequently seen.

11

ACUTE

- Inflammation begins within few hours, i.e., 4-6 (hours) and continues for several days.
- Vascular response is clearly visible (excessive vascular dilatation).
- Oedema
- Haemorrhages (may be)
- All the cardinal signs of inflammation are present.
- Neutrophils are the predominant cells although sometimes mononuclear cells may be present in large numbers.



12

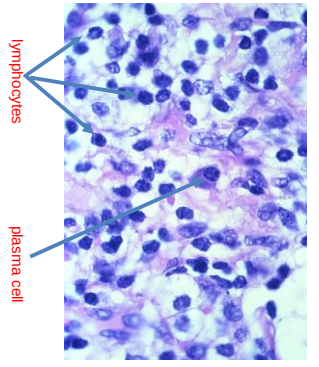
SUBACUTE

- Decline of vascular response (hyperaemia and oedema)
  - Oedema fluid drained by lymphatics
- Change in type of leukocytic infiltrate (may be)
  - e.g., lymphocytes, macrophages and may be plasma cells.
- Occur in about few days -- few weeks.

13

CHRONIC

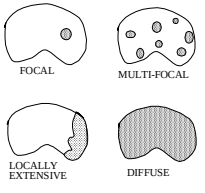
- Involvement of host tissue reparative process.
- Persistence of causative factor
- Predominant cells are lymphocytes and macrophages.
- The evidence of repair
  - regeneration
  - fibrosis
  - granulation tissue.
- May develop after an acute episode
- May develop as chronic from beginning, as in **TB**



14

3. DISTRIBUTION OF INFLAMMATION

- Distribution in the tissue
  - focal
  - multifocal
  - locally extensive
  - diffuse



FOCAL

- Small single area in a tissue (radius of 1mm or less or extending up to a centimeter or slightly more)
- Most often no leukocytosis in the blood picture
- Mostly resolve quickly.

15

LOCALLY EXTENSIVE

- Involve a considerable area of a tissue.
- It may arise from a single focal inflammation spreading now to a wider area or may arise from coalescence of multiple foci.
- This type of inflammation usually has bacterial aetiology.

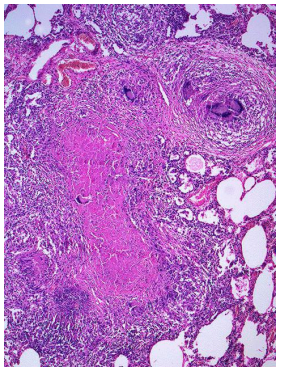
DIFFUSE

- Involve all the tissue or organ.
- At certain areas the inflammation is more severe, while at other is not so
- Such lesions are often of viral aetiology
- Some of the toxicant also produces similar lesions.

16

MULTIFOCAL

- Multiple small scattered foci of inflammation in a tissue.
- Between those inflamed areas is normal tissue.
- Such lesions occur most often due to vascular basis, e.g., spread of septic emboli from an inflamed heart valve.
- Inflammatory reaction in tuberculosis is mostly of this type where multiple granuloma formation takes place although diffuse reaction can occur simultaneously.



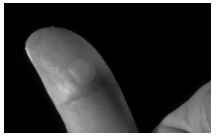
17

4. TYPE OF EXUDATE

- Nature of the components of an inflammation
  - fluid, protein contents and cellular components

SEROUS

- Exudate largely contain fluid rich in proteins, e.g., blisters produced in burns.
- With the passage of time fibrinogen exudes, form fibrin, the exudate is sero-fibrinous.
- Later, neutrophils exudes, exudate is termed as fibrinopurulent.
- At the end, the blister is ruptured and fluid is drained and absorbed leaving fibrin and debris to form a scab.



18

- The very early exudate in most inflammations is serous in nature
- The serous exudate dilutes the irritant in the tissue
- In flu, the running nose condition is serous exudate.
- **Albumin** is the first protein to leak from the vessel having the lowest molecular mass (69,000), next come the **IgG** (γ-globulin; 150,000) and being the bigger **fibrinogen** (340,000) leaks late.
- All the proteins may leak simultaneously but the speed to reach at the site of inflammation may vary according to their molecular weight.
- The serous exudate also acts as a good source for bacterial proliferation being good medium.
- However, the amount of antibodies present in the serous exudates are important,

19

Grossly

–the exudate is fluid in nature and easily drools on opening of the cavity/blister.

Microscopically

–it stains pink and appears homogenous granular in sections.

20