

Wound Healing



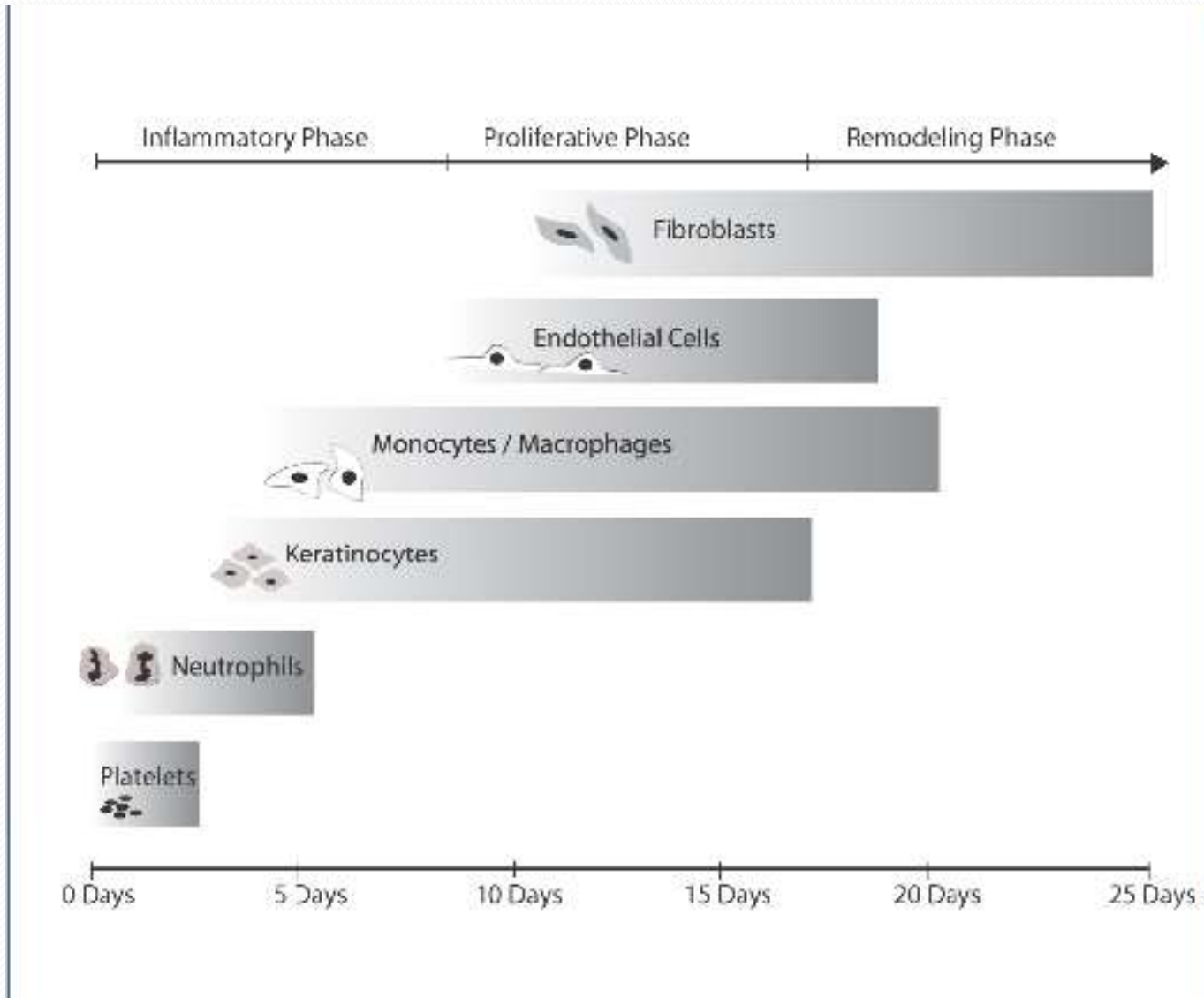
Definition include the repair or reconstitution of a defect in an organ or tissue, commonly the skin.

