



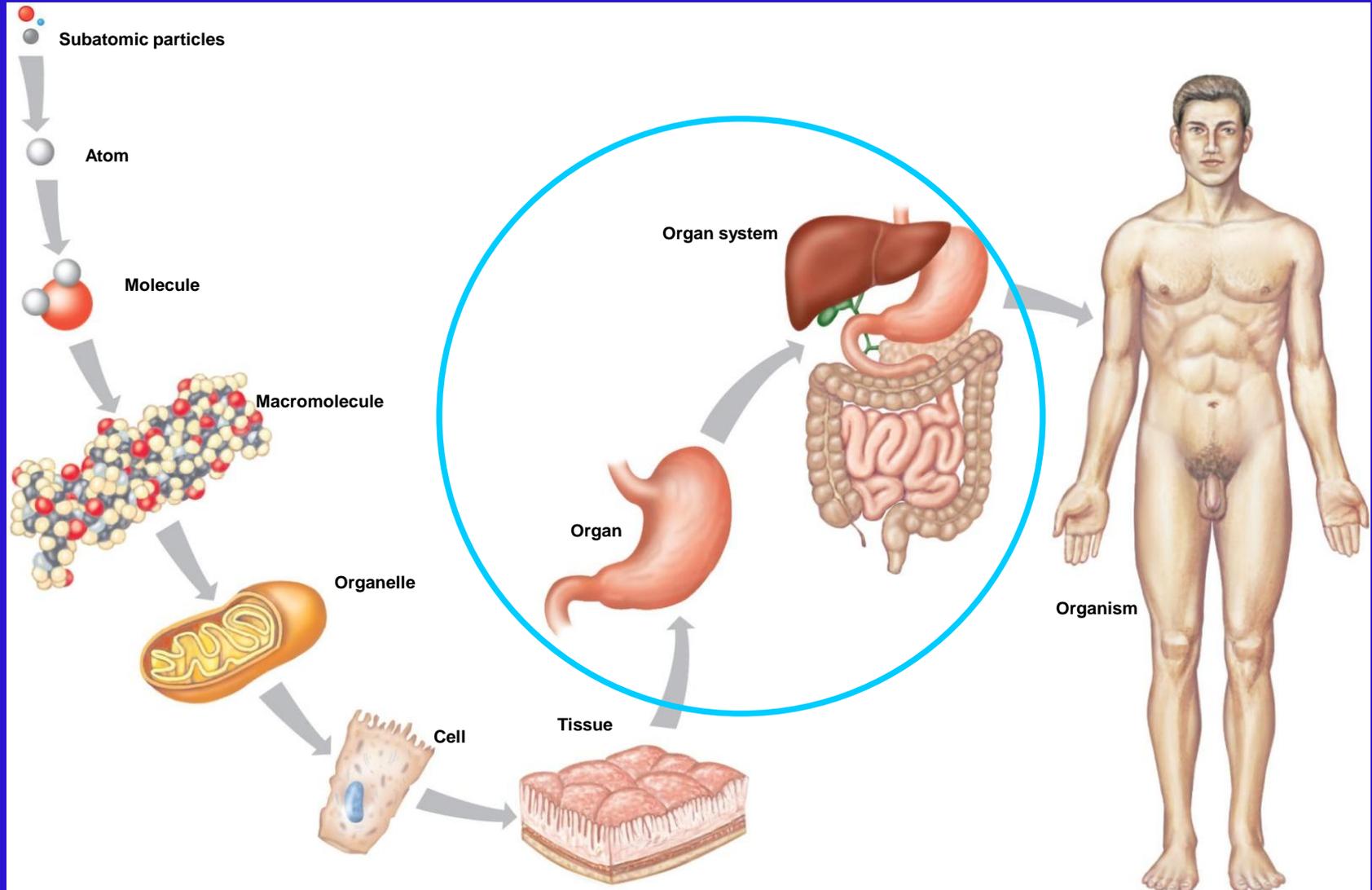
HUMAN BODY SYSTEMS ORGANIZATION SKIN ANATOMY

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Fig. 1.3

Levels of Organization



Tissues, Organs, and Systems

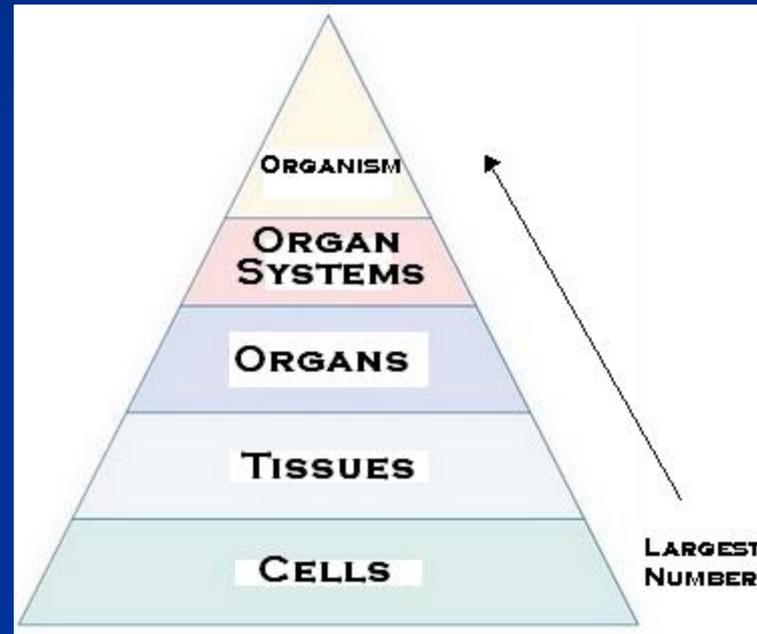


[The Human Body Video](#)

Organization of humans

There are four levels of organization, it is called a HIERARCHY.

1. Cells;
2. Tissues;
3. Organs;
4. Organ Systems.

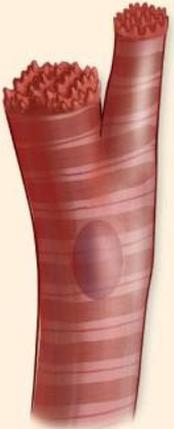
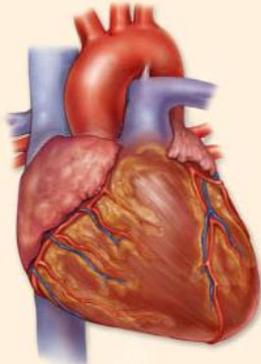
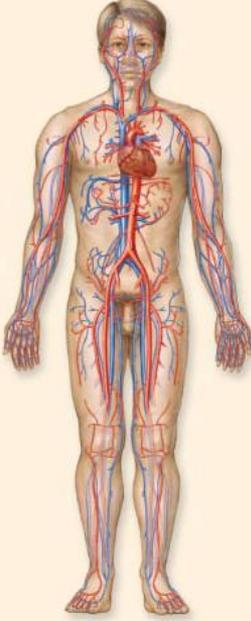


Bodies of vertebrates (animals with spines) are composed of different cell types

-Humans have 210

Organization of Your Body

Organization Structure Diagram

Cell	Tissue	Organ	Organ System
Cardiac Muscle Cell	Cardiac Muscle	Heart	Circulatory System
			

Smallest
Level

Largest
Level



Organization

1. CELL = BIOLOGY

2. Tissues: are groups of cells that are similar in structure and function.

[Intro Cells & Tissues Video](#)

In adult vertebrates, there are four **primary tissues**:

- Epithelial,
- Connective,
- Muscle,
- Nerve Tissue.

All perform different bodily functions, thus are different cells.

Epithelial Tissue

- Epithelial Tissue:
- Separates, protects, and keeps organs in place.
- Covers the body surface and forms the lining of most organs.
- Ex: Skin (epidermis), & inside of mouth

[The Skin Video \(5 min\)](#)

- Layer of skins



Connective Tissue

- Connective Tissue-
- *Provides support and structure to the body, also fills spaces.*
- The most abundant tissue in the human body.
- Ex: Blood, bones, cartilage, and fat.

[Bones & Cartilage Video \(3 min\)](#)

Muscle Tissue

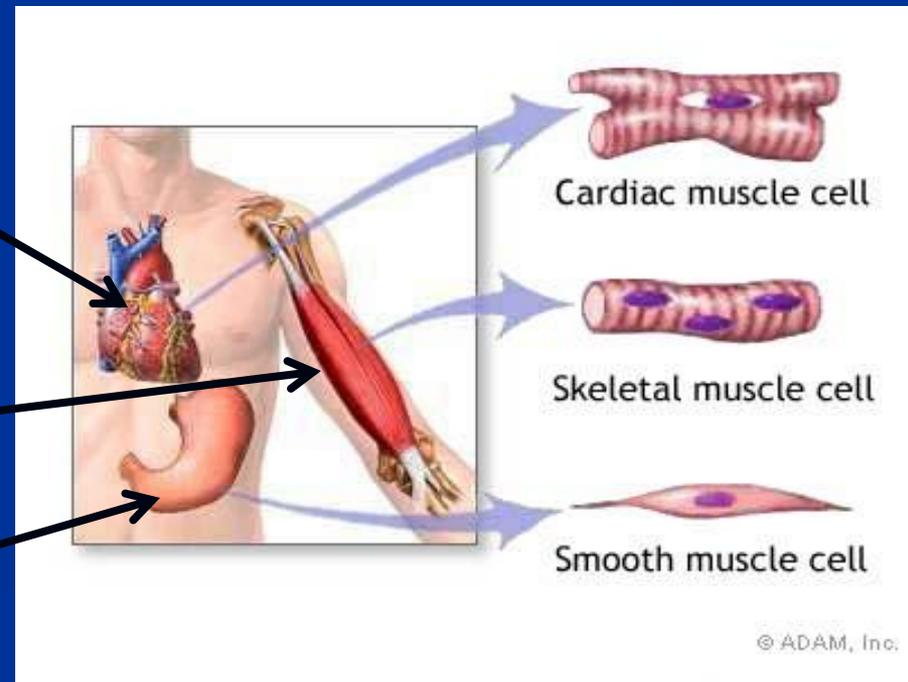
- Muscle Tissue -Contracts and relaxes to support movement.
- Three types: Skeletal, smooth, and cardiac.

Ex:

Cardiac muscle contracts to pump blood through the body;

Skeletal muscle moves the bones when directed by brain.

Smooth muscle contracts in digesting;



Nerve Tissue

■ Nerve Tissue

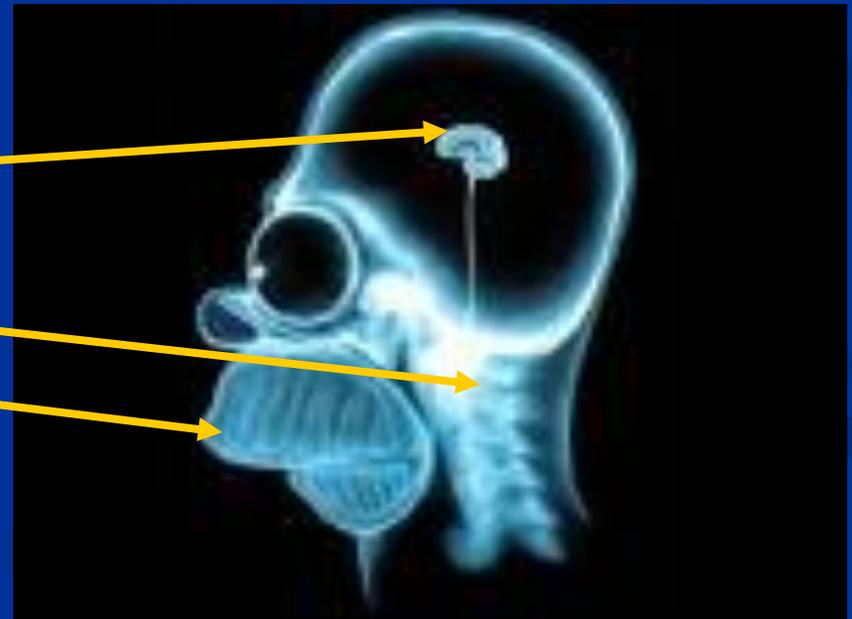
- responds to stimuli in the environment;
- controls movement, reflexes, and receives sensory information;

Ex:

Brain tissue,

Spinal Cord Tissue,

Peripheral nerve cells.



[Nerve Video](#)

3. Organs: are combinations of different tissues that form a **structural and functional UNIT.**

Any organ that is essential to life is called a vital organ.

Examples:

- **Heart** - Pumps blood throughout the body.
- **Liver** - Removes toxins from the blood, produces chemicals that help in digestion.
- **Lungs** - Supplies oxygen to the blood and removes CO₂ from blood.
- **Brain** - The control center of the body.

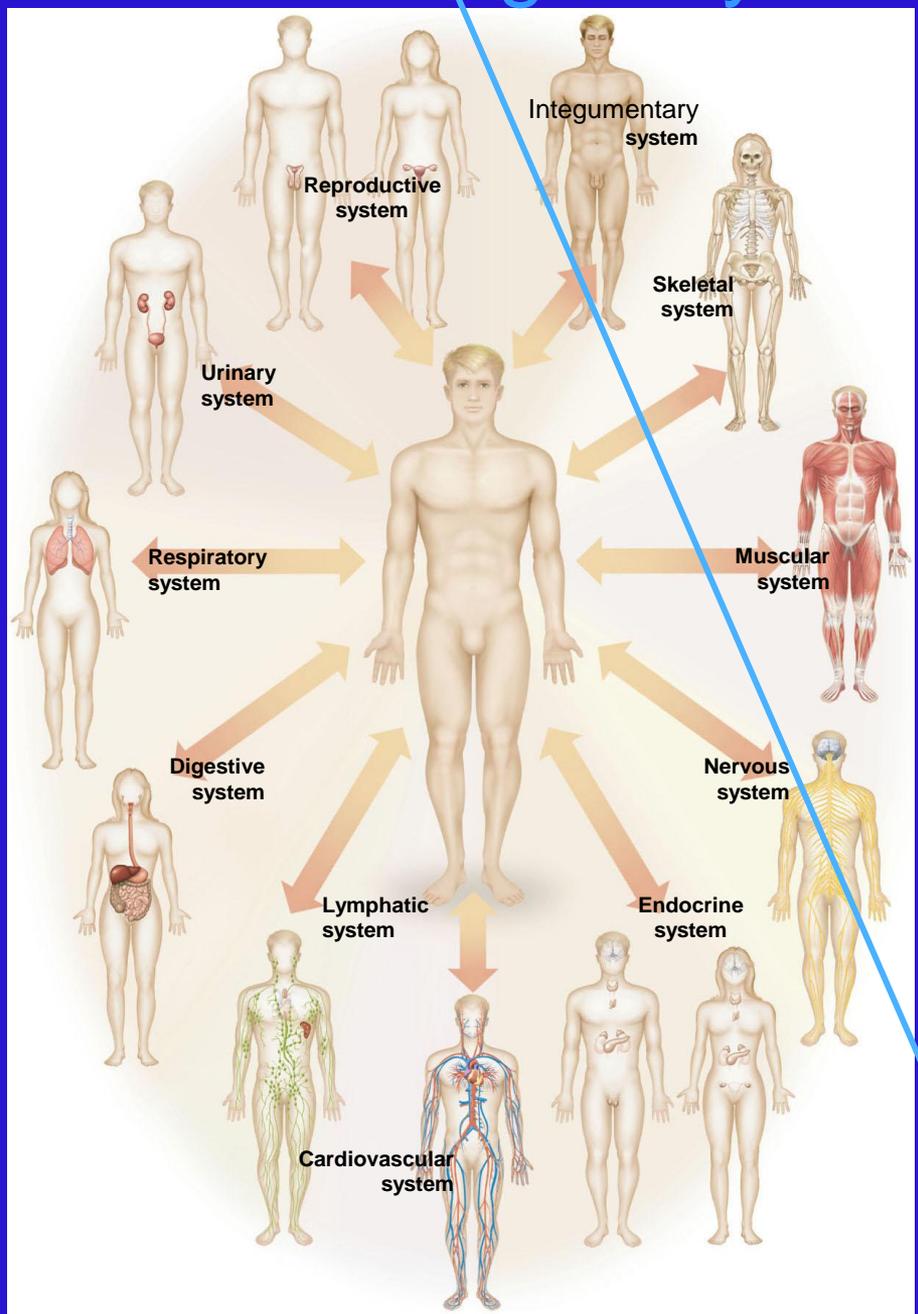
4. systems: are groups of organs that cooperate to perform the major activities of the body.

