

BASIC PRINCIPLES OF WOUND HEALING PROCESS



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

Ms. Rupali Rupasmita Rout
Assistant Professor

Wound healing mostly means healing of the skin. The wound healing begins immediately after an injury to the epidermal layer and might take years.

This process in the skin generally involves three main phases: **the inflammatory phase, the proliferative phase, and the remodeling phase.**

Inflammatory Phase:

- The inflammatory phase is the first stage of the wound healing process, which begins immediately after tissue injury.
- This phase is characterized by a rapid and coordinated response of the immune system to the injury, aimed at removing debris and pathogens and preparing the wound for tissue repair.
- The inflammatory phase typically lasts for a few days.
- During the inflammatory phase, various signaling molecules and growth factors are released at the site of injury, which attract immune cells to the wound.
- The initial response involves the constriction of blood vessels, followed by the dilation of blood vessels to allow immune cells to enter the injured area.
- This leads to increased blood flow, redness, warmth, and swelling in the affected area, termed as inflammation.

Proliferative Phase:

- The proliferative phase is the second stage of the wound healing process, which begins a few days after tissue injury and can last up to several weeks. During this phase, the body produces new tissue to fill the wound gap and restore the quality of the tissue.
- The proliferative phase involves several key processes, including angiogenesis, granulation tissue formation, and extracellular matrix synthesis.

- **Angiogenesis** is the process of forming new blood vessels, which is essential for supplying oxygen and nutrients to the healing tissue.
- Growth factors released during the inflammatory phase, such as vascular endothelial growth factor (VEGF), stimulate the proliferation of endothelial cells, which form the walls of blood vessels.
- New blood vessels also help to remove metabolic waste and deliver immune cells to the site of injury.
- **Granulation** tissue is a type of highly vascularized connective tissue that forms in the wound bed during the proliferative phase.
- This tissue contains fibroblasts, which synthesize and deposit extracellular matrix components, such as collagen and elastin, to provide structural support and strength to the healing tissue.
- **The extracellular matrix** also helps to guide the proliferation of cells involved in tissue repair.

Remodeling Phase:

- The remodeling phase is the final stage of the wound healing process, which can last for several months or even years after tissue injury. During this phase, the newly formed tissue undergoes remodeling to improve its strength and refine its structure.
- The remodeling phase involves the reorganization and maturation of the extracellular matrix, which is primarily composed of collagen fibers.
- During the proliferative phase, fibroblasts produce large amounts of collagen, which is initially disorganized and weak.
- In the remodeling phase, collagen fibers are cross-linked and reorganized into a more mature and aligned structure, which improves

the strength and durability of the healing tissue.

- The remodeling phase also involves the removal of excess tissue through a process called apoptosis. This process helps to refine the structure of the healing tissue and reduce scar formation.
- Other cells involved in the remodeling phase include myofibroblasts, which are specialized cells that help to contract the wound and close any remaining gap in the tissue.
- Myofibroblasts also contribute to the remodeling of the extracellular matrix by applying tension to collagen fibers, which promotes their realignment and cross-linking.