1-scar formation

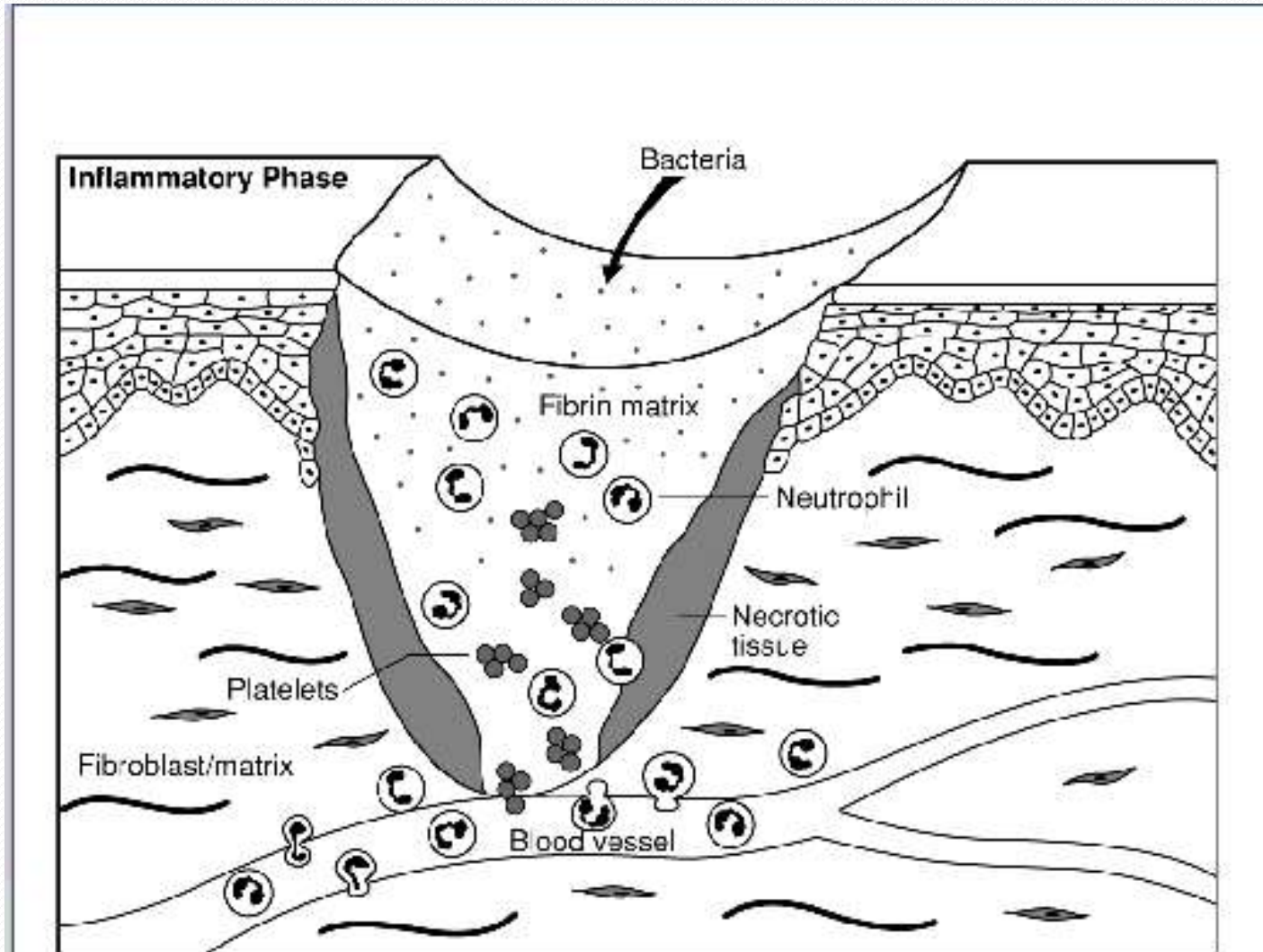
2-Regeneration

neural injury and skin is characterized by little regeneration and much scarring,

hepatic and bone injury usually heals primarily through regeneration.



