Repair: sometimes called healing, refers to the restoration of tissue architecture and function after an injury. It occurs by two types of reactions: regeneration of the injured tissue and scar formation by the deposition of connective tissue

Regeneration. Able the tissues to replace the damaged cells and essentially return to a normal state;

this process is called regeneration. And occurs by proliferation of residual (uninjured) cells that retain the capacity to divide, and by replacement from tissue stem cells. It is the typical response to injury in the rapidly dividing epithelia of the skin and intestines, and some parenchymal organs, notably the liver.

Scar formation. If the injured tissues are incapable of regeneration, or if the supporting structures of the tissue are severely damaged, repair occurs by the laying down of connective (fibrous) tissue, a process that results in scar formation. Although the fibrous scar cannot perform the function of lost parenchymal cells, it provides enough structural stability that the injured tissue is usually able to function.

Cell cycle

It is the period between two successive cell divisions and is divided into 4 unequal phases

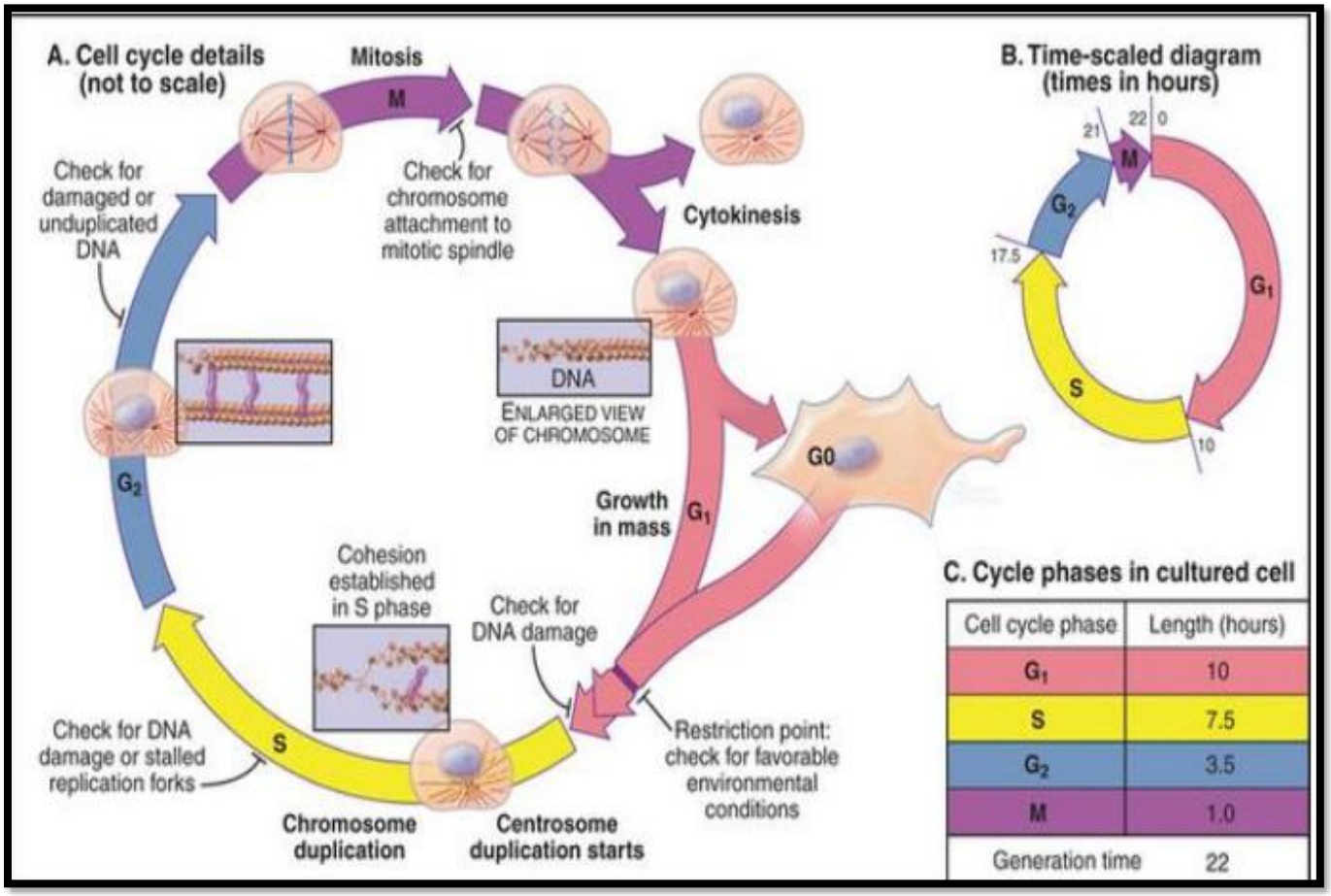
1) M (mitosis) phase.

