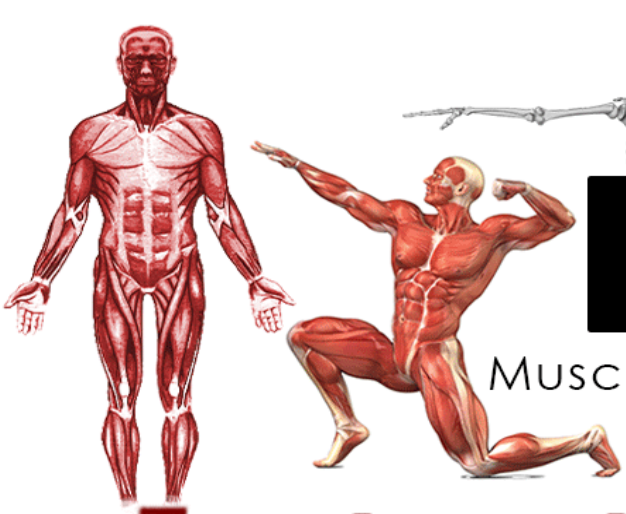
1.2



MSS

Musculoskeletal System

Histology

Doctor 2018 | Medicine | JU

Done by

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Contributed In The Grammatical Correction

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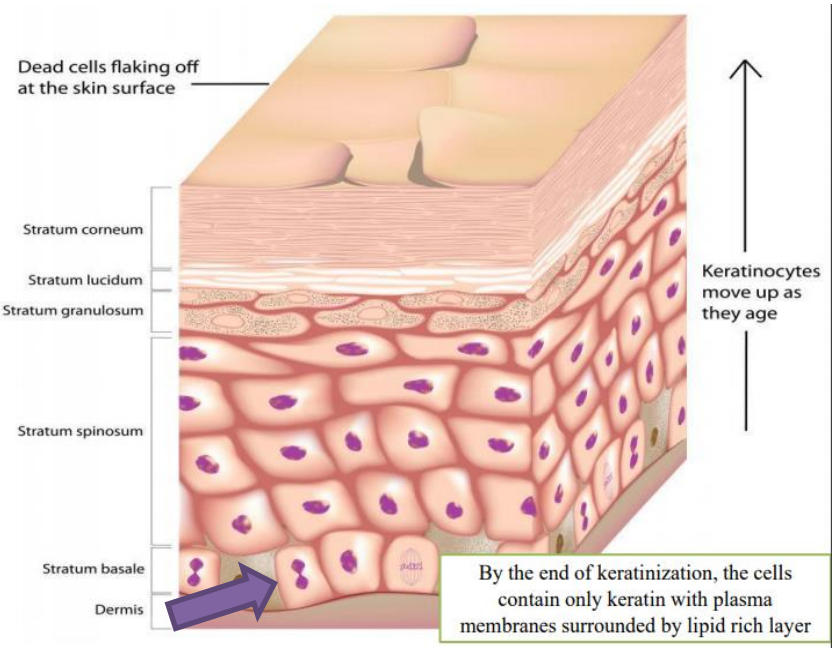


the basal cell layer can undergo mitosis.

The purple arrow represents a mother cell that is splitting into two new identical cells. One of the new cells will continue to move upward through the epidermis and the other cell stays on the basement membrane to continue multiplying and to have continuous renewal of the skin because our skin is continuously shedding from the top.

