

Al-Mustaqbal University College
Department of Nursing



Pathophysiology

Lecture \6

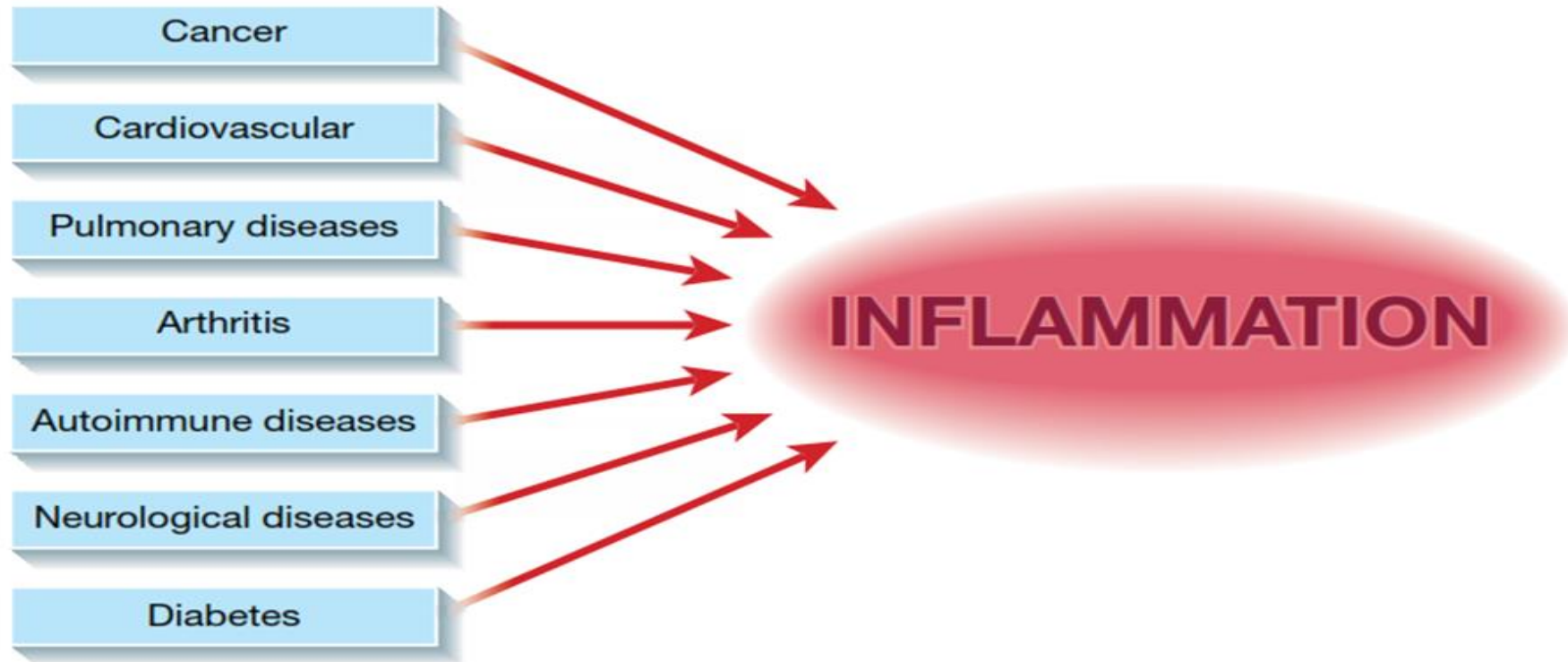
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► Inflammation, tissue repair and regeneration

1. Inflammation : the following figure shows that causes of inflammation:



Inflammation is the body's attempt at self-protection; the aim being to remove harmful stimuli, including damaged cells, irritants or pathogens, and begin the healing process. Inflammation can be defined clinically as the presence of swelling, redness and pain. Some diseases associated with inflammation include arthritis and neurological diseases. The signs and symptoms of inflammation are caused by four processes:

- 1) Mast cell degranulation,
- 2) Activation of plasma proteins,
- 3) The immune response and
- 4) Heat.

Physical and mechanical barriers

These are part of the first-line defense against microorganisms. They include the skin and the epithelial cells of the viscera, genito-urinary and respiratory tracts. The epithelial cells produce mucus to protect the lining of the tracts, some contain cilia to move the pathogens out and the temperature of the skin inhibits microorganisms from colonizing on the skin.

Biochemical barriers

Epithelial surfaces also provide both physical and biochemical barriers against infection. Some of these substances include sweat, saliva, which contains enzymes to destroy bacteria, and tears. Perspiration makes the skin pH slightly acidic, which is not a good environment for the bacteria to grow.

Acute and chronic inflammation

Acute inflammation starts rapidly (rapid onset) and quickly becomes severe. Signs and symptoms are only present for a few days, but in some cases may persist for a few weeks. Some examples include acute bronchitis, appendicitis and sore throat

Chronic inflammation means long-term inflammation, which can last for several months and even years. Some examples include chronic asthma, chronic peptic ulcer and chronic sinusitis.

2. Tissue repair:

Wound healing, or cicatrization, is an intricate process in which the skin (or another organ-tissue) repairs itself after injury. In normal skin, the epidermis (outermost layer) and dermis (inner or deeper layer) exists in a steady-state equilibrium, forming a protective barrier against the external environment. Once the protective barrier is broken, the normal (physiological) process of wound healing is immediately set in motion. The classic model of wound healing is divided into three or four sequential, yet overlapping, phases:

- 1) Hemostasis (not considered a phase by some),
- 2) Inflammatory,
- 3) Proliferative and
- 4) Remodeling.

Upon injury to the skin, a set of complex biochemical events take place in a closely orchestrated cascade to repair the damage.

Within minutes post-injury, platelets (thrombocytes) aggregate at the injury site to form a fibrin clot. This clot acts to control active bleeding (haemostasis). The speed of wound healing can be impacted by many factors, including the bloodstream levels of hormones such as oxytocin.

In the inflammatory phase, bacteria and debris are phagocytosed and removed, and factors are released that cause the migration and division of cells involved in the proliferative phase.

The proliferative phase is characterized by angiogenesis, collagen deposition, granulation tissue formation, epithelialization, and wound contraction. In angiogenesis, new blood vessels are formed by vascular endothelial cells. In fibroplasia and granulation tissue formation, fibroblasts grow and form a new, provisional extracellular matrix (ECM) by excreting collagen and fibronectin. Concurrently, re-epithelialization of the epidermis occurs, in which epithelial cells proliferate and 'crawl' atop the wound bed, providing cover for the new tissue

3. Regeneration:

In the regeneration phase, blood vessels are repaired and new cells form in the damaged site, similar. Three phases occur in repairing the wound. These are the migratory, proliferative and maturation phases. In the migratory phase, the clot becomes a scab and epithelial cells migrate beneath the scab to bridge the wound. During the proliferative phase there is extensive growth of epithelial cells beneath the scab, deposition of collagen fibers by fibroblasts and continued growth of blood vessels. In the maturation phase, the scab drops off as the epidermis returns to normal thickness. In the dermis the, collagen fibers become more structured, fibroblasts decrease in number and blood vessels are restored to their normal function. to the cells that were damaged and removed.

Any Question?