-The vertebrate body contains 11 principal organ systems.

The Eleven Organ Systems

A&P II

A&P I



The 11 Human Body Systems

The 11 human body systems are as follows:

- nervous system
- respiratory system
- excretory system
- muscular system
- endocrine system
- lymphatic (immune) system
- integumentary system
- digestive system
- skeletal system
- circulatory system
- reproductive system

All are extremely important because each system is responsible for a specific cellular function, just on a much larger scale.

Overview of Organ Systems

Organ systems communicate, integrate, support and move, maintain and regulate, defend, reproduce the body.

✓ **Communicate outside environment changes:**

-Three organ systems detect external stimuli and coordinate the body's responses

- Nervous, sensory and endocrine systems

✓ **Support and movement:**

-The **musculoskeletal system** consists of two interrelated organ systems

✓ Regulation and maintenance:

-Four organ systems regulate and maintain the body's chemistry; called HOMEOSTASIS.

Digestive, circulatory, respiratory and excretory systems.

✓ Defense:

-The body defends itself with two organ systems:

Integumentary and immune.

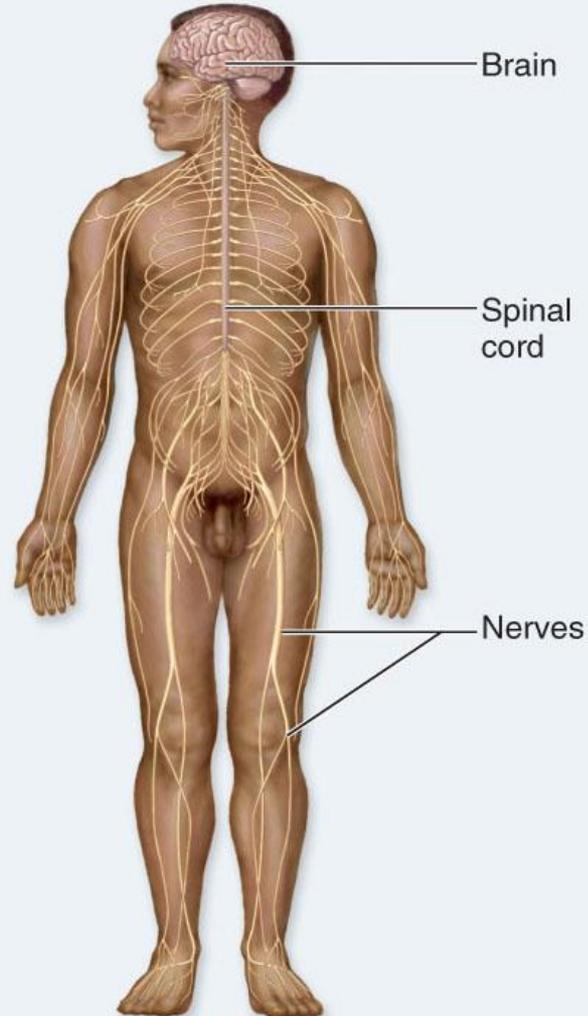
✓ Reproduction and development

-The Reproductive system.

Overview of Major Organ Systems

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Nervous System



The Nervous System

Purpose: to coordinate the body's response to changes in its internal and external environment

Major Organs and Their Functions

Brain – control center of the body, where all processes are relayed through

- consists of cerebrum (controls thought and senses) and cerebellum (controls motor functions)

Spinal Cord – sends instructions from the brain to the rest of the body and vice versa

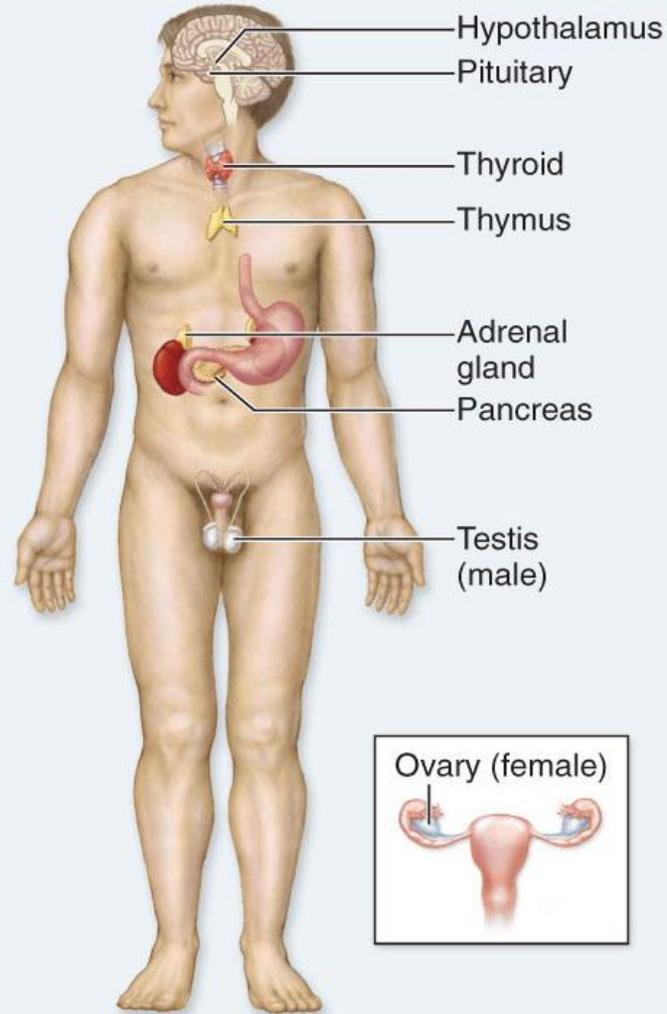
- any organism with a major nerve cord is classified as a chordate

Nerves – conduct impulses to muscle cells throughout the body

Overview of Organ Systems

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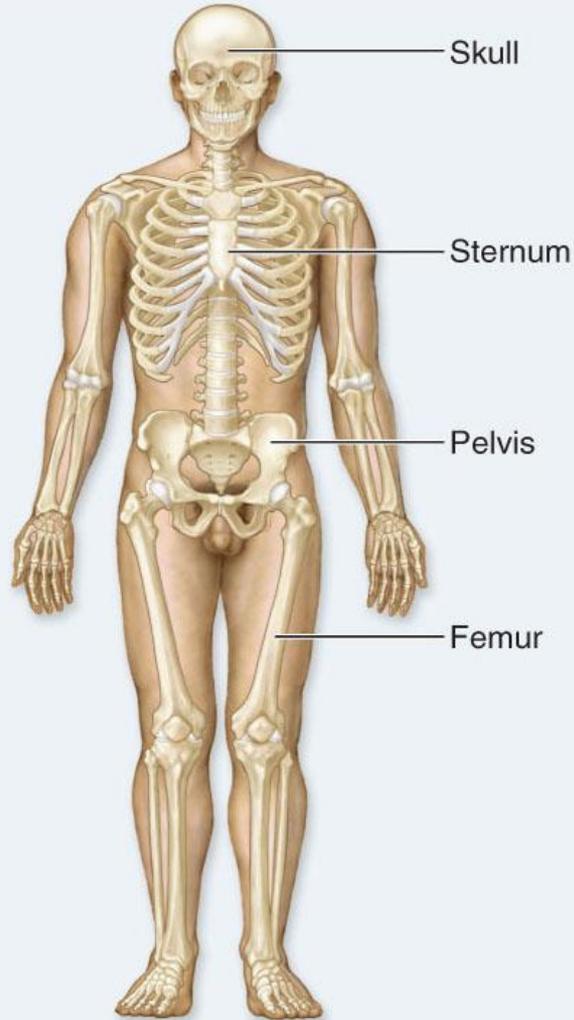
Endocrine System



Overview of Organ Systems

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Skeletal System



The Skeletal System

Purpose: to provide structure, support, and movement to the human body

Bones are where new blood cells are generated (in the marrow), and require the mineral calcium for strength

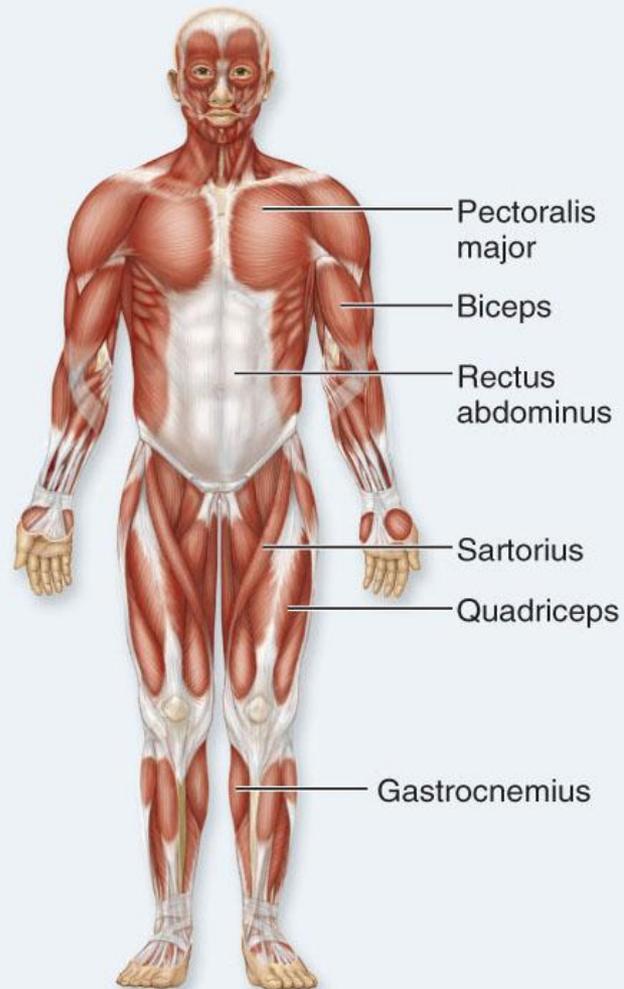
Major Bones of the Human Body

- femur (thigh bone)
- radius and ulna (lower arm)
- sternum (breastbone)
- fibula and tibia (calf)
- scapula (shoulder)
- coccyx (tail bone)
- humerus (upper arm)
- cranium (skull)
- clavicle (shoulder blade)
- vertebrae (back)
- pelvic bone
- phalanges (fingers/toes)

Overview of Organ Systems

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Muscular System



The Muscular System

Purpose: works with the skeletal and nervous system to produce movement, also helps to circulate blood through the human body

- muscle cells are fibrous

- muscle contractions can be voluntary or involuntary

Major Muscles in the Human Body

- biceps

- triceps

- deltoids

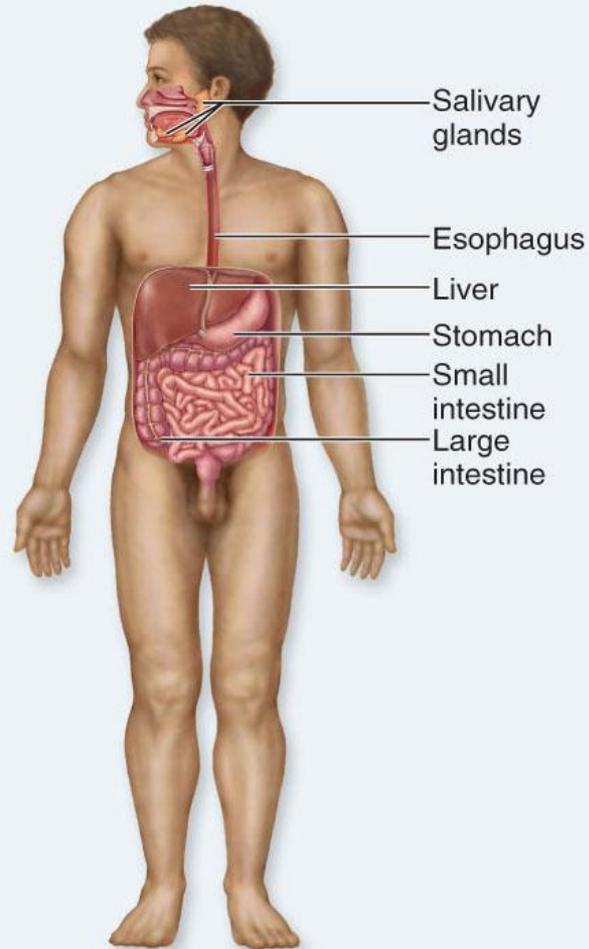
- glutes

- hamstrings

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Digestive System



The Digestive System

Purpose: to dissolve food so it can be absorbed into the bloodstream and used by the body

Major Organs and their Functions:

Mouth – to chew and grind up food

-- saliva also begins to breakdown food into particles

Esophagus – pipe connecting mouth to stomach

Stomach – produces acid that breakdowns food.

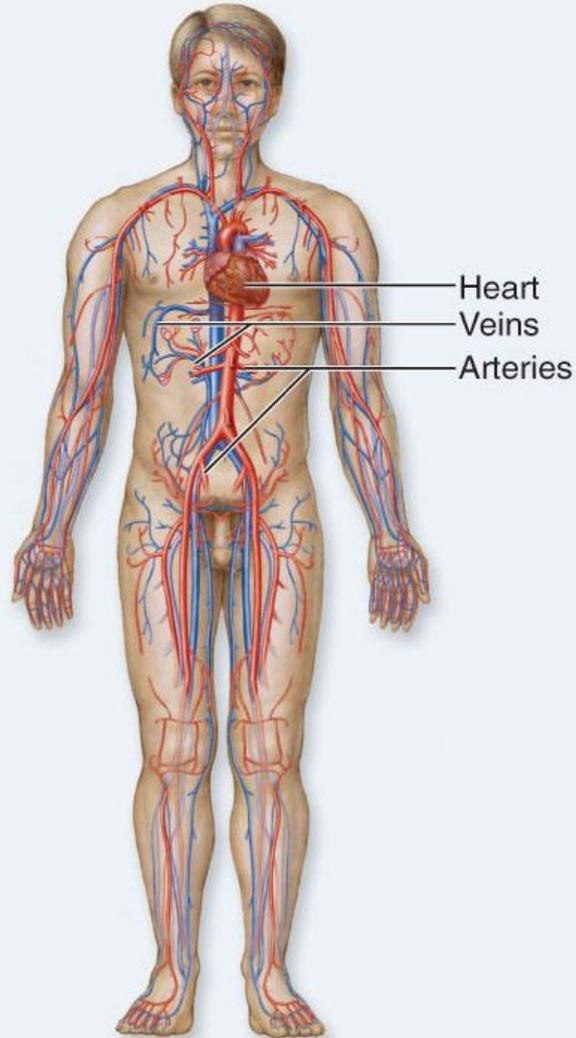
Small Intestine – Digested food moves through intestine by Villi. The Villi absorbs nutrients and water from digested food.

