

An emergency team that gets under your skin

When the skin is damaged, the body launches an emergency response that ideally ends with a fully healed wound. But what actually happens in this process, and how can research support the body's efforts? An overview of the three phases of wound healing

ILLUSTRATION MAXIMILIAN NERTINGER

1. EXUDATION PHASE

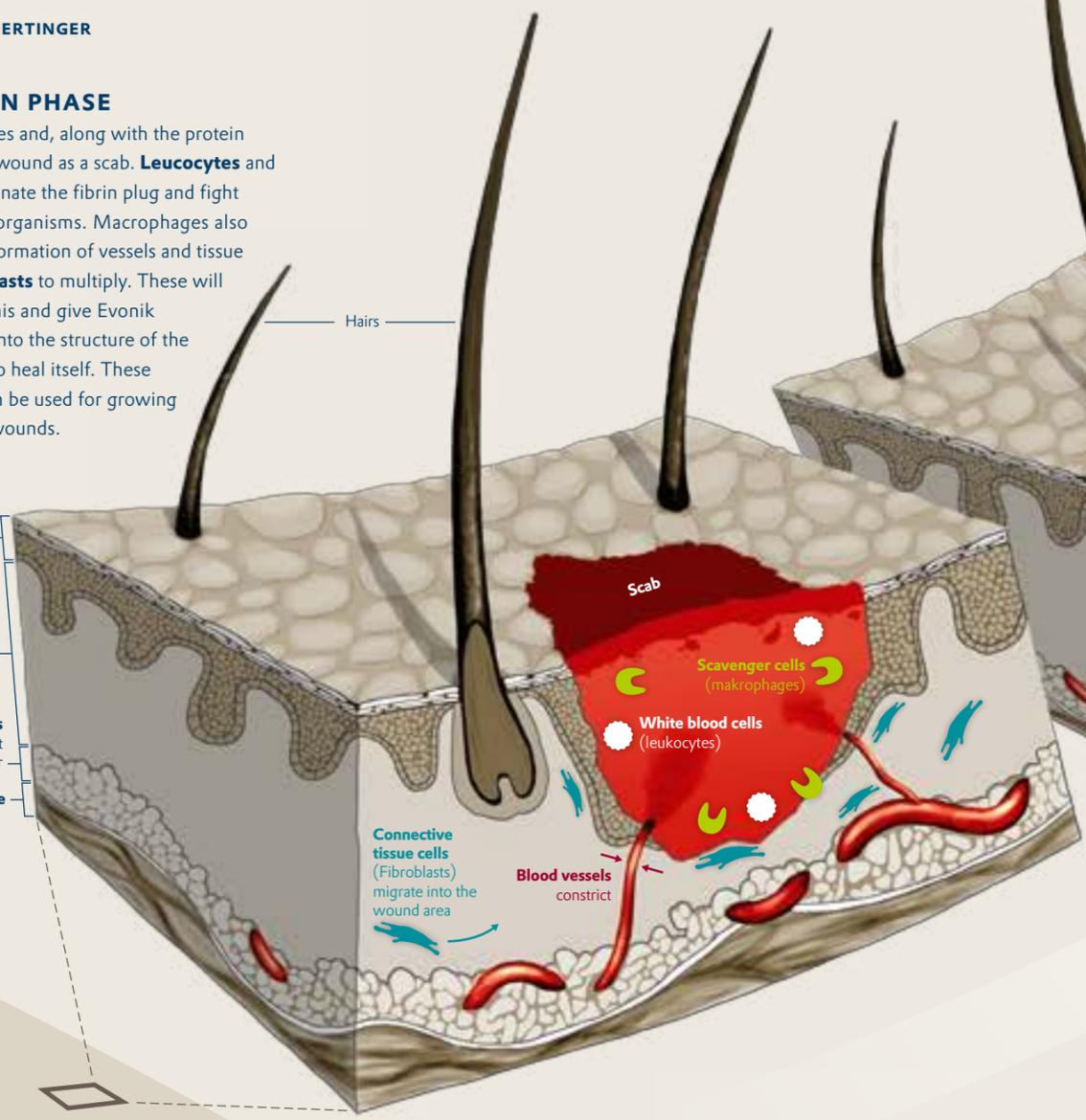
The blood coagulates and, along with the protein fibrin, sticks to the wound as a scab. **Leucocytes** and **macrophages** eliminate the fibrin plug and fight bacteria and microorganisms. Macrophages also stimulate the new formation of vessels and tissue and prompt **fibroblasts** to multiply. These will later form the dermis and give Evonik important insights into the structure of the skin and its ability to heal itself. These insights, in turn, can be used for growing tissue and healing wounds.

