

An Overview of Wound Healing

The process of wound healing

“A dynamic, natural and efficient process that involves the **overlapping of various healing stages**, with a continual sequence of regulatory mechanisms that bring about the ultimate healing of the wound”

(Calvin, 1998)

Wound healing is the body's way of achieving **3 specific goals**

- Clean away the debris
- Fill the cavity/hole
- Rework to strengthen

Wound healing processes can be divided into three parts

- Inflammation
- Proliferation
- Maturation

Inflammatory phase

The 2 key events during this phase (Waldorf & Fewkes, 1995):

- **Haemostasis**

- Injured cells in wound area release clotting factors
 - Platelet aggregation
 - Fibrin clot formed
- Activation of clotting factors stimulates release of vasoactive substances resulting in vasodilation & increased capillary permeability

- **Inflammation**

- Vasodilation & increased capillary permeability causes warmth, oedema, production of exudate, erythema

Factors affecting inflammation

Continued tissue destruction dryness (desiccation)

Excessive exudate

Clinical Infection

Poor Blood Supply

Cytotoxic Agents

Thermal shock

Proliferative Stage

2nd Phase in wound healing

During this phase:

- Vascular integrity is restored
- Wound defect is filled with new connective tissue
- Wound surface covered by new epithelium

Proliferative Stage

Angiogenesis

- Most important cell type is the microvascular endothelial cell
- Vascular bud formation produces extensions to “sprout”
- Once they encounter another capillary they connect forming a vascular loop

Granulation

- Granulation tissue is easily identified by its colour and consistency
- The tissue is red, has a firm texture and is grainy/granular in appearance
- Collagen synthesis by fibroblasts is an integral part of granulation tissue formation

Epithelialisation

- Epithelialisation occurs by:
 - Mitosis of bordering epithelial cells
 - Lateral and centripetal migration

Factors Affecting Proliferation

Desiccation

Mechanical Disruption

Cytotoxic Agents

Poor Nutrition

Clotting or Scab Formation

Thermal Shock

Maturation Phase

Remodelling process

Continues for up to 1 year or longer

Fibroblasts decrease in number

Vascularity decreases

Tensile strength increases

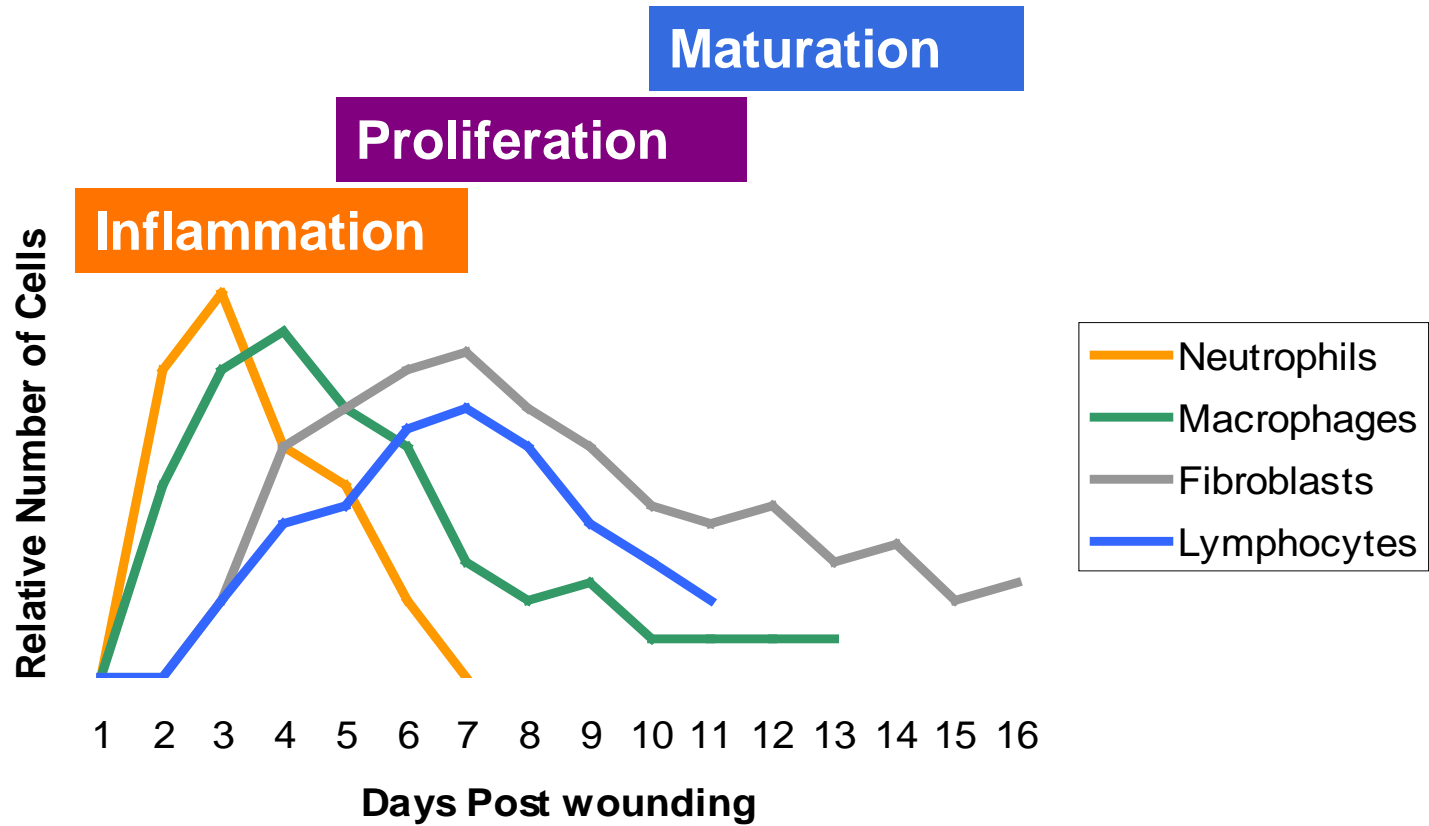
Factors Affecting Maturation

Nutritional Status

Mechanical Stress

Chemical Agents

Stages of Wound Healing



Differences in cells activity in a healing wound and a chronic wound

Healing wound	Chronic wound
↑ Cell mitosis	↓ Mitogenic activity
↓ Pro inflammatory cytokines	↑ Pro inflammatory cytokines
↓ MMPs	↑ MMP's
↑ TIMPs	↓ TIMP's
↑ Growth factors	↓ Growth factors
Cells capable of rapid response	Senescent cells