Large Intestine – removes water from the digested food and gets the waste ready for excretion

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Circulatory System



The Circulatory System

Purpose: to deliver oxygenated blood to the various cells and organ systems in your body so they can undergo cellular respiration

Major Organs and Their Functions

Heart – the major muscle of the circulatory system

- pumps blood through its four chambers (two ventricles and two atria)
- pumps deoxygenated blood into the lungs, where it gets oxygenated, returned to the heart, and then pumped out through the aorta to the rest of the body
- valve regulate the flow of blood between the chambers

Arteries – carry blood away from the heart and to the major organs of the body

Veins – carry blood back to the heart away from the major organs of the body

Capillaries – small blood vessels where gas exchange occurs

Blood – the cells that flow through the circulatory system

- red blood cells contain hemoglobin, an iron-rich protein that carries oxygen

- white blood cells function in the immune system

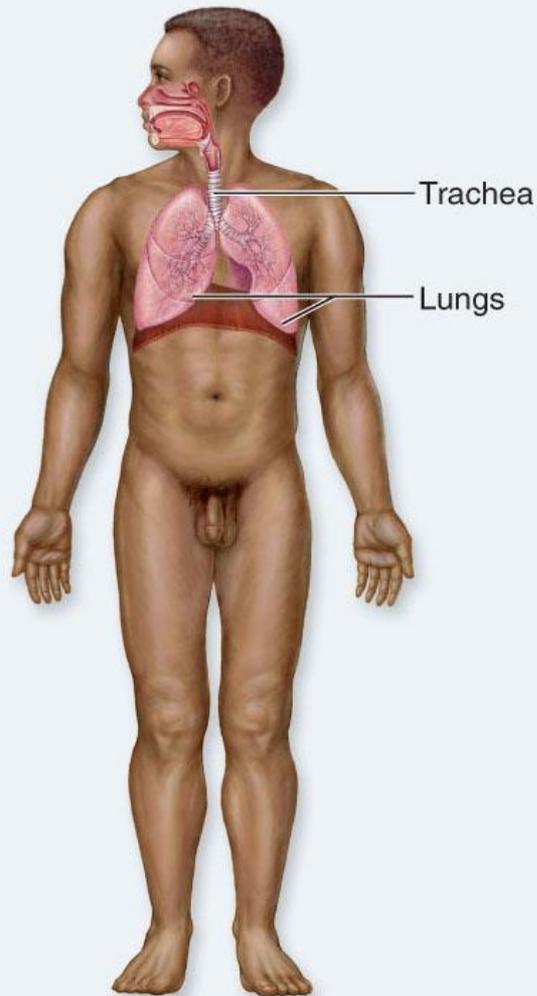
- platelets help in blood clotting

Spleen – helps to filter out toxins in the blood

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Respiratory System



The Respiratory System

Purpose: to provide the body with oxygen and to remove carbon dioxide

Major Organs and Their Functions

Nose & Mouth – internal entry and exit point for air

Pharynx – serves as a passage way for both air and food at the back of the throat

Larynx – your “voicebox”, as air passes over your vocal chords, you speak

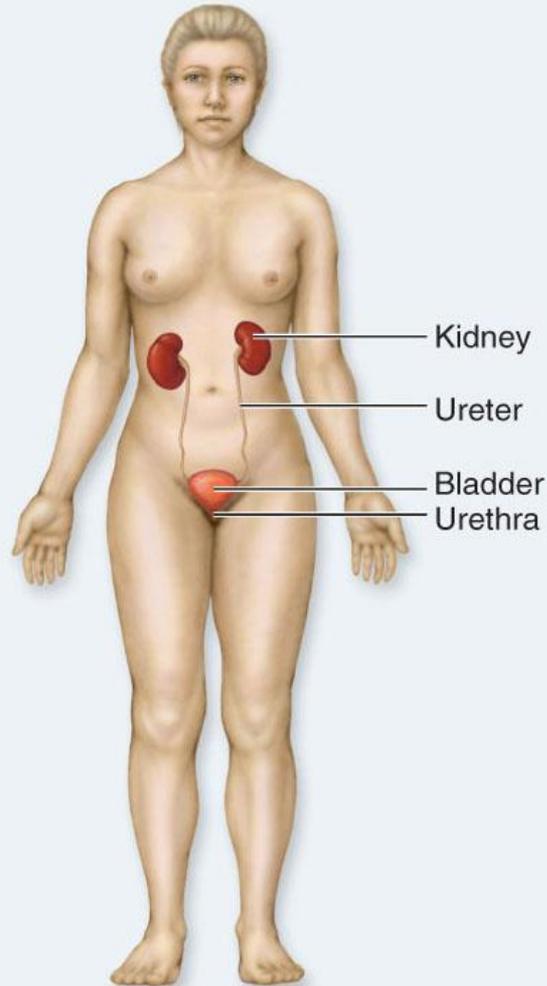
Trachea – the “windpipe”, or what connects your pharynx to your lungs

Lungs- Supplies oxygen to the blood and remove CO₂ from blood.

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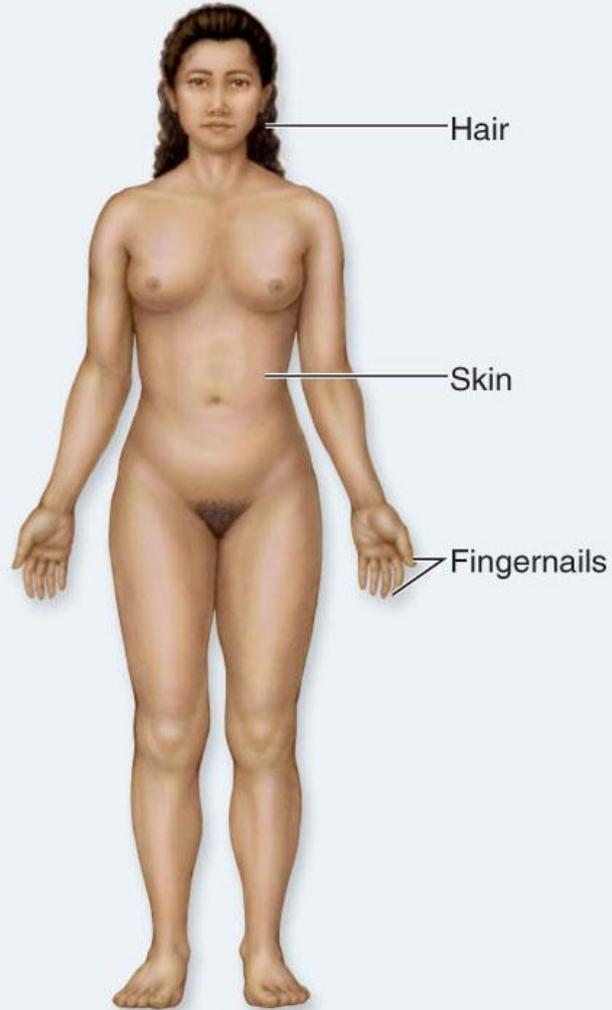
Urinary System



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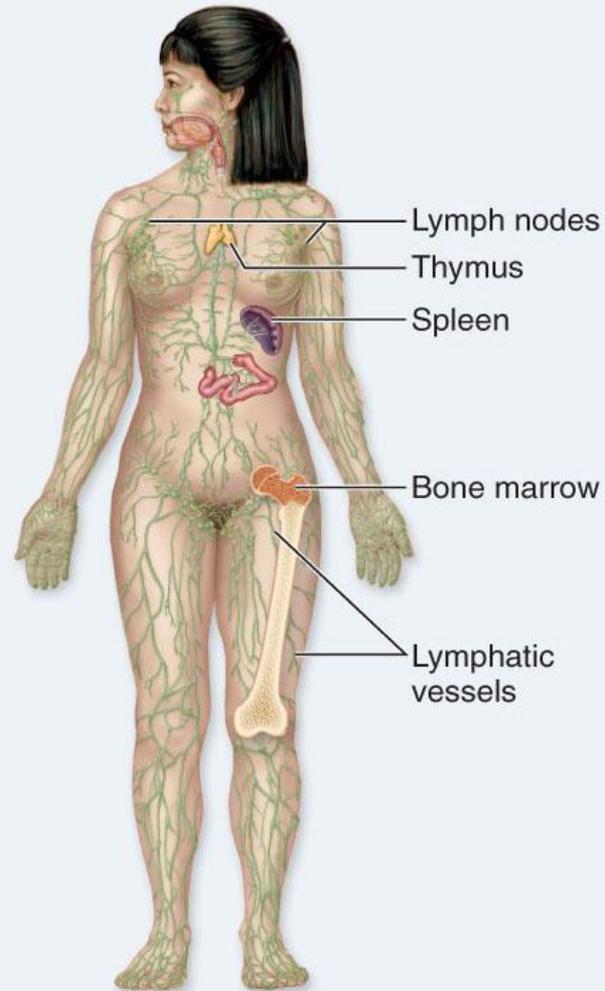
Integumentary System



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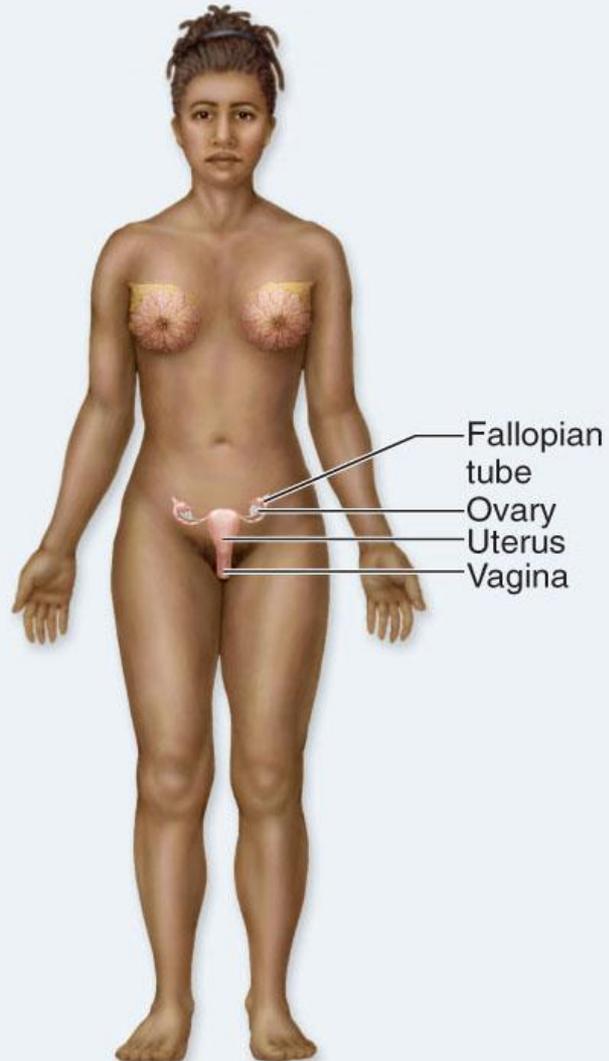
Lymphatic/Immune System



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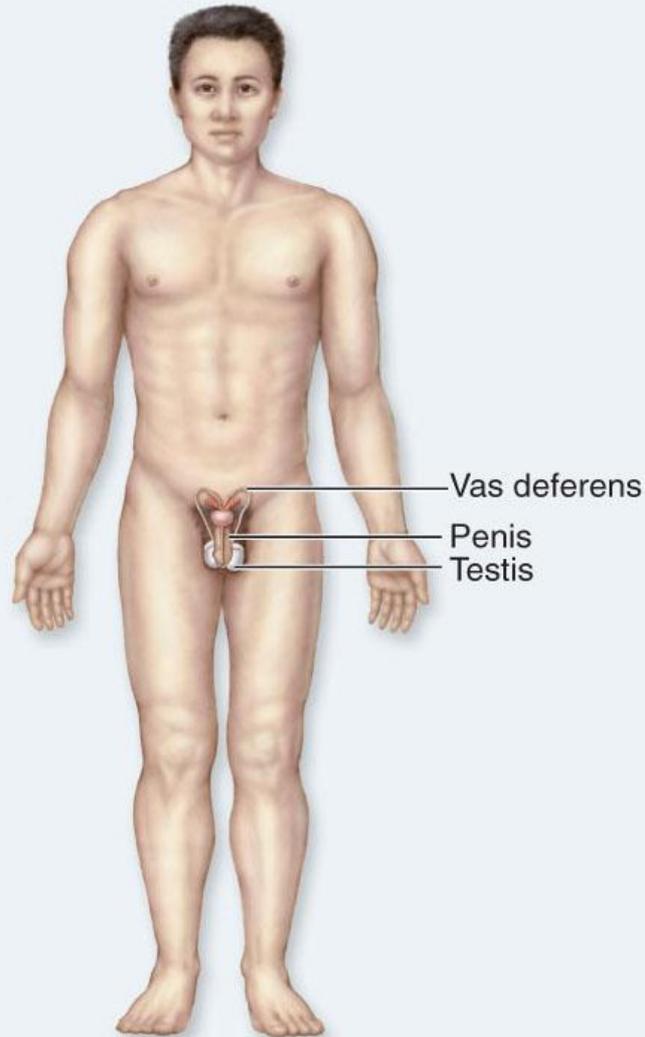
Reproductive System (female)



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Reproductive System (male)



Homeostasis

As animals have evolved, specialization of body structures has increased

For cells to function efficiently and interact properly, internal body conditions must be relatively constant

-The dynamic constancy of the internal environment is called **homeostasis**

-It is essential for life

Homeostasis

Humans have set points for body temperature, blood glucose concentrations, electrolyte (ion) concentration, tendon tension, etc.

We are **endothermic**: can maintain a relatively constant body temperature (37°C or 98.6°F)

-Changes in body temperature are detected by the **hypothalamus** in the brain

Integumentary System

Term used to denote the

- SKIN

and its accessory structures

- Nails
- Hair
- Skin glands

Functions of the Integumentary System

- Protection
- Sensation
- Permits movement and growth
- Endocrine - Vitamin D production
- Excretion - Regulation of sweat
- Immunity - First line of defense
- Temperature regulation

Interconnections between the Integumentary and the other 10 Body Systems



Page 196

The skin provides protection, contains sensory organs, and helps control body temperature

Skeletal System



Vitamin D activated by the skin helps provide calcium for bone matrix.

