

Hair, sebaceous glands, and nails

<u>Hair</u>

Hairs are made up of hair follicles and hair shafts .The hair shaft is made up of columns of dead keratinized cells(hard keratin) organized into three layers :

- a central medulla , or core (not seen in fine hairs);
- a keratinized cortex ;
- a thin hard outer cuticle , which is highly keratinized.

Hair follicles are tubular invaginations of the epidermis, which develop as down growths of the epidermis into the dermis. The hair follicle contains the following.

• An external root sheath (ERS), which is continuous with the epidermis. This layer does not take part in hair formation. A glassy basement membrane separates the ERS from the surrounding connective tissue.

• An internal root sheath (IRS), which lies inside the ERS. The IRS contains keratinized cells derived from cells in the hair matrix. The type of keratin found here is softer than that found in the hair itself. The IRS degenerates at the point where the sebaceous gland opens onto the hair.

Hair follicle stem cells in the hair matrix , which is found in the hair bulb , are responsible for forming hair . The stem cells proliferate, move upwards, and gradually become keratinized to produce the hair. These stem cells also form the ERS and IRS , and sebaceous glands.

The dermis forms a dermal papilla at the base of the hair follicle/ hair bulb, which provides the blood supply for the hair. It is separated from the hair matrix by a basement membrane.

Hair follicles can become inflamed, due to bacterial infections (e.g., Staphylococcus aureus), resulting in a tender red spot or pustule (folliculitus).

Contraction of the arrector pili muscle, a small bundle of smooth muscle cells associated with the hair follicle, raises the hair, and forms 'goose bumps'. This helps to release sebum from the gland into the duct, and to release heat.

Pigmentation of hair

Hair color depends on the pigment melanin, produced by melanocytes in the hair matrix. Differences in hair color depend on which additional forms of melanin, pheomelanin (red or yellow) and eumelanin (brown or black), are present. The pigment is produced by melanocytes in the hair matrix, and is then transferred to keratinocytes, which retain this pigment as they differentiate and form hair. In old age, melanocytes stop producing melanin, and hair turns white.

<u>Hair growth</u>

Hair follicles alternate between growing and resting phases. Hair is only produced in the growing phase (this can be several years in the scalp). Hair falls out in the resting phase. This can be permanent, resulting in baldness.

Cutting hair does not change its growth rate.

Sebaceous g lands

These glands are branched, acinar holocrine glands found next to hair follicles .The cells rupture to secrete an oily sebum into the lumen of the hair follicle (holocrine secretion).

The ruptured cells are continuously replaced by stem cells (basal cells), located at the edges of the gland.

<u>Nails</u>

Nails (or nail plates) consist of a strong plate of hard keratin, and they protect the distal end of each digit . The nail plate is a specialized layer of stratum corneum . It is formed by the nail bed (nail matrix) underneath the nail plate. Proliferating cells in the basal layer of the nail bed move upwards continuously. As the cells move upwards they are displaced distally and gradually transformed into hard keratin, which lengthens and strengthens the nail plate. The tightly packed, hard, keratinized epidermal cells in the nail plate have lost their nuclei and organelles. Nails grow at a rate of about 0.1 - 0.2 mm per day.

The proximal end of the nail plate extends deep into the dermis to form the nail root . The nail root is covered by the proximal nail fold . The covering epithelium of this nail fold is called the eponychium . The outer thick corneal layer of the

eponychium extends over the dorsal layer of the nail, to form the cuticle , which protects the base of the nail plate. If the cuticle is lost, the nail bed can become infected. The eponychium also contributes to the formation of the superficial layer of the nail plate.

The distal edge of the nail has a free edge . Here, the nail plate is firmly attached to the underlying epithelium, which is known as the hyponychium (hypo means ' below '). This region of epithelium contains a thickened layer of stratum corneum.

The tight connection between the nail plate and the underlying epithelium protects the nail bed from bacterial and fungal infections. If this connection is disrupted, then a fungal infection of the nail bed can cause onychomycosis .

Pigmentation of nails

The pink color of nails derives from the color of the underlying vascular dermis. The nail itself is thin, hard, and relatively transparent. The white crescent at the proximal end of the nail is called the lunula . The underlying epithelium is thicker here, which explains the white color of the lunula. The increased epithelial thickness means that the pink color of the dermis does not shown.