Epidermis
Protects against bacteria

Dermis
Supplies nutrients to the epidermis

Subcutis
Stores body fat and water

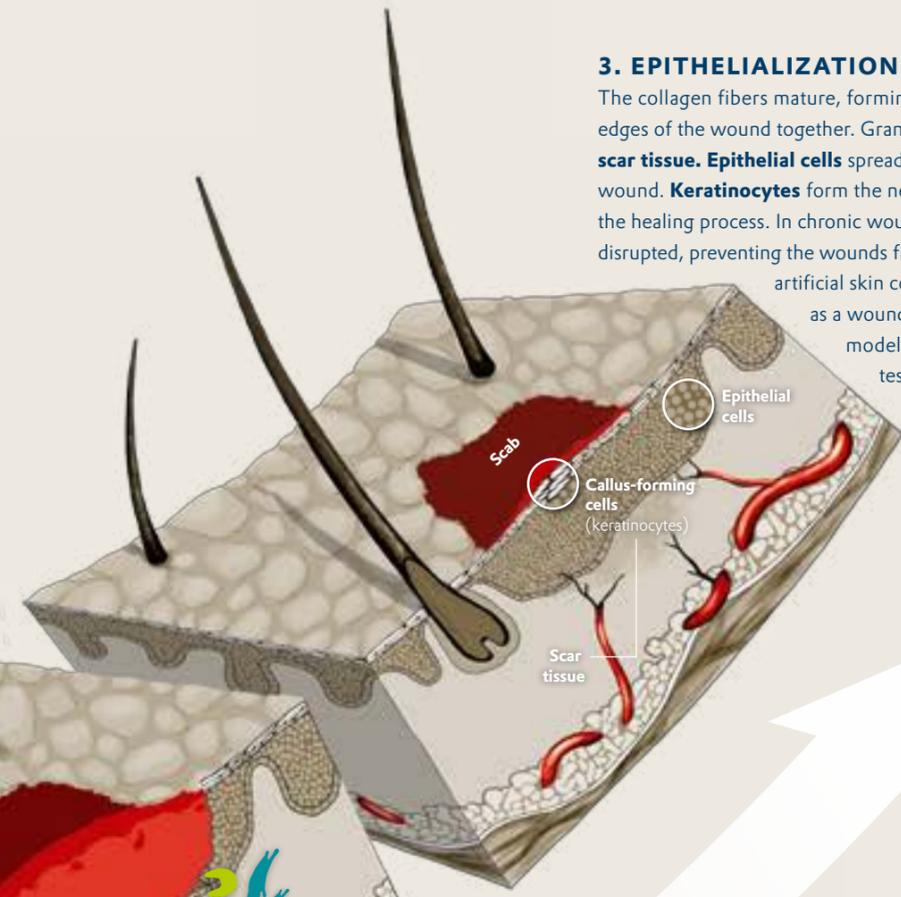
Muscle



Drawing not to scale

3. EPITHELIALIZATION PHASE

The collagen fibers mature, forming a network that pulls the edges of the wound together. Granulation tissue converts to **scar tissue**. **Epithelial cells** spread across the surface of the wound. **Keratinocytes** form the new epidermis and complete the healing process. In chronic wounds, however, this process is disrupted, preventing the wounds from healing. This is where artificial skin could help: as a transplant, as a wound dressing or as a laboratory model on which Evonik could test substances for their impact on wound healing.



2. GRANULATION PHASE

Newly formed **granulation tissue** fills in the wound; fibroblasts adhere to the remaining fibrin network and migrate from the edges of the wound into the wound itself. Here they form collagen fibers, a key component of the skin's connective tissue. In this way, fibroblasts play a crucial role in accelerating new tissue formation. Evonik hopes to optimize this process: Researchers are looking for materials and active agents that would stimulate cell growth and allow wounds to heal more quickly.

FACTS ABOUT SKIN

The skin is a true multitalent: water-repellent and breathable, cushioned and climate-controlled, self-healing and razor thin. The skin...



...covers two square meters, making it the largest organ in the body



...weighs 14 kilograms, accounting for roughly 20% of our body weight



...renews every four weeks



...loses 600,000 flakes an hour, which accounts for 70% of the dust in our homes



...possesses three million sweat glands, which excrete up to 10 liters of perspiration a day.



...contains seven kilometers of blood vessels



...is home to ten quadrillion bacteria, most of which live in our armpits.



...is thicker and fatter in men than in women, which would have once been important for hunting



...contains the following in a single square centimeter:
- Three million cells
- Four meters of nerve fiber
- 100 sweat glands
- 15 sebaceous glands
- 5 hairs