Lymphatic System



The skin, acting as a barrier, provides an important first line of defense for the immune system.

Muscular System



Involuntary muscle contractions (shivering) work with the skin to control body temperature. Muscles act on facial skin to create expressions.

Digestive System



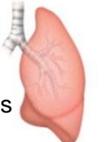
Excess calories may be stored as subcutaneous fat. Vitamin D activated by the skin stimulates dietary calcium absorption.

Nervous System



Sensory receptors provide information about the outside world to the nervous system. Nerves control the activity of sweat glands.

Respiratory System



Stimulation of skin receptors may alter respiratory rate.

Endocrine System



Hormones help to increase skin blood flow during exercise. Other hormones stimulate either the synthesis or the decomposition of subcutaneous fat.

Urinary System



The kidneys help compensate for water and electrolytes lost in sweat.

Cardiovascular System



Skin blood vessels play a role in regulating body temperature.

Reproductive System



Sensory receptors play an important role in sexual activity and in the suckling reflex.

Skin

- Thin, relatively flat organ
- Classified as a membrane - the cutaneous membrane
- Two main layers
 - Epidermis - outer, thinner
 - Dermis - inner, thicker
- The two layers are separated by a basement membrane

- The skin covers the entire body and provides protection against injuries, infection, and toxic compounds.
- The system contains many nerve endings that act as RECEPTORS for pain, temperature, touch, and pressure.

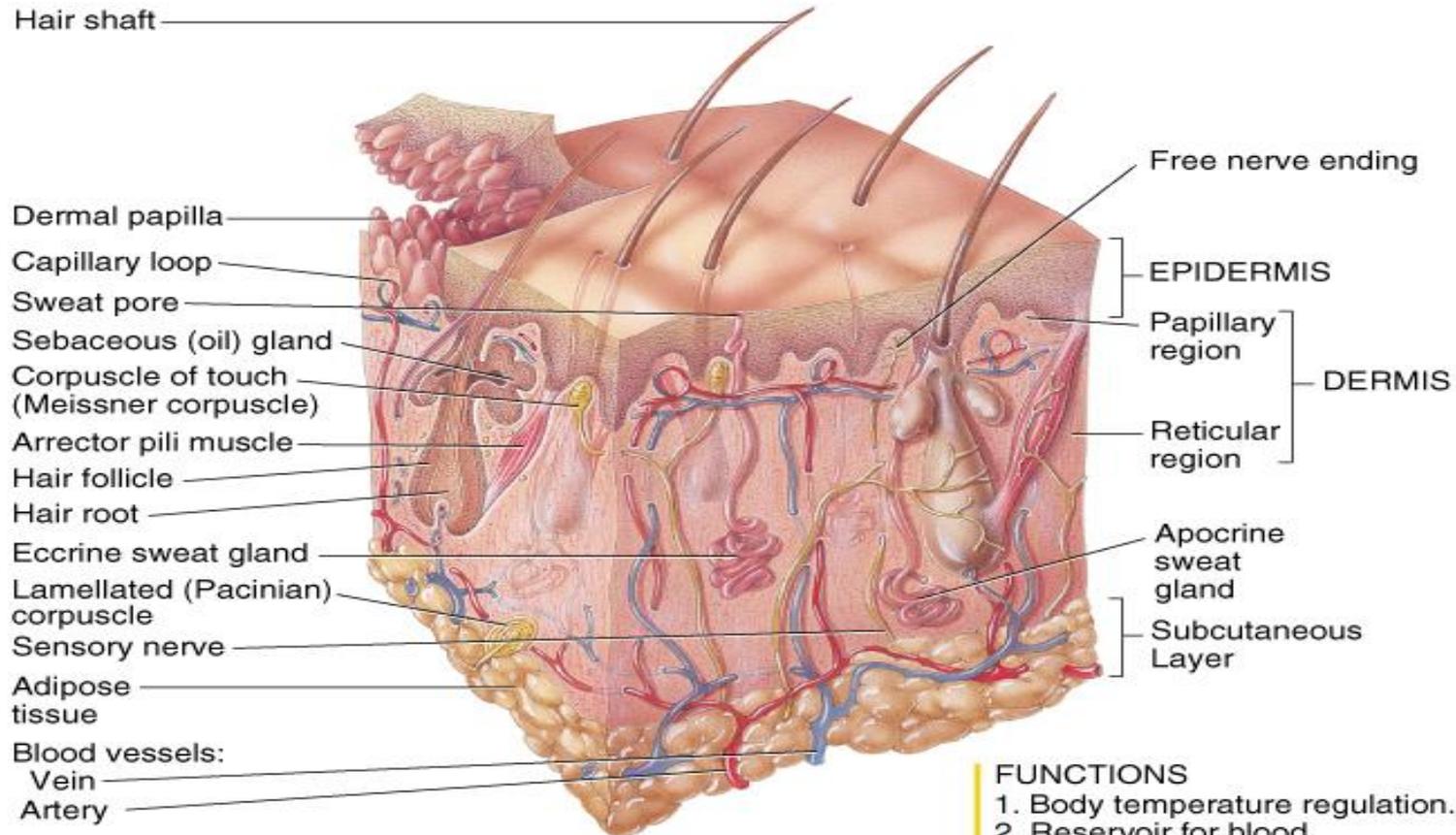
Anatomy of the Skin

- Upper layer of skin is called EPIDERMIS
EPI- means on top of
DERMIS means skin
- The lower layer of skin is called the DERMIS.

INTRODUCTION

- Skin is the outer covering of the body.
- Skin and its appendages constitute the integumentary system.
- Largest organ of the body.
- Constitutes 16% of the body weight.

INTEGUMENTARY SYSTEM



FUNCTIONS

1. Body temperature regulation.
2. Reservoir for blood.
3. Protection from external
4. Cutaneous sensations.
5. Excretion and absorption.
6. Vitamin D synthesis.

Some Facts about Skin

- Surface area: 1.5-2.0 sq meters
- Thickness: 0.5-3.0 mm
- Growth rate of nail: 0.1mm per day
- Growth rate of hair: 1.5-2.2 mm per week
- Life span of hair:
 - Eyelashes, axilla- 4 months
 - Scalp – 4 years

FUNCTIONS OF SKIN

- Protective shield for the body
- Barrier to water
- Thermoregulation
- Important sense organ (pain, touch, temperature & pressure)
- Absorption of ultraviolet radiation from sun for the production of vitamin D

The Epidermis

- Is multilayered.
- Contains is superficial layer of dead skin cells called STRATUM CORNEUM.
- The stratum corneum is composed of cells called KERATIN.
- Is AVASCULAR (no blood vessels)
- Has no nerve tissue (can't feel pain)

The Dermis

- Has two distinct layers:
 1. Papillary Layer (more superficial)
 2. Reticular Layer (deeper)
- Accessory organs begin the dermis.
- Some of the accessory organs end or cross into the epidermis.
- The dermis contains blood vessels and nerve tissue.

Subcutaneous Fat and Superficial Fascia

- The SubQ fat is found deep to the dermis.
- It contains the larger blood vessels of the skin.
- It is composed of adipose (fat) tissue, a form of connective tissue.
- Deep to the subQ layer is the fascial layer that covers the muscles beneath.

LAYERS OF THE SKIN

Epidermis:

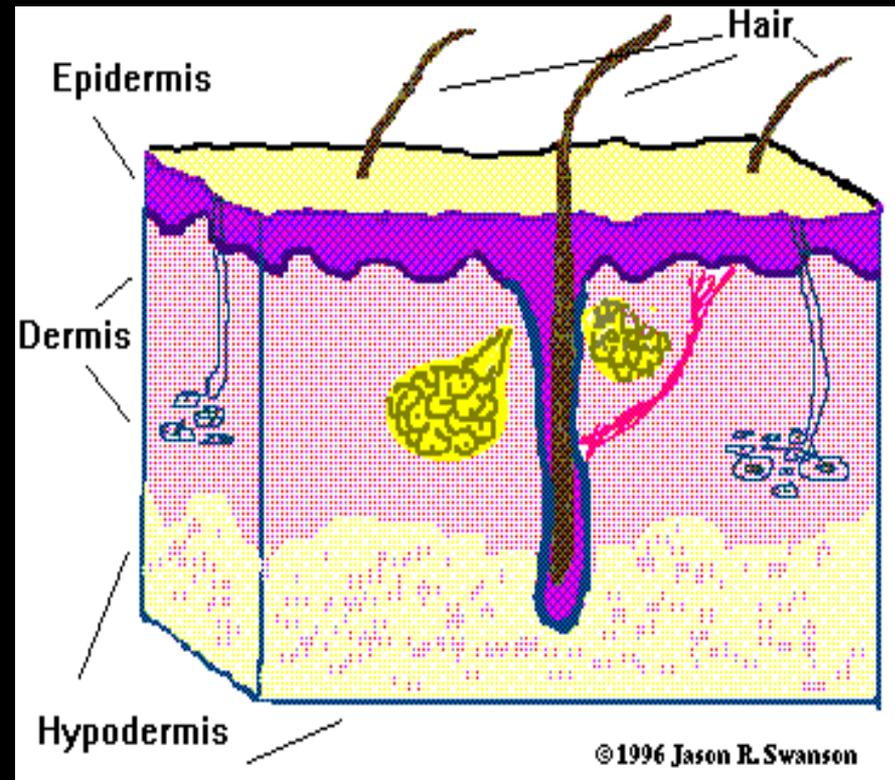
- Composed of keratinized stratified squamous epithelium.

Dermis:

- Papillary region composed of loose connective tissue.
- Reticular region composed of dense irregular connective tissue.

Hypodermis:

- Composed of areolar tissue with abundant adipocytes.



Epidermis

- Composed entirely of stratified squamous epithelium
- Lacks blood vessels
- Composed of four, or in the palm and sole, five distinct layers
- The outermost layer of cells harden and die in a process called keratinization

Epidermal Layers

dead

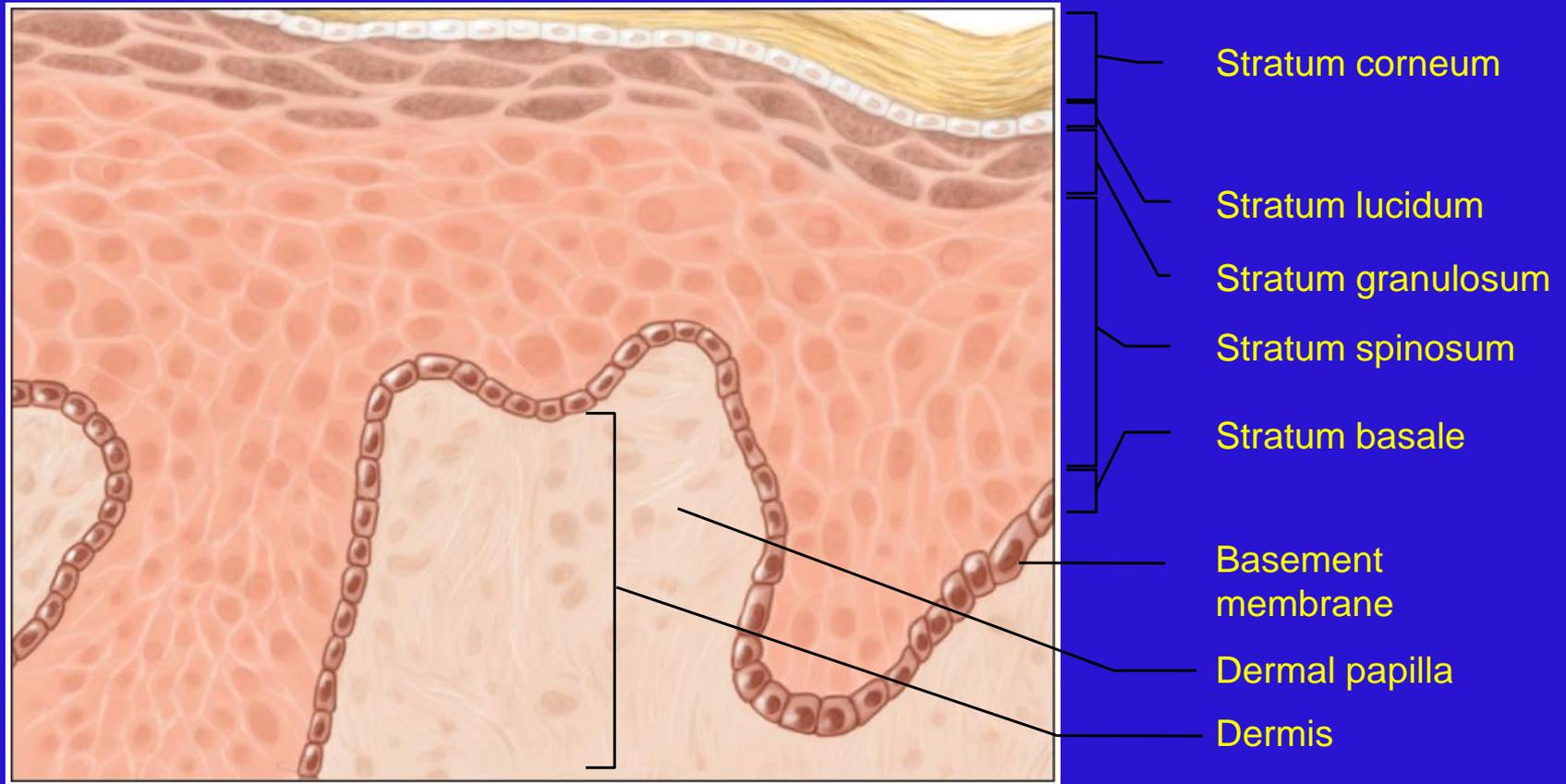


- **Stratum corneum**
 - outermost layer, composed of layers of dead, non-nucleated, keratinized cells
- **Stratum lucidum**
 - on soles and palms only, appears clear
- **Stratum granulosum**
 - 3 to 5 layers of flattened, granular cells
- **Stratum spinosum**
 - many layers of nucleated cells, becoming flattened, developing keratin fibers
- **Stratum basale**
 - deepest layer, single layer of cuboidal or columnar cells that are growing and dividing