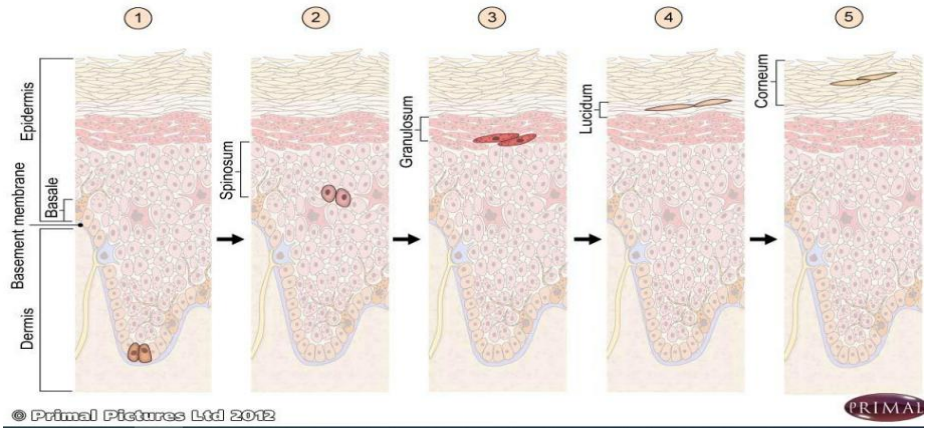
This process is called **keratinization** / **maturation of the keratinocytes**, it takes 2-4 weeks to complete.

https://youtu.be/OKosGSm7Ps4

notice from the video that as the cells move up, they die. why?

1) the cytoplasm of these cells will be filled with keratin which will destroy the organelles and the nuclei leading to cell death.

2) Epithelium is avascular tissue, and as we go away from the basement membrane the diffusion of nutrients and oxygen decreases leading to cell death.



If we trace these cells from the basement membrane, they are part of:

Stratum Basale -> Stratum Spinosum -> Granulosum -> Lucidum -> Corneum -> desquamate

this is **keratinization** again 😊

Psoriasis الصدفية

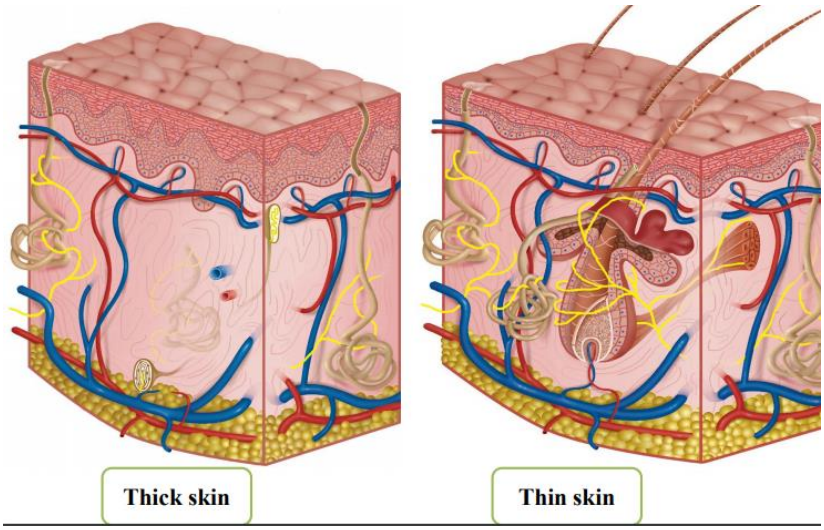
-keratinization is accelerated, happens within 1 week instead 2-4 weeks in normal cases

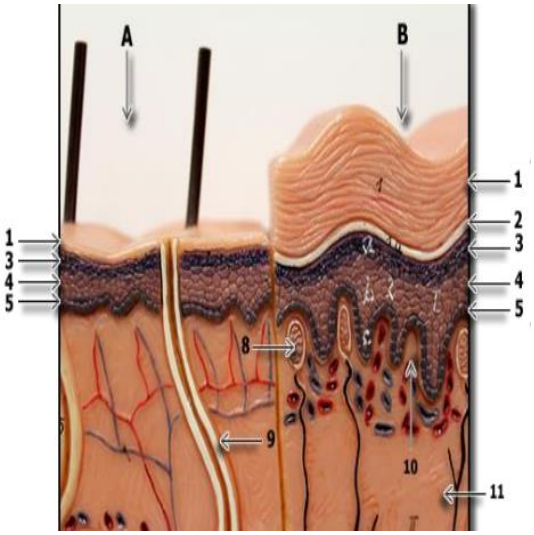
-it is a common skin disease that speeds up the life cycle of skin cells. It causes cells to build up rapidly on the surface of the skin. The extra skin cells form scales and red patches that are itchy and sometimes painful.