Inflammatory Phase



Inflammatory Phase

- **Hemostasis**
- **removal of dead and devitalized tissues**
- **and prevention of colonization and invasive infection by microbial pathogens**

fibrin -- polymerization into a gel--- fibrin matrix (scaffolding for cell migration)

Neutrophilic infiltrate first 2 days

remove dead tissue by phagocytosis and to prevent infection

absence does not prevent the overall progress of wound healing

Monocyte/macrophages

appear 48 to 72 hours after injury.

macrophages originate from the circulation,

By the third day they are predominant cell type in the healing wound.

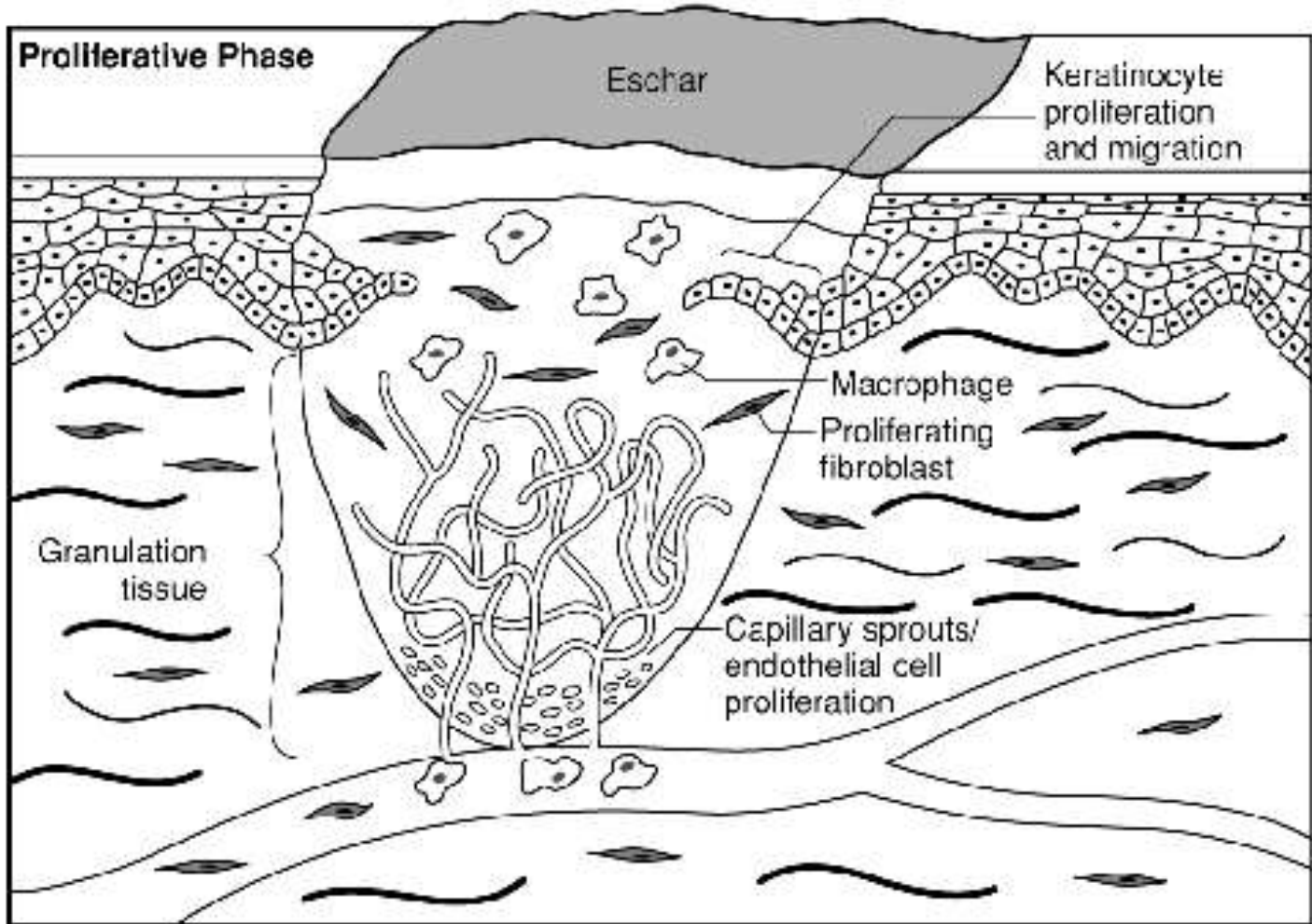
- phagocytoses debris and bacteria,
- orchestrated production of the growth factors necessary for production of the extracellular matrix by fibroblasts and the production of new blood vessels in the healing wound.