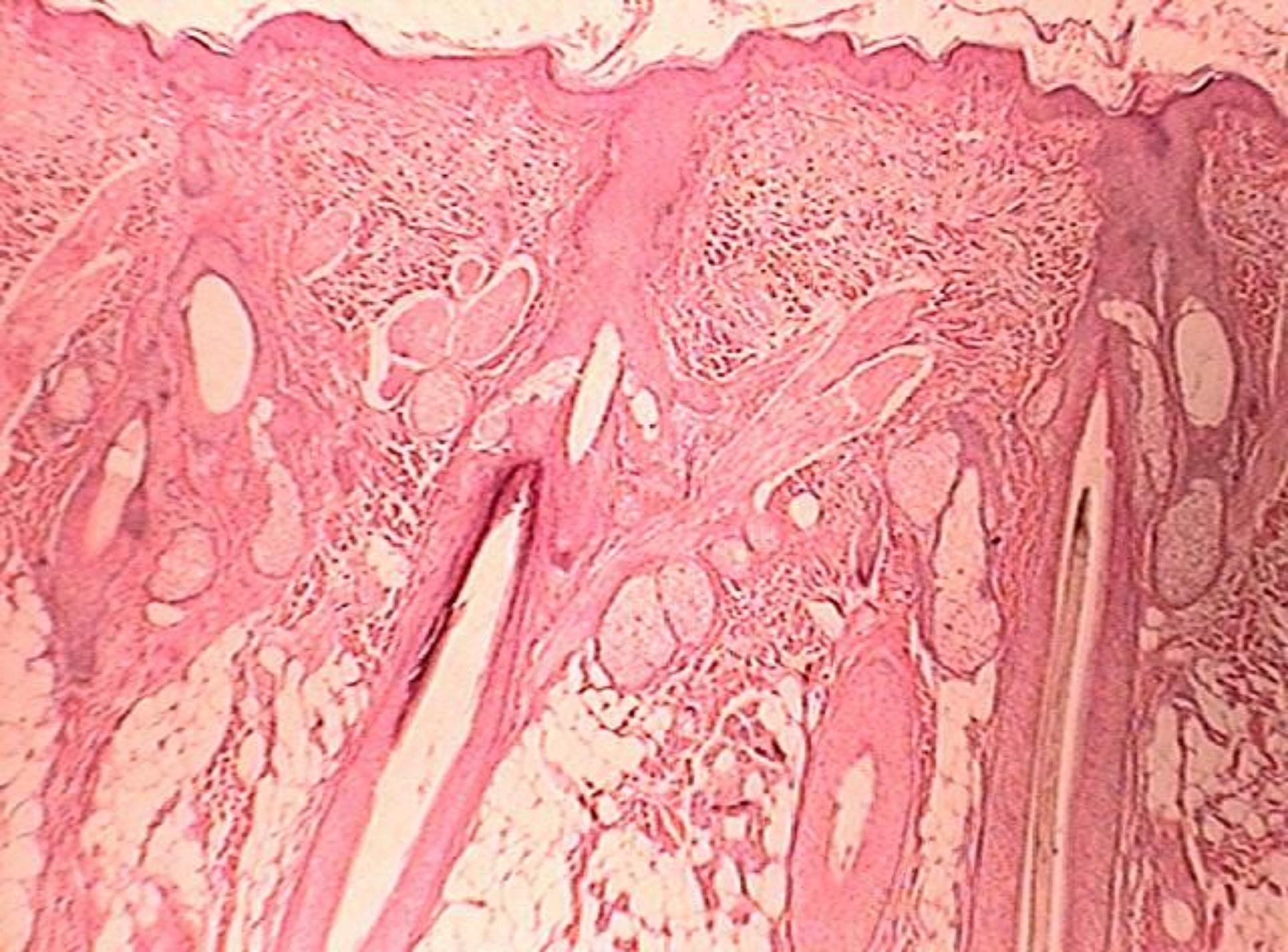
alive

Fig. 6.3a

Epidermal Layers



(a)



LAYERS OF THE EPIDERMIS

Stratum Basale (Germinal/ Malpighian layer):

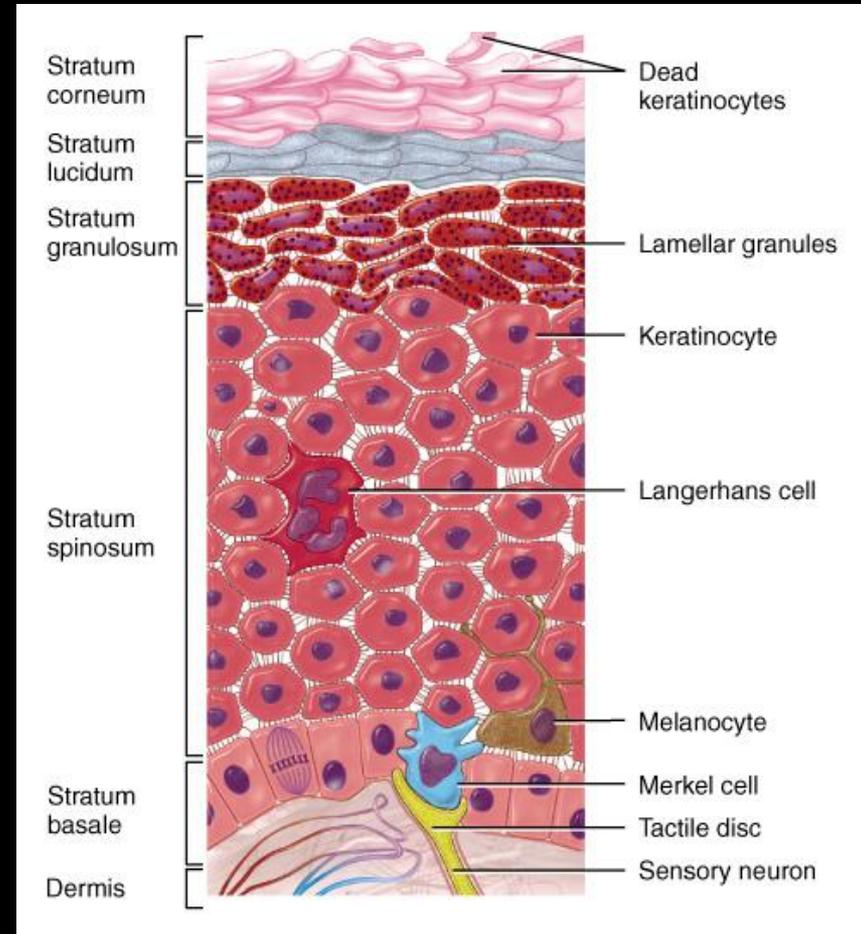
- Single layer of cuboidal cells resting on basement membrane.
- High mitotic activity.

Stratum Spinosum:

- Several layers of polygonal cells.
- Cells are held together by desmosomes.

Stratum Granulosum:

- 3-5 layers of flattened polygonal cells.
- Cells contain keratohyaline granules.



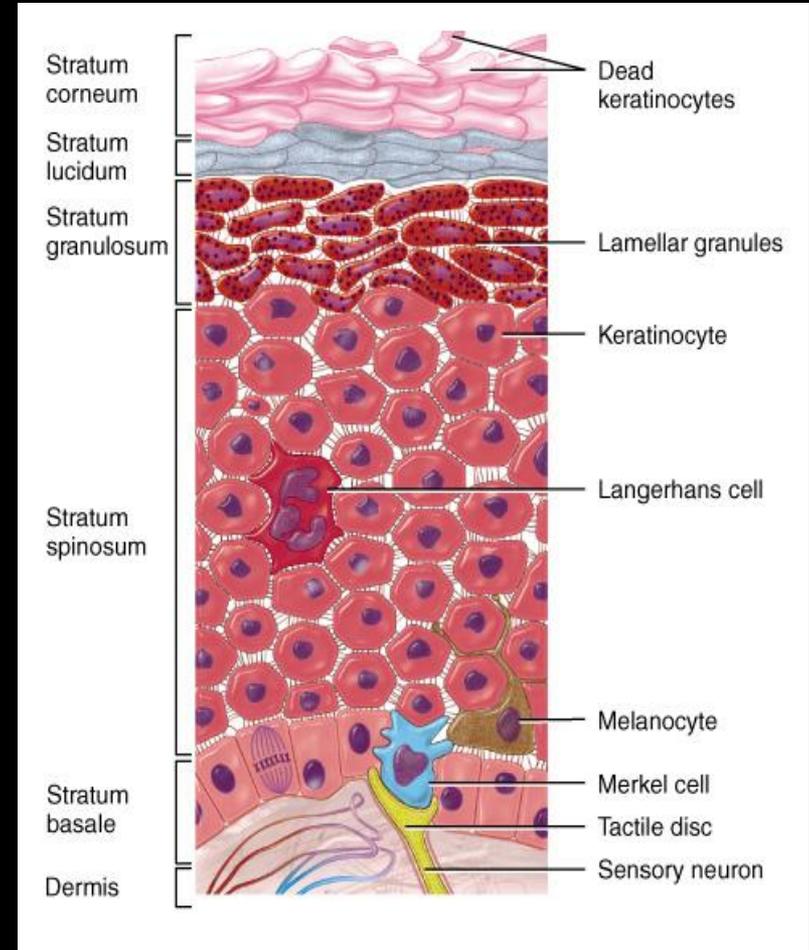
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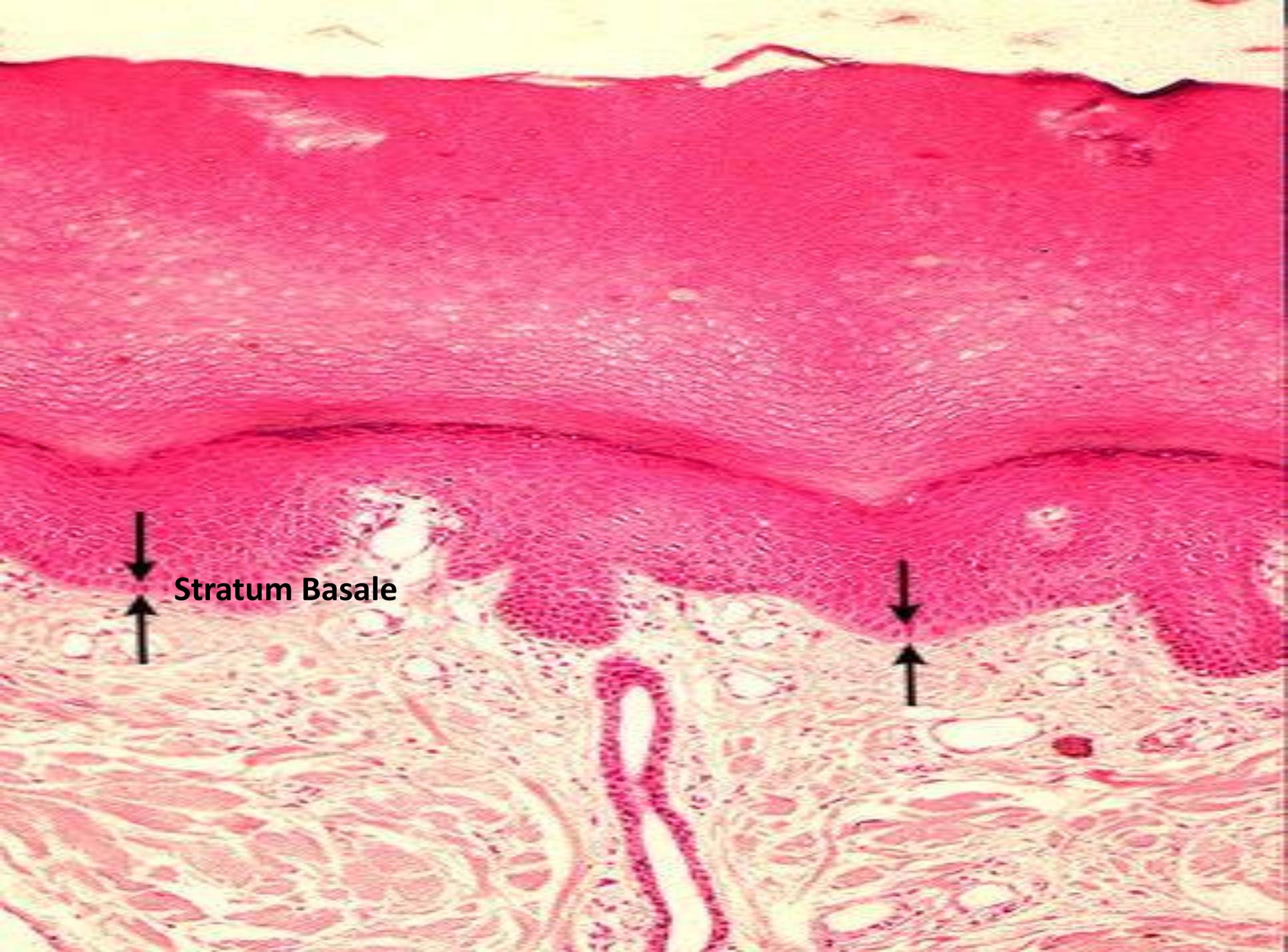
Stratum Lucidum:

- Seen only in non-hairy or thick skin.
- Cells are flattened, translucent, eosinophilic with indistinct boundaries & nucleus.
- Contains a product of keratohyaline i.e. eleidin.

Stratum Corneum:

- Composed of structureless dehydrated dead cells.
- Flattened & scale-like.
- Filled with keratin.
- Superficial layer is continuously sloughed off.





Stratum Basale



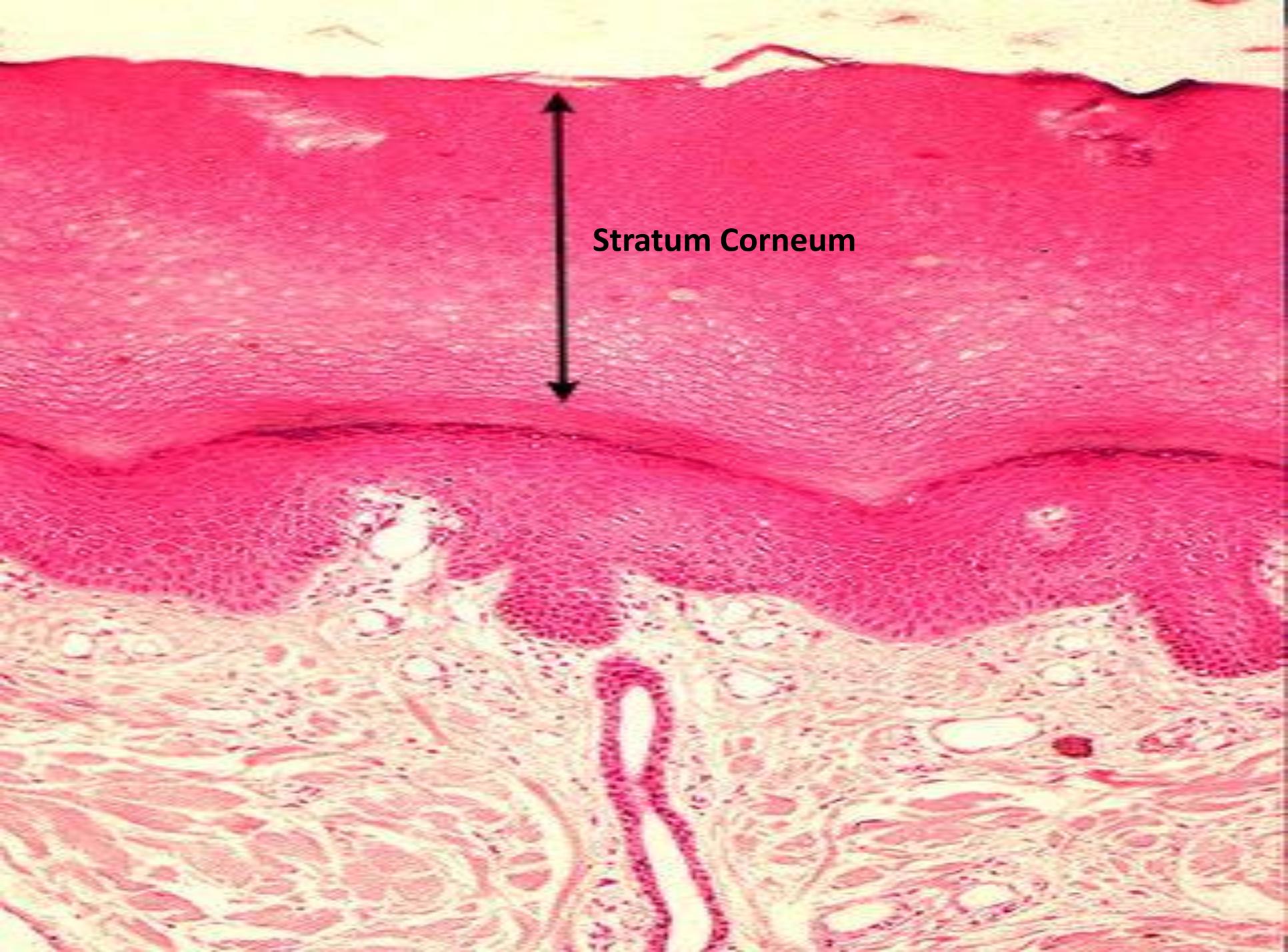
Stratum Spinosum



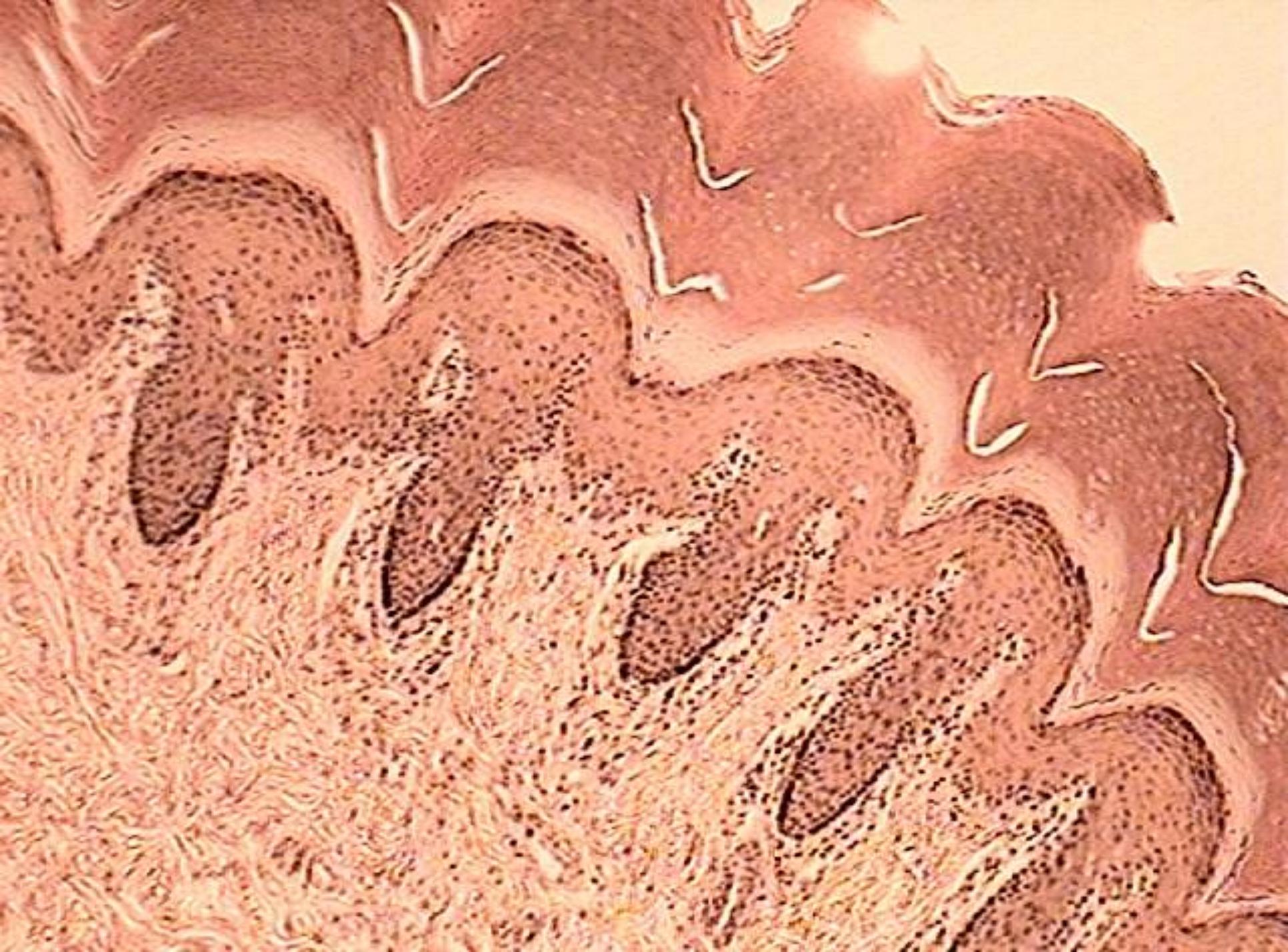
Stratum Granulosum



Stratum Lucidum



Stratum Corneum



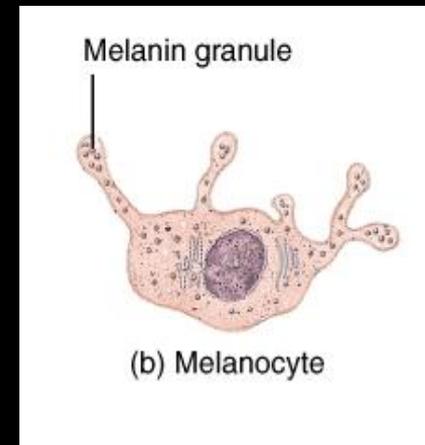
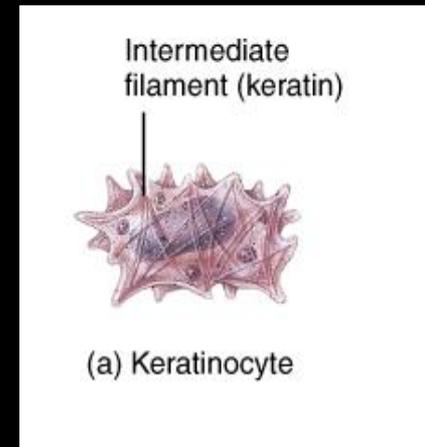
SPECIALIZED CELLS OF THE EPIDERMIS

Keratinocytes:

- Most common cells of the epidermis.
- Provides protection and waterproofing sealant.

Melanocytes:

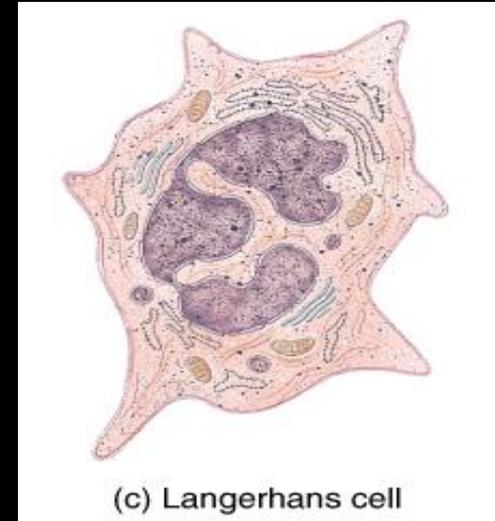
- Rounded cells with dendrite-like branches.
- Present in Stratum basale.
- Produces melanin pigment responsible for the colour of skin.
- Melanin is a brown/black pigment that absorbs UV-light.



SPECIALIZED CELLS OF THE EPIDERMIS

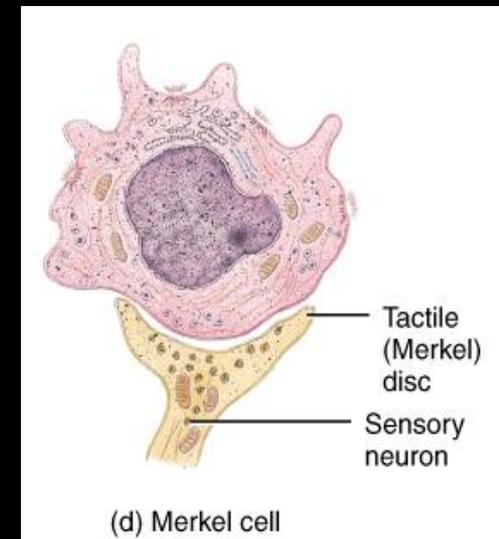
Langerhans Cells (antigen presenting cells):

- Non-pigmented granular dendrocytes.
- Present in Stratum spinosum.
- Nucleus is indented at many places & cytoplasm contains rod-shaped granules.
- They participate in immune responses against bacteria and viruses.



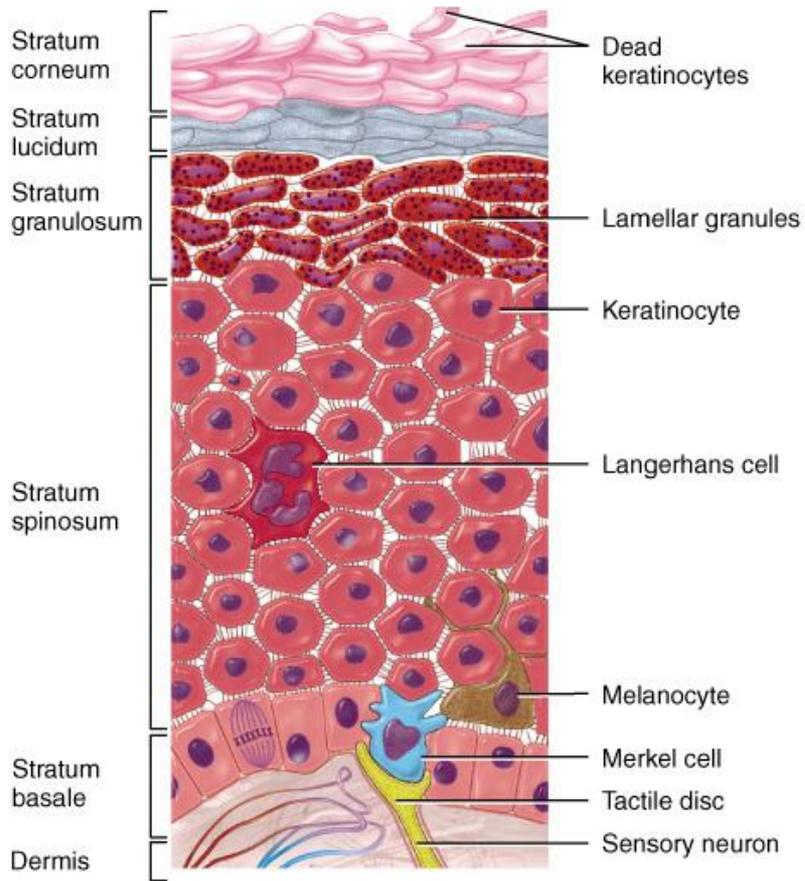
Merkel Cells:

- Found in Stratum basale.
- Sensory cells innervated by sensory nerves.
- Abundant in fingertips, oral mucosa & hair follicles.
- Function as mechanoreceptors.



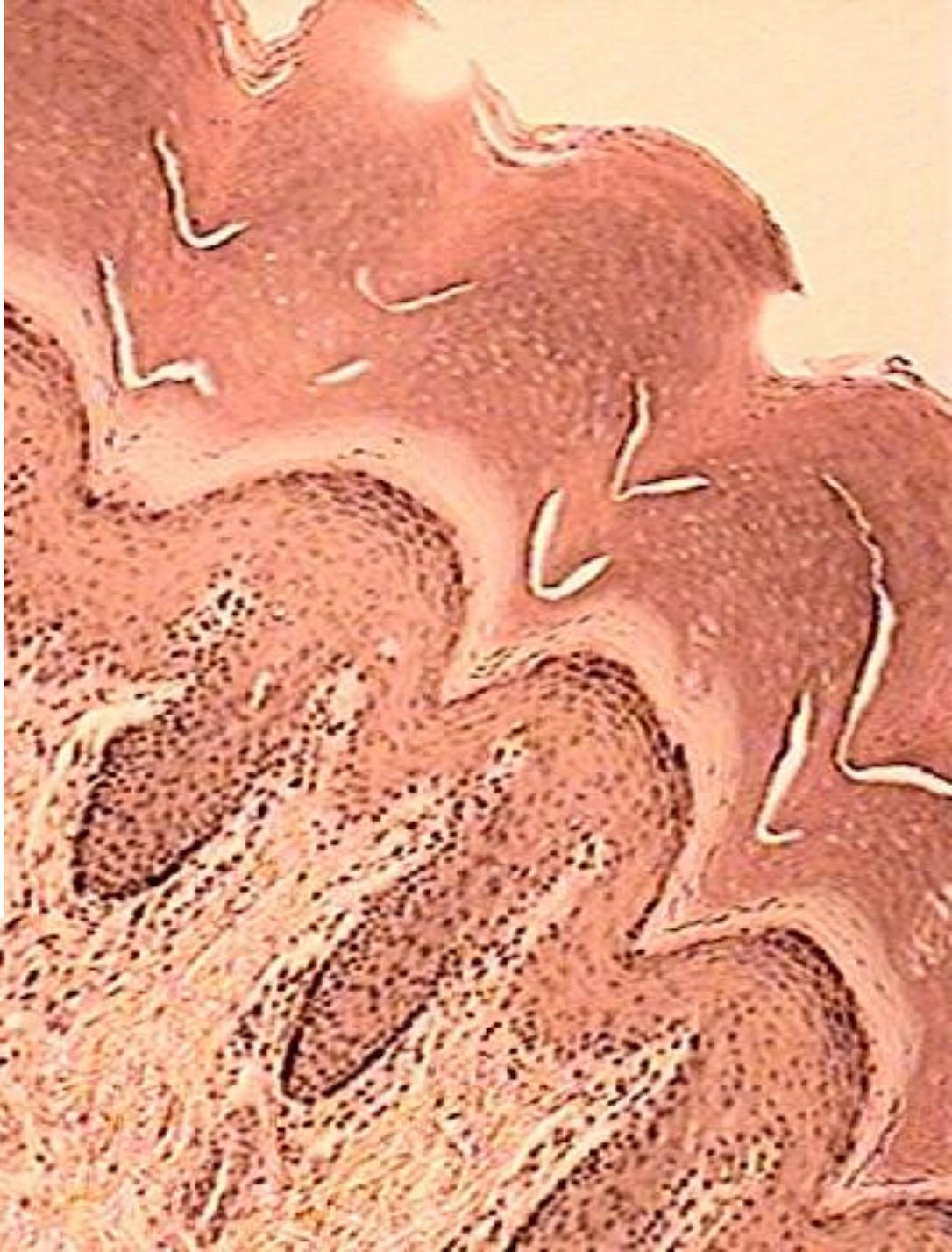
GENERAL TYPES OF SENSATION

- **Pain:** neurons free endings
- **Pressure:** bodies of Meissner
- **Cold:** final endings of Krause
- **Hot:** bodies of Ruffini
- **Pleasure..????**