***Types of skin:**

1-thin skin

2-thick skin





Differences:

1-location:

thin skin -> dominant and lines most of the body surface

thick skin -> palms of the hands and soles of the feet

2-the thickness of the epidermal layer

Note: that the thin and thick refer to the thickness of epidermal layer

thin skin -> thinner epidermis

thick skin -> thicker epidermis

but the dermis is usually thicker in thin skin

3- the presence of hair follicles

-Hair follicles (canals): pockets inside the dermis where we find the hair shaft.

in the palms of the hands and soles of the feet (thick skin) has no hair follicles.

Thin skin has hair follicles.

4- the presence of sebaceous glands

Sebaceous glands: their ducts open into the hair follicles and they secret oily material called sebum.

Sebum is important for the lubrication of the hair and the surface of our skin.

Thick skin has no sebaceous glands.

Thin skin has sebaceous glands.

5- types of sweat glands

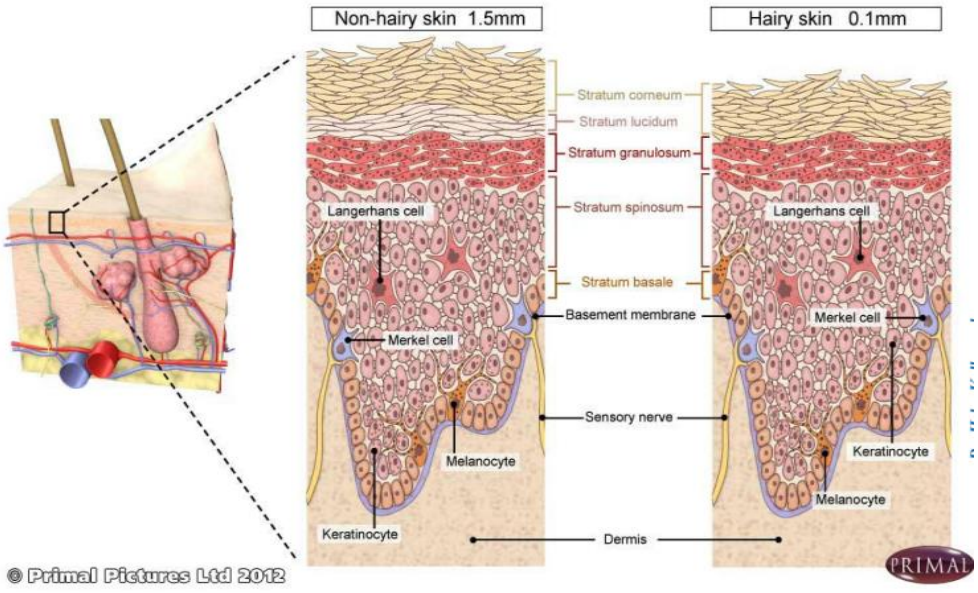
Sweat gland: simple coiled tubular gland.

Types of sweat gland:

1-ecrine sweat gland: typical sweat gland, the duct opens into the surface of epithelium, it excretes sweat into the surface of the skin and presents all over our skin.

2-apocine sweat gland: the duct opens into the hair canal and presents in certain areas in our body.

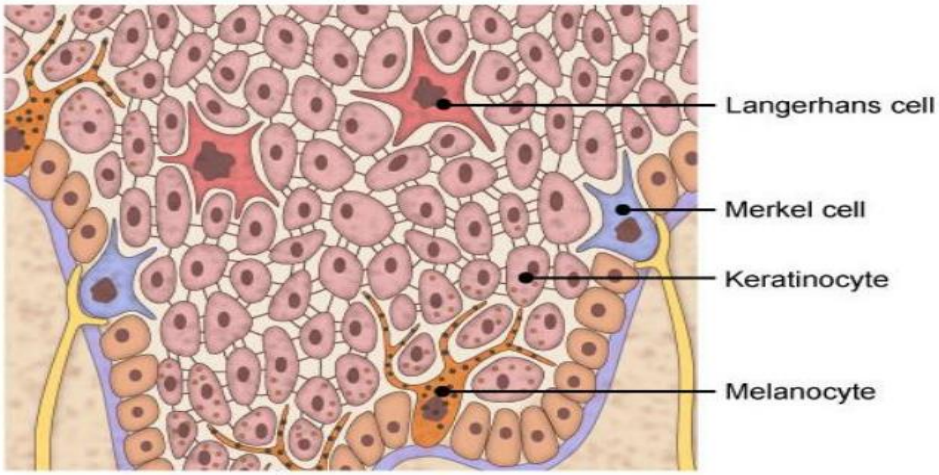
Thick skin has no apocrine sweat glands.