2) G1 (gap 1) phase: growth presynthetic.

3) S (synthesis) phase: the synthesis of nuclear DNA .

4) G2 (gap 2) phase: growth premitotic.

5) G0 (gap 0) phase: is the resting phase of the cell after M phase



The tissues of the body are divided into three groups their intrinsic proliferative capacity.

1. Labile (continuously dividing) tissues

Cells of these tissues are continuously being lost and replaced by maturation from stem cells and by proliferation of mature cells. Labile cells have short resting (G_0) phase

Labile cells include

- Hematopoietic cells in the bone marrow
- Surface epithelia, such as the stratified squamous surfaces of the skin, oral cavity
- The columnar epithelium of the gastrointestinal tract, uterus, and fallopian tubes
- The transitional epithelium of the urinary tract.

These tissues can readily regenerate after injury as long as the pool of stem cells is preserved.

2.Stable tissues.

Cells of these tissues are quiescent and have only minimal replicative activity in their normal state. However, these cells are capable of proliferating in response to injury or loss of tissue mass.

Stable cells constitute the parenchyma of most solid tissues, such as liver, kidney, and pancreas. They also include endothelial cells, fibroblasts, and smooth muscle cells; the proliferation of these cells is particularly important in wound healing. With the exception of liver**, stable tissues have a limited capacity to regenerate after injury.**

3.Permanent tissues.

The cells of these tissues are considered to be terminally differentiated and non proliferative in postnatal life.

Permanent cell Most neurons and cardiac muscle cells belong to this category. Thus, injury to brain or heart is irreversible and results in a scar, because neurons and cardiac myocytes cannot regenerate. Skeletal muscle is usually classified as a permanent tissue, but satellite cells attached to the endomysial sheath provide some regenerative capacity for this tissue**. In permanent tissues, repair is typically dominated by scar formation.**

Repair

It is the replacement of injured tissue by scar tissue.

Two processes are involved in repair:

1)Granulation tissue formation (derives its name from slightly granular and pink appearance of the tissue). Each granule appear histologically as proliferation of new small blood vessels which are slightly lifted on the surface by thin covering of fibroblasts and young collagen.

2)Contraction of wounds. Contraction starts after 2-3 days and completed by the 14th day. During this period, the wound is reduced by approximately 80% of its original size.

Healing

Healing of skin wounds conceder a classical example of combination of regeneration and repair

Healing of wound by first intention:

This occurs in a closed wound when there is little loss of tissue and very slight bleeding. Inflammation is mild and repair begins in about twelve hours by proliferation of fibroblasts and angioblasts. The fibroblast bridge the gap between the two cut surfaces and forming collagen fiber ,the newly formed collagen shrink and the resulting tissue is called **scar**

The angioblsts form buds by the side of or at the end of capillaries and the blood is pushed through them and angioblasts continue to proloiferate to form new capillaries among the fibroblasts. fibroblasts and vascular endothelial cells begin proliferating to form granulation tissue - pink soft granular appearance on the surface of the wound. histologically : granulation tissue is composed of : proliferation of new small blood vessels and proliferation of fibroblasts

Healing by second intention :

It occurs when the necrosis is extensive, presence of foreign body or when infection occurs.following injury inflammatory reaction and heamorrhage occur blood clots and neutrophiles gather in to the area in large numbers to destroy the irritant(usually bacteria). By the second day pus may be visible in the wound, in 48-72 hours macrophage and lymphocyte appear in the area and gradually out number the nutrophils.Macrophages actively involve themselves in liquefying and removing the necrotised tissue and cellular debris.

Differs from primary healing:

1. inflammatory reaction is more intense
2. larger amounts of granulation tissue are formed
3. wound contraction (5 to 10%),

Factors influencing wound healing

Systemic factors

- Nutrition
- Metabolic status
- Circulatory status
- Hormones

Local factors

- Infections
- Foreign bodies
- Mechanical factors
- Size / Location