(a) Four principal cell types in epidermis

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PIGMENTATION OF SKIN

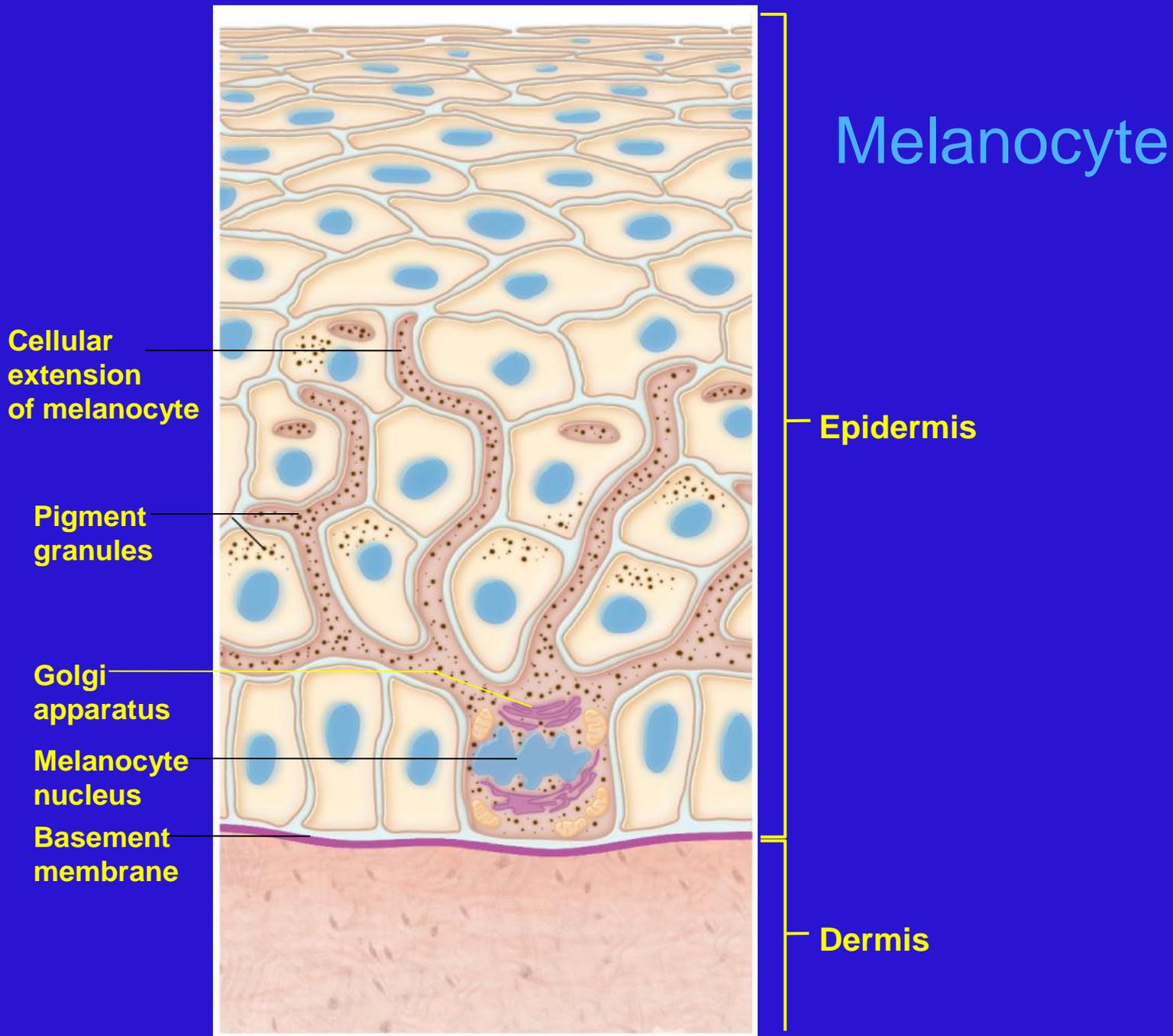
The colour of skin depends upon following factors:

- **Carotene:** yellow-orange pigment (precursor of vitamin A) found in stratum corneum & dermis.
 - **Melanin:** produced in epidermis by melanocytes gives black colour to the skin.
 - **Hemoglobin** (in blood vessels of dermis): gives pink colour to the skin.

Melanocytes

- Specialized cells in the stratum basale of the epidermis with long processes that extend into the stratum spinosum
- Produce the dark pigment melanin which provides skin color
- Melanin production is stimulated by ultraviolet radiation

Fig. 6.4b



Melanocyte



Pigment granule

Nucleus

Cell membrane

10,600x

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Skin Cancers

Squamous cell carcinoma



(a)

Basal cell carcinoma

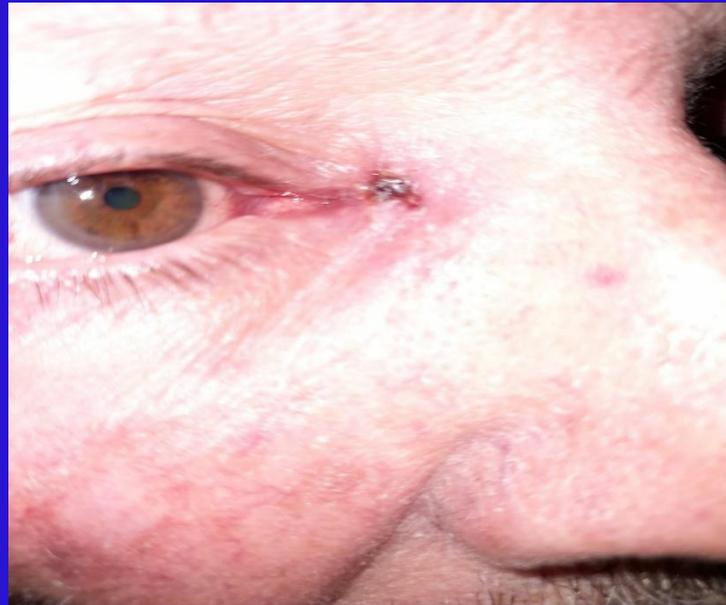
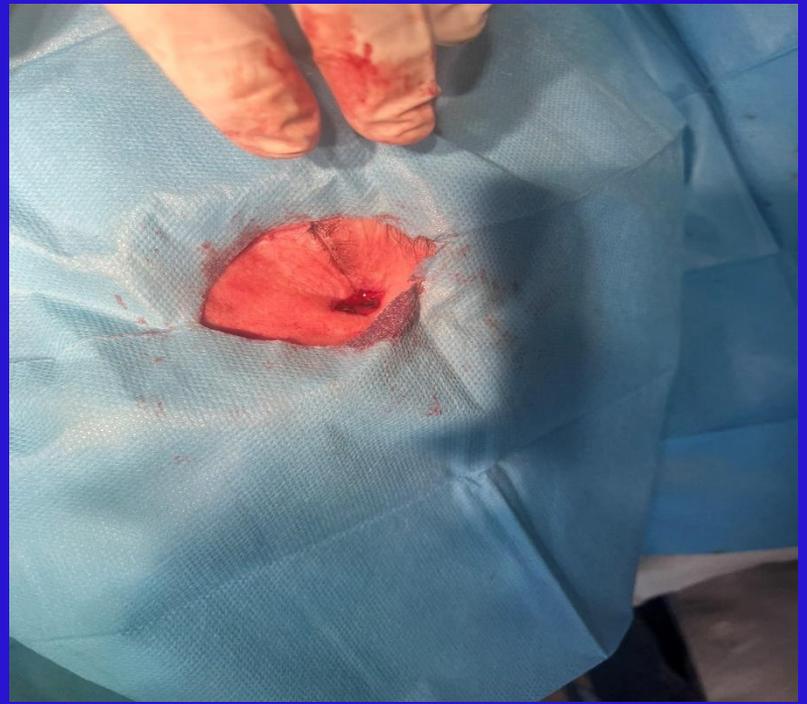


(b)

Malignant melanoma

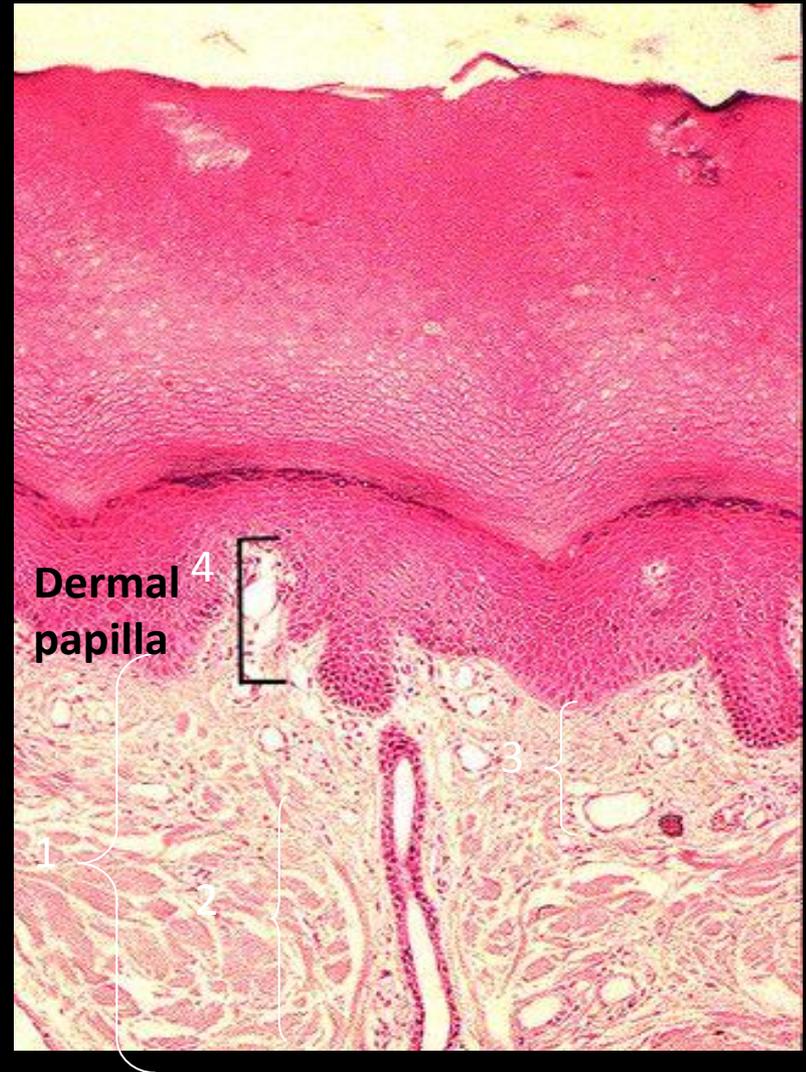


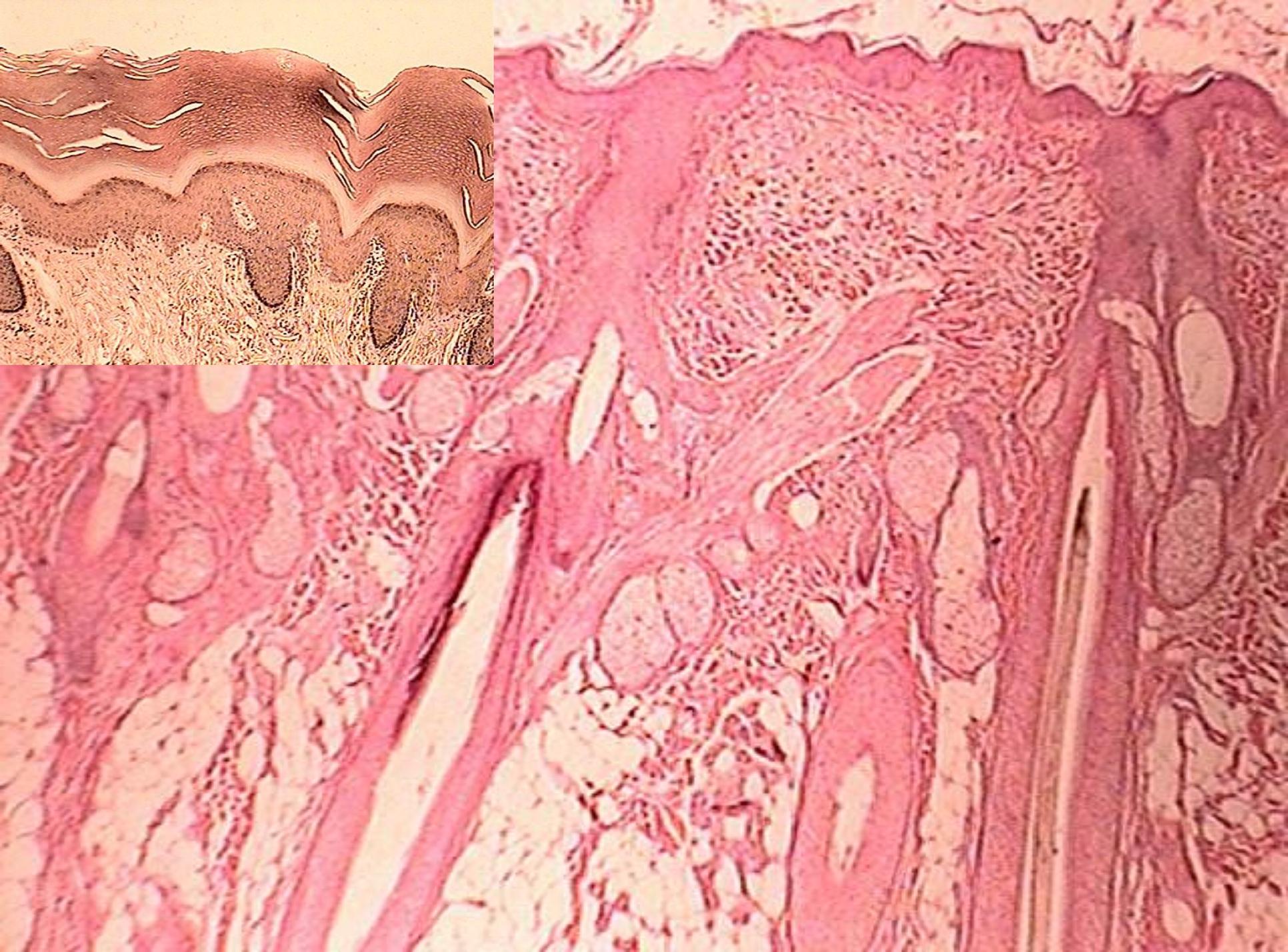
(c)



LAYERS OF THE DERMIS

- **Papillary layer:**
 - Narrow band of loose connective tissue.
 - In contact with basement membrane of stratum basale.
 - Dermal papillae** (finger- like processes)
- **Reticular layer:**
 - Dense irregular connective tissue.
 - Thick elastic fibres.





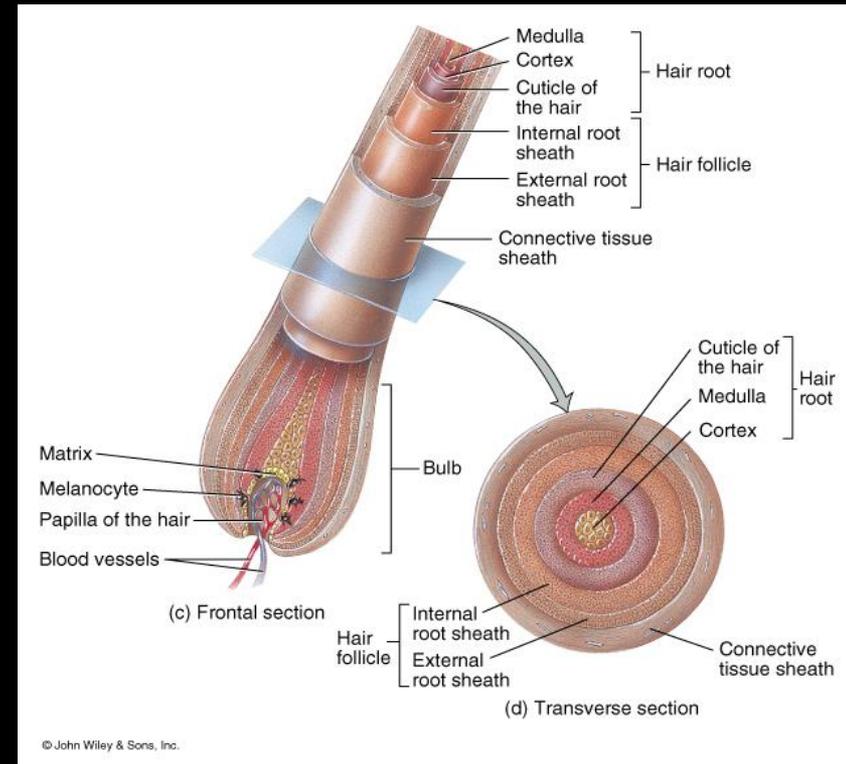
TYPES OF SKIN

	Thin Skin	Thick Skin
Layers of epidermis	St. corneum & spinosum are thin while lucidum is absent.	St. corneum & spinosum are thick while lucidum is present.
Thickness of epidermis	0.10-0.15 mm	0.6-4.5 mm
Epidermal ridges	Absent	Present (well developed dermal papillae)
Hair follicles, arrector pili muscle & sebaceous gland	Present	Absent
Sweat glands	Few	Many
Sensory receptors	Less	More
Distribution	Covers all parts of body except palms & soles	Present in palms, palmar surface of digits & soles

APPENDAGES OF THE SKIN

HAIRS:

- Keratinized filaments derived from invagination of the basal layer of epidermis into the dermis.
- **Parts-**
 - a) Root: enclosed by hair follicle.
 - b) Shaft: projects above the surface.
- **Hair follicle:** tubular invagination, partly epidermal and partly dermal in origin.



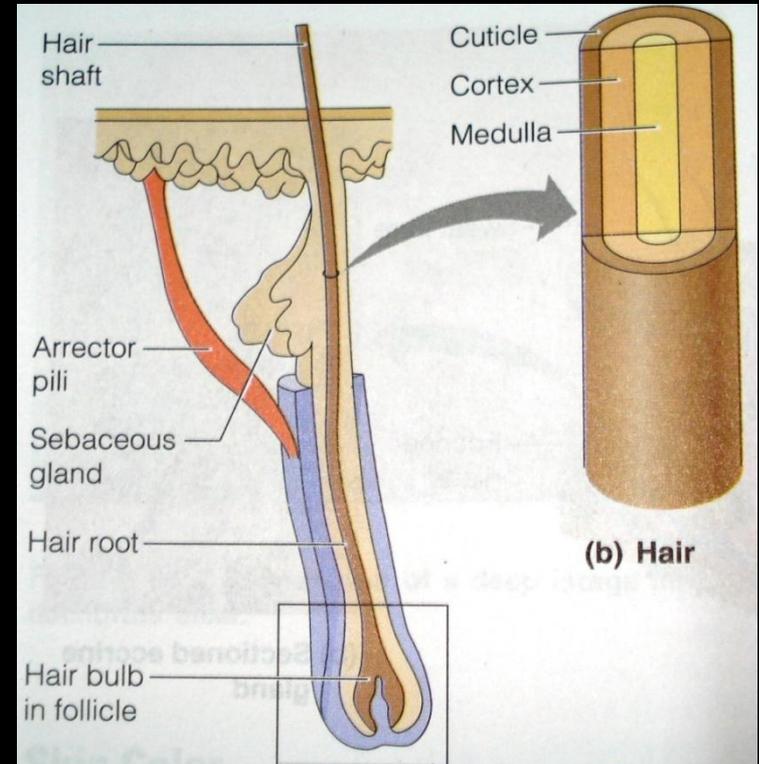
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Structure of shaft and root:

- **Medulla**
- **Cortex**
- **Cuticle**

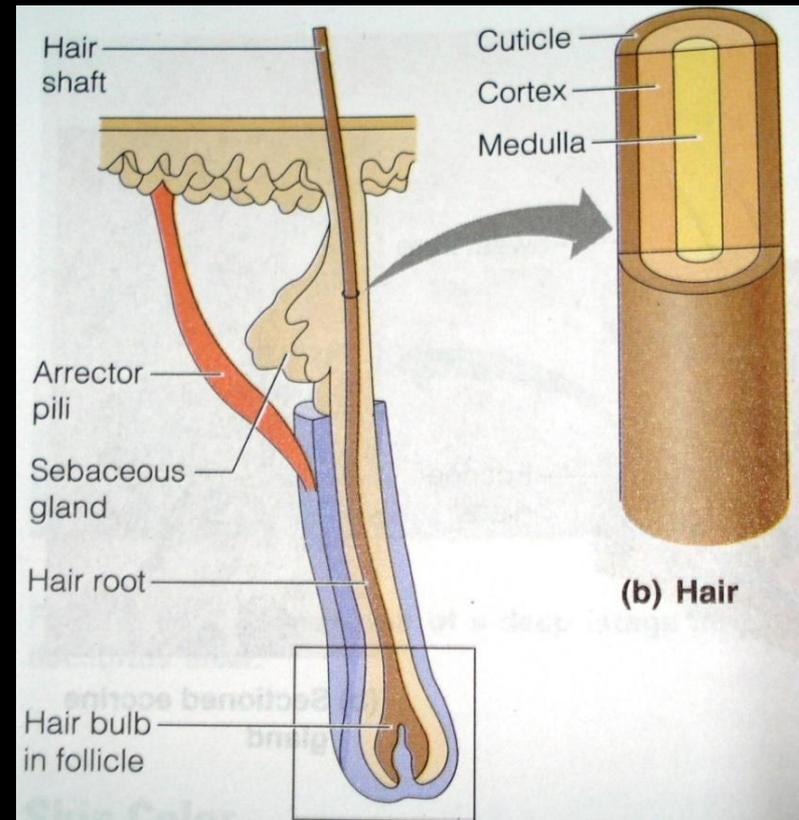
Hair follicle:

- Tubular invagination of epidermis & dermis in which hair root resides.
- Layers: 3 (inner root sheath, outer root sheath, connective tissue sheath).



contd.....

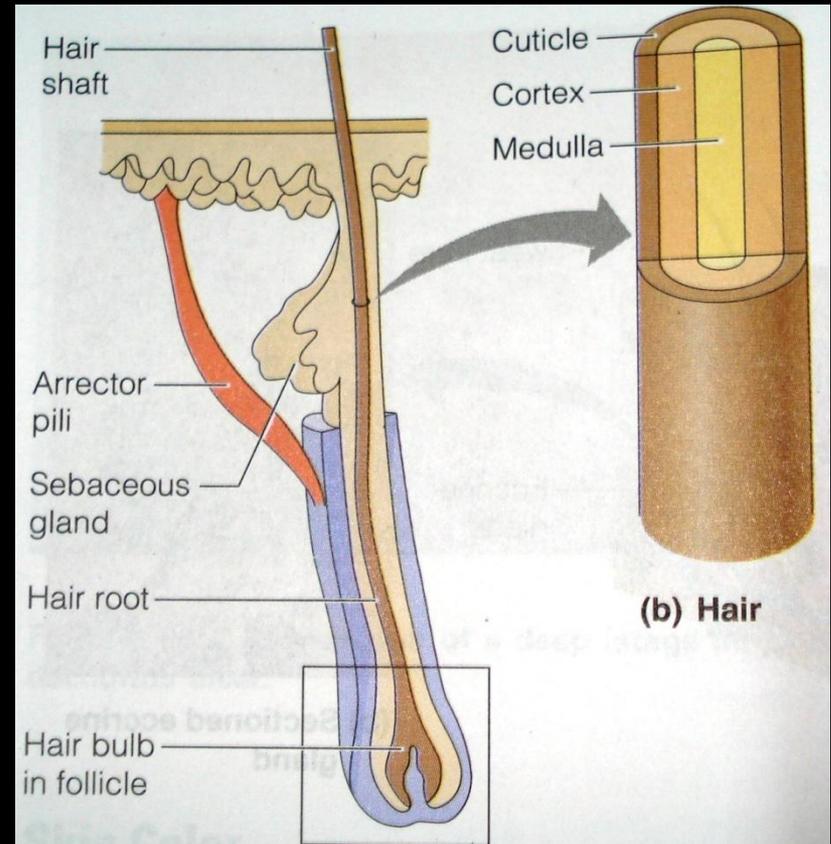
- **Hair bulb:** lower expanded end of hair follicle.
- **Hair papilla:** the indentation at the base of hair bulb by part of the dermis.



contd.....

Arrector Pili Muscle:

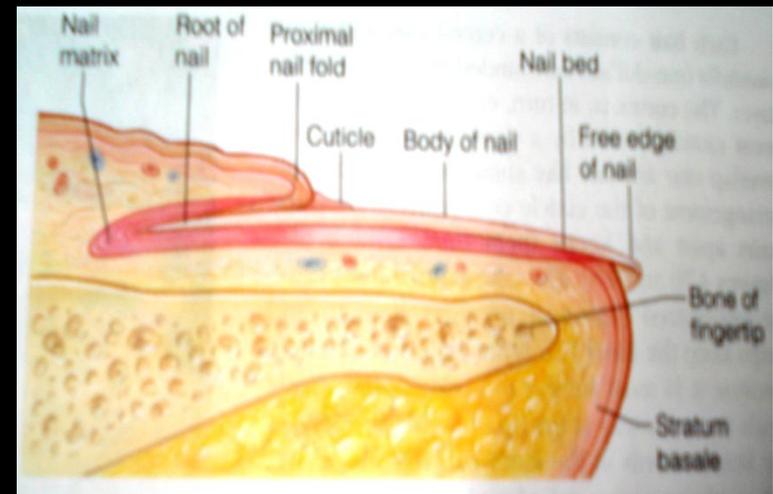
- Smooth muscle innervated by sympathetic nerves.
- Extends from papillary layer of dermis to the connective tissue sheath of a hair follicle.
- Contraction of muscle presses the sebaceous gland which squeezes out sebum.
- Formation of “goose flesh”.



APPENDAGES OF THE SKIN

NAILS:

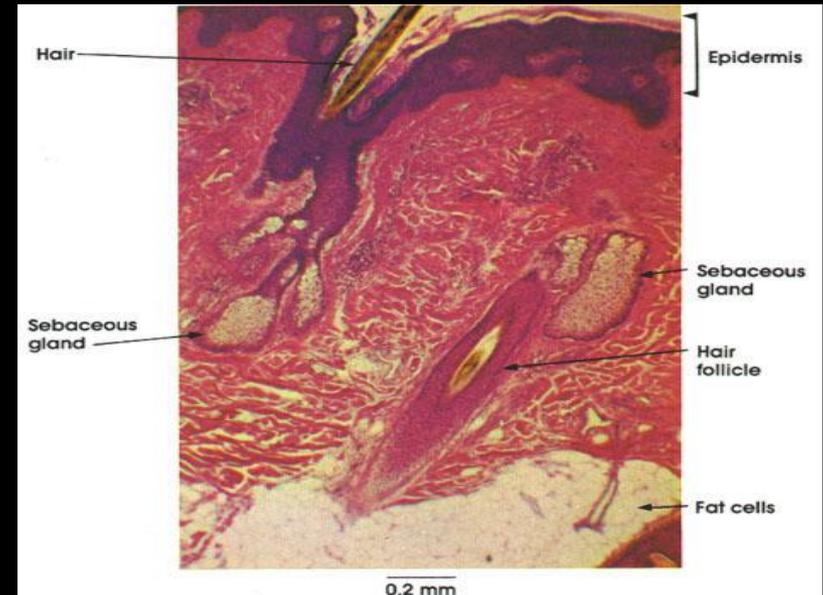
- Hardened keratin plates on the dorsal surface of the tips of fingers & toes.
- Parts:
 - a) Root
 - b) Free border
 - c) Body
- **Nail bed:** tissue on which the nail rests. Made up of stratum basale & spinosum.



APPENDAGES OF THE SKIN

SEBACEOUS GLANDS:

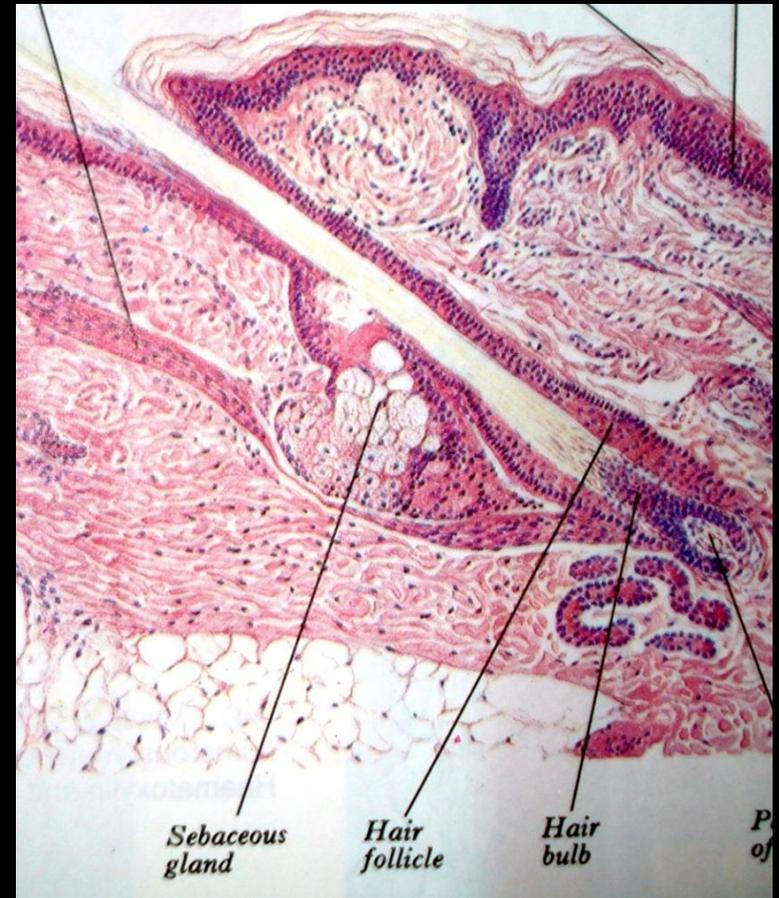
- Distributed all over the dermis of the skin, except for the palms & soles.
- Abundant in the scalp, face, around the apertures of the ear, nose, mouth & anus.