6- Notice that the epidermis of the thick (non-hairy) skin has the 5 layers we have studied, while the epidermis of the thin (hairy) skin has only 4, the stratum lucidum is not present.

Differences:	Thin skin	Thick skin
Number of layers in the epidermis	4 the stratum lucidum is not present.	5
Stratum corneum	Less prominent	More prominent
Stratum granulosum	Less developed	Well developed
Location	Dominant and lines most of the body surface	Palms of the hands and soles of the feet
Dermis	Thicker	Thinner
Hair and sebaceous glands	Present	Not present
Apocrine sweat glands	Present	Not present

Types of epidermal cells:



(1) keratinocyte

- Approximately 90% of epidermal cells are keratinocytes.
- Produce **keratin**
- Produce **lamellar granules** that helps waterproof the skin

> keratinocytes continuously shed and regenerate every 2-4 weeks

notice the morphology of the cells as we go away from the basement membrane.

-In the basal layer -> cuboidal / columnar cells

-In stratum spinosum -> polyhedral in shape

-Then flatting of the cells until we end up with complete squamous cells that are continuously shedding out of the epithelium.

>>the structure of keratinocytes changes dramatically as they mature: they change from square-shaped cells to flat cells.

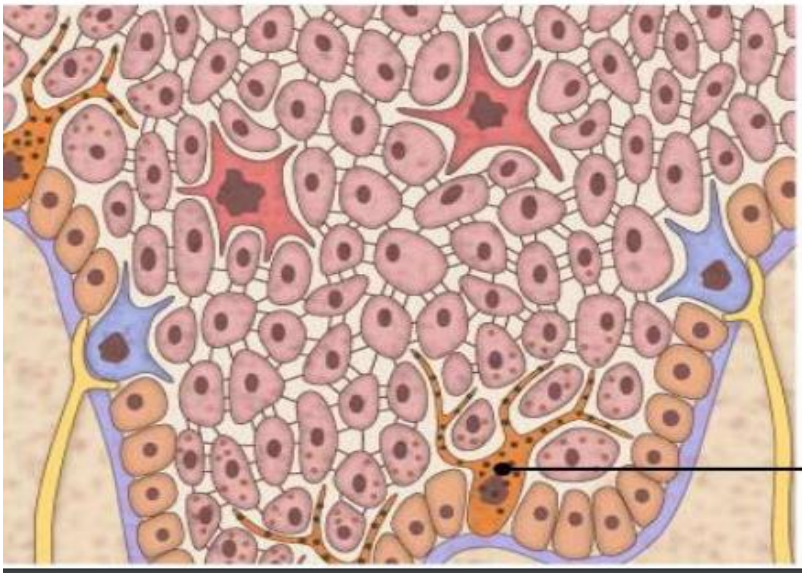
>> throughout their life they become engorged with keratin before eventually dying, loosing all their internal structures.

(2) melanocytes

Melanocytes are our natural SPF

Skin Protection Factors

- Are derived from the neural crest cells.
- Have protrusions that transfer melanin granules to the keratinocytes
- Are located in the stratum basale
- Synthesize the dark brown pigment melanin
- Melanin protects the skin from the damaging effects of ultraviolet radiation



Melanin imparts a dark color to the skin, and exposure of the skin to sunlight promotes increased synthesis of melanin

1 melanocyte for every 10 basal keratinocytes

Notes:

> melanocytes are attached to the basement membrane by hemidesmosomes and not attached to other keratinocytes.