However, it is clear that, unlike the neutrophil the absence of monocyte/macrophages has severe consequences for healing wounds

Lymphocyte is the last cell to enter the wound and enters between 5 and 7 days after wounding

mast cell appears during the later part of the inflammatory phase, its function remains unclear.
aberrant scarring



Proliferative Phase days 4 to 21

Keratinocytes adjacent to the wound alter their phenotype in the hours following injury. Regression of the desmosomal connections between keratinocytes and to the underlying basement membrane frees the cells and allows them to migrate laterally between the desiccated eschar and the provisional fibrin matrix beneath

provisional fibrin matrix ----- granulation tissue.

Granulation tissue is composed of three cell types that

Fibroblasts,

Macrophages,

Endothelial cells.

Granulation tissue begins to appear in human wounds by about day 4 post injury

Over time the provisional matrix of fibrin is replaced with type III collagen by fibroblast

Endothelial cells form new blood vessels through angiogenesis and vasculogenesis .

One interesting element of the proliferative phase of wound healing is that at a certain point all of these processes need to be turned off and the formation of granulation tissue/extracellular matrix halted

once collagen matrix has filled in the wound cavity, fibroblasts rapidly disappear and newly formed blood regress

Because dysregulation of this process is believed to produce hypertrophic scarring

Remodeling Phase

last from 21 days up to 1 year Once

the wound has been “filled in” with granulation tissue and after keratinocyte migration has re-epithelialized it, the process of wound remodeling occurs.

remodeling is characterized by

- **processes of wound contraction**
- **collagen remodeling .**

Type III collagen ----- replaced by type I collagen.

The breaking strength of the healing wound improves slowly during this process, reflecting the turnover in collagen subtypes and increased collagen crosslinking.

At 3 weeks (beginning of the remodeling phase) wounds only have approximately 20% of the strength of unwounded skin.

and will eventually only possess 70% of the breaking strength of unwounded Skin.

Q 2016 T or F :- As re-epithelialization progress rapidly in wound healing the patient can take a shower after 21 days after surgery.

Answer as the wound healing process take 1-2 years the patient should not shower for that period.

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Factors Affecting wound healing

Age

Ischemia

Infection

Foreign body

Malnutrition

 global

 Nutrient – specific

Diabetes

Steroid

Uremia

Jaundice

Cancer

Irradiation

Chemotherapy

Genetic causes (Ehler-Denlos)

