Process of acute inflammation

-The process of acute inflammation is initiated by resident immune cells already present in the involved tissue, mainly resident **macrophages, dendritic cells, histiocytes, Kupffer cells** and mast cells.

-These cells possess surface receptors known (PRRs), which recognize (bind) two subclasses of molecules:

1- pathogen-associated molecular patterns (PAMPs) : compounds that are associated with various pathogens,

2- (DAMPs are compounds that are associated with host-related injury and cell damage).

-At the onset of an infection, burn, or other injuries, these cells undergo activation (one of the PRRs recognize a PAMP or DAMP) and release **inflammatory mediators** responsible for the clinical signs of inflammation.

- Vasodilation and its resulting increased blood flow causes the redness (*rubor*) and increased heat (*calor*).

- Increased permeability of the blood vessels results in an exudation (leakage) of plasma proteins and fluid into the tissue (edema)which manifests itself as swelling (*tumor*).

- Some of the released mediators such as(bradykinin) increase the sensitivity to pain (hyperalgesia, *dolor*).

-The mediator molecules also alter the blood vessels to permit the migration of leukocytes, mainly neutrophils and macrophages, outside of the blood vessels (extravasation) into the tissue.

- The neutrophils migrate along a chemotactic gradient created by the local cells to reach the site of injury.

- The loss of function (*functio laesa*) is probably the result of a neurological reflex in response to pain.

-In addition to cell-derived mediators, several acellular biochemical cascade systems consisting of preformed(plasma proteins) act in to initiate and propagate the inflammatory response. These include the complement system activated by bacteria and the coagulation and fibrinolysis systems activated by necrosis, e.g. a burn or a trauma. .

A-Vascular component

Vasodilation and increased permeability

As defined, acute inflammation is an immunovascular response to an inflammatory stimulus. This means acute inflammation can be broader divided into a

1-vascular phase that occurs first,

followed by a

2- cellular phase involving immune cells (more specifically myeloid granulocytes in the acute setting).

1- Upon contact with PAMPs, tissue macrophages and mastocytes release **histamine** and **serotonin,** as well as **eicosanoids** such as **prostaglandin E2** and **leukotriene B4** to remodel the local vasculature.

. These mediators vasodilate and permeabilize the blood vessels, which results in distribution of blood plasma from the vessel into the tissue space. The vascular component of acute inflammation involves the movement of plasma fluid, containing important proteins such as **fibrin** and **immunoglobulins (antibodies),** into inflamed tissue.

The increased collection of fluid into the tissue causes it to swell (edema). This exuded tissue fluid contain various antimicrobial mediators from the plasma such as (**complement, lysozyme, antibodies**), which damage to microbes, and opsonise the microbes in preparation for the cellular phase.

- If the stimulus is a lacerating wound, exuded (**platelets, coagulants, plasmin and kinins)** can clot the wounded area and provide haemostasis in the first instance.

.- Some of the exuded tissue fluid is also funneled by lymphatics to the regional lymph nodes, flushing bacteria along to start the recognition and attack phase of the adaptive immune system.