> the pigment melanin is synthesized in the cytoplasm forming secretory granules called melanosomes.

>these melanosomes will be transferred into the processes of the melanocytes where the melanin will be phagocytized by the keratinocytes.

> the melanin pigment will be transported to keratinocytes.

Melanocytes do NOT store melanin.

> each melanocyte with its processes can touch up to 30 keratinocytes.

This is the pigment melanin inside the keratinocytes.

It is accumulated in a supranuclear position of keratinocytes to form a structure like umbrella to protect the DNA of keratinocytes from the harmful effect of UV light.

This is a melanocyte. We can't see the processes under the microscope.

Why not all the keratinocytes have this layer? Because we need to protect the actively dividing cells in Stratum Basale and the deepest layer of Stratum Spinosum.

***The number of melanocytes in human is the same. The color of the skin, hair and iris of the eye differs due to the activity of the melanocytes.**

=> The more melanin we have in our skin, the darker the skin is.

***people with less protective melanin should be careful not to be exposed to sun light for long period of time.**

***cancer in melanocyte is called melanoma which is the most aggressive type of skin cancer. / the most common cause of melanoma: excessive exposure to the sun🌞**

***Albinism: is a genetic deficit in which the body can't make melanin, there is no shielding, no protection from the UV light and exposure to the sun can lead to mutations of their skin cells.**

***sun exposure will lead to the production of more melanin (suntan).**

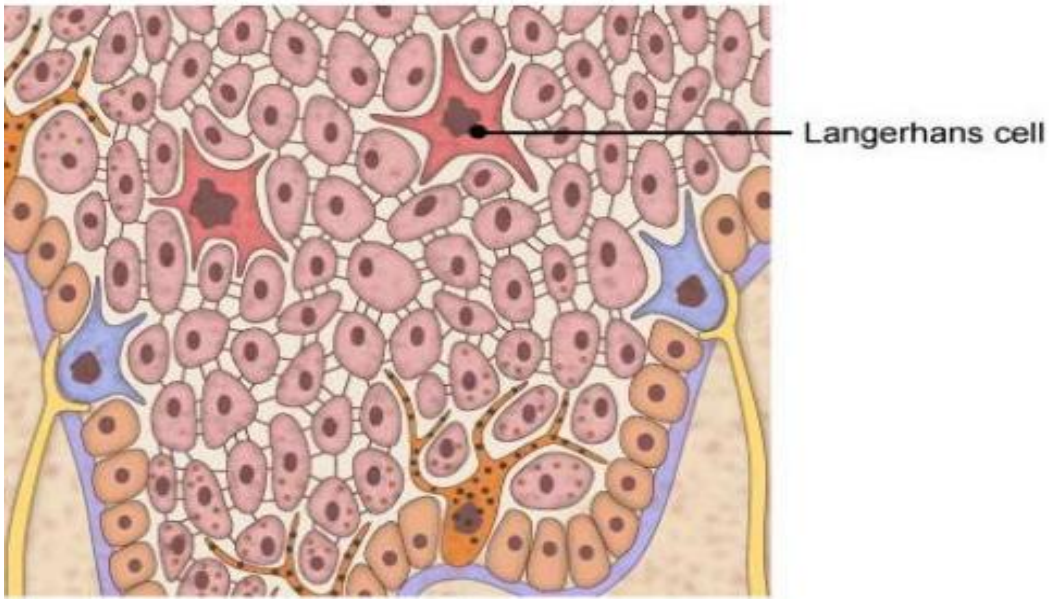
***Even the sunspots (Dark- Brown spots on our skin) means that the Melanocytes are**