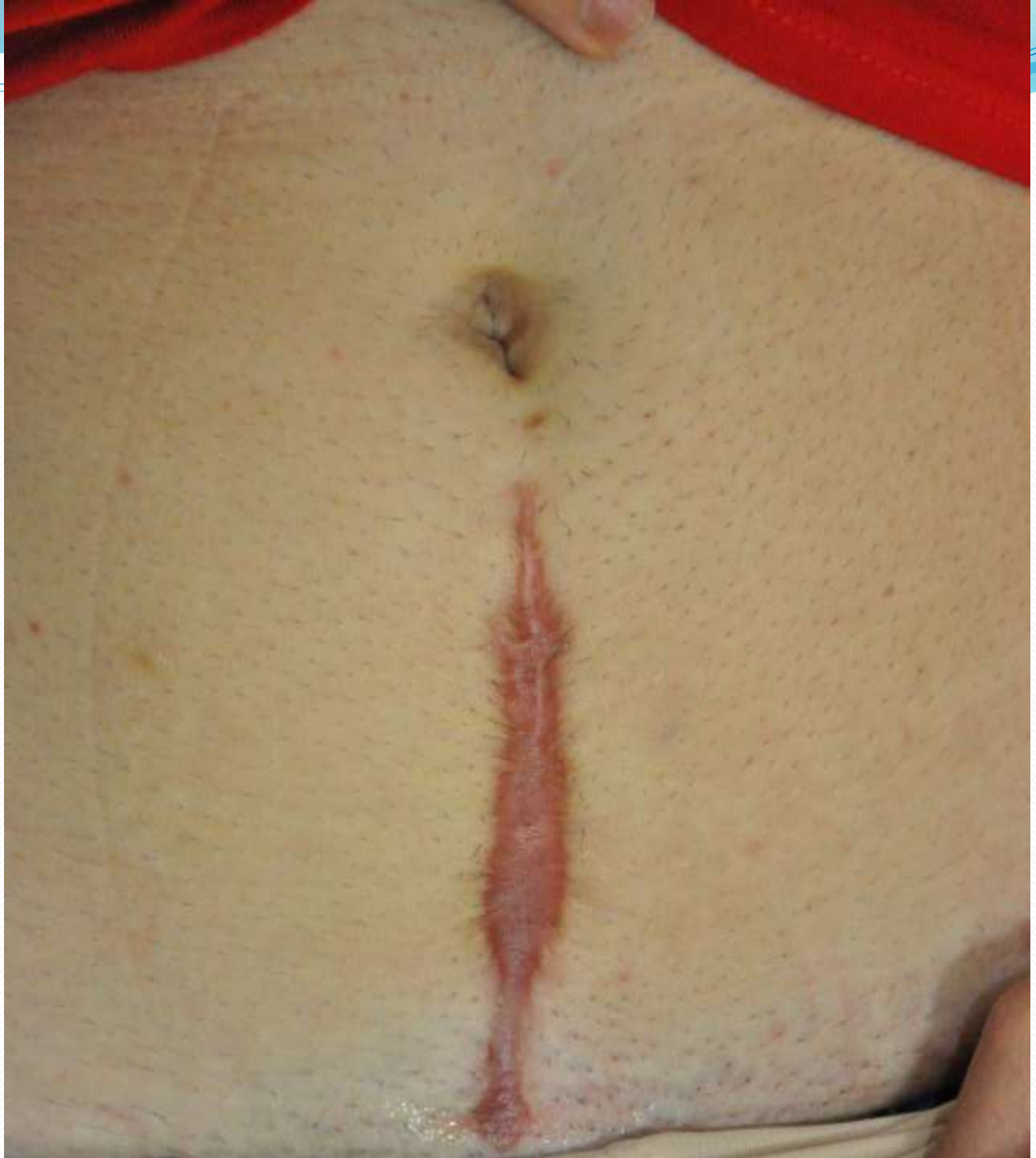
Tobacco

Alcohol

Edema

Pressure









Hypertrophic	keloid
Before 6 months	After 6 months
Limited to the wound edge	Extend beyond the wound
Resolve spontaneously	Permanent
Every body can have	some times hereditary
Wound contracture	less wound contracture



Thank you