Over activated and they do not know when to stop producing this pigment

(3) Langerhans cells

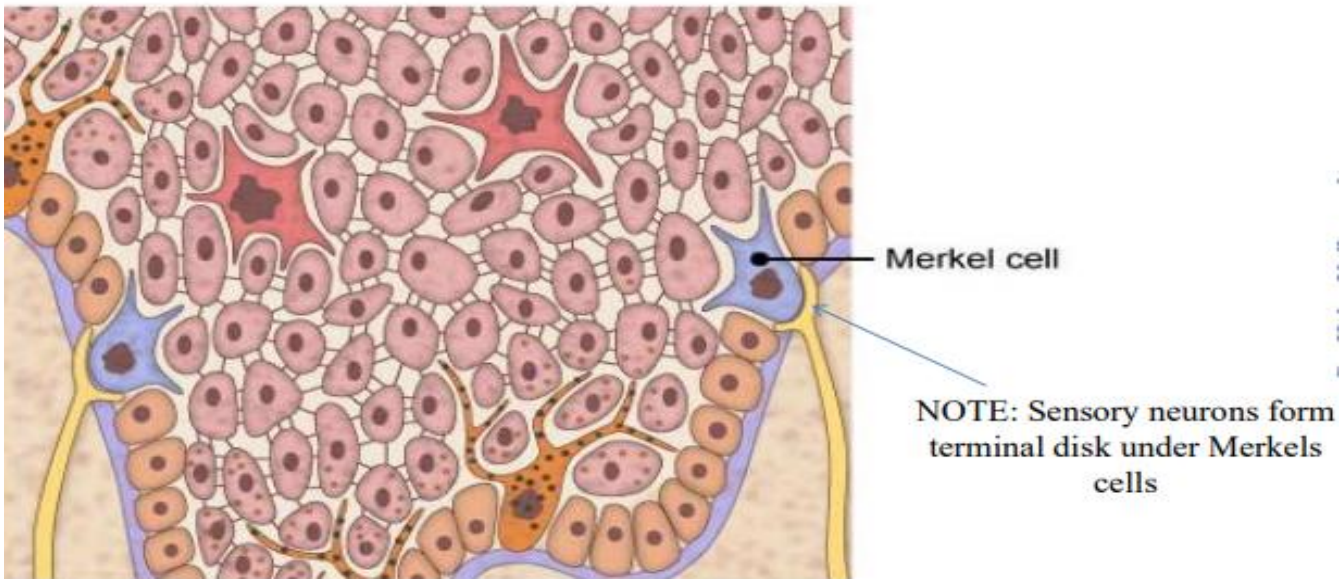
> they are immune cells inside the epidermis mainly in stratum spinosum.

- Originate from bone marrow (monocytes)
- Mainly in the stratum spinosum
- Langerhans cells recognize, phagocytose, and process foreign antigens
- Represent 2-8% of epidermal Cells



(4) Merkel cells

- Are found in the stratum basale
- Are most abundant in the fingertips
- Are closely associated with afferent (sensory) unmyelinated Axons
- Function as light touch receptors (mechanoreceptors)



> attached to the basement membrane by hemidesmosomes and attached to the neighboring keratinocytes.

Dermis

Remember that there are two types of connective tissues:

1- **Loose connective tissue -> contains collagen type 1 fibers, elastic fibers, spaces filed with ground substance and different types of cells (highly vascularized)**
2- **Dense connective tissue**

Exactly under the epithelium we expect to have loose connective tissue -> the most superficial layer of dermis is a loose connective tissue and is called papillary layer of dermis

As you go down the fibers get thicker, the cells and spaces get less, and we end up by a dense connective tissue. The fibers here are irregularly arranged because our skin is subjected to forces and stresses from more than one direction. (dense irregular connective tissue) this layer is called reticular layer of dermis

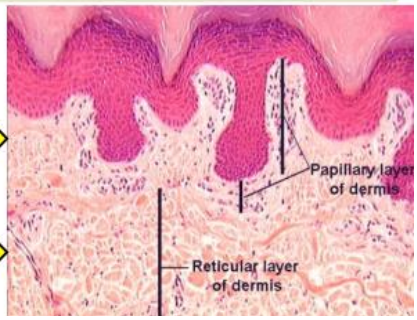
=> Reticular does not refer to having mainly reticular fibers, it refers to collagen type 1 fibers and elastic fibers crossing each other to form very nice net of fibers (reticularum means net).

- The dermis lies immediately beneath the epidermis and is much thicker.
- It is responsible for the elasticity and strength of skin
- Contains blood vessels and nerve supply

It supplies the epidermis with nutrients,
and plays an important role in thermoregulation

- Is derived from mesoderm

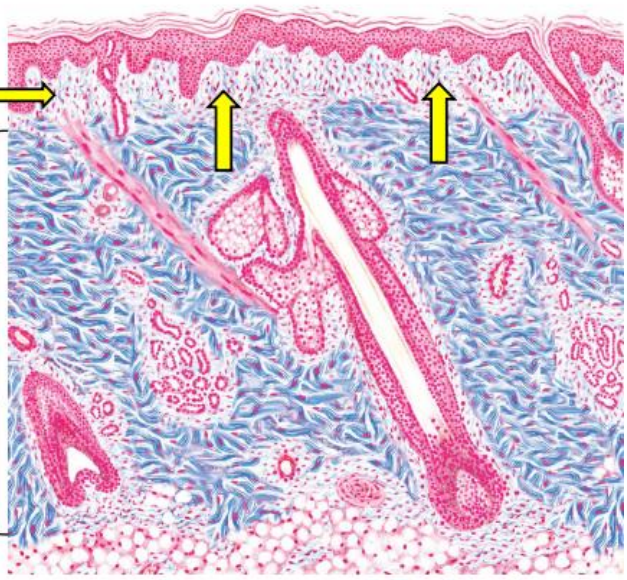
The dermis can be divided into two sub-layers:



(1) Papillary layer of dermis
Loose connective tissue

(2)Reticular layer of dermis
Dense irregular connective tissue

Is important in giving the skin it overall strength (collagen1) and elasticity (elastic fibers),

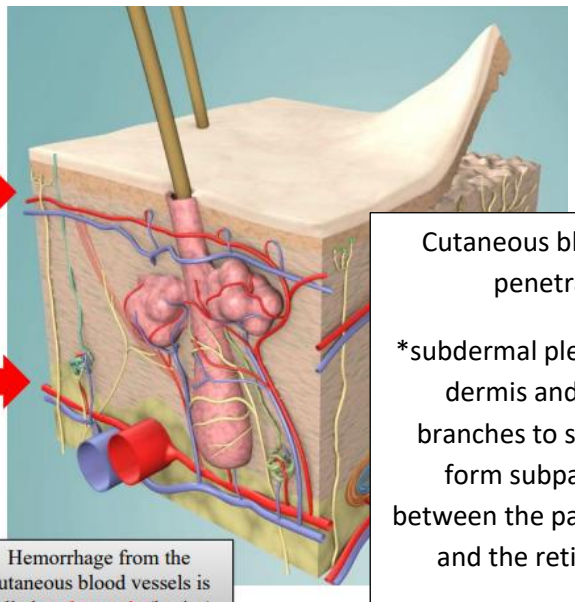


The blood vessels form two major plexuses:

Subpapillary plexus

Thermoregulation

Subdermal plexus



Hemorrhage from the cutaneous blood vessels is called **ecchymosis** (bruise)

Cutaneous blood vessels that do not penetrate the epidermis

*subdermal plexus: located between the dermis and hypodermis, it sends branches to supply the dermis and to form subpapillary plexus located between the papillary layer of the dermis and the reticular layer of dermis.

On the top of the stratum corneum layer, there is an additional layer of oily material from the secretions of sebaceous glands called acid mantle. it has also the sweat secreted from the sweat glands and the dead cells that are continuously shedding from the skin.

- additional protection

-keeps our skin moist and soft

-slightly acidic to prevent the overgrowth of pathogens on our skin

The **acid mantle** is a very fine, slightly acidic film on the surface of human skin

Is made up of natural oils, sweat, and dead skin cells, and is slightly more acidic in nature to prevent harmful (naturally alkaline) contaminants from penetrating and damaging the skin

The **acid mantle** adds protection from bacteria, environmental pollutants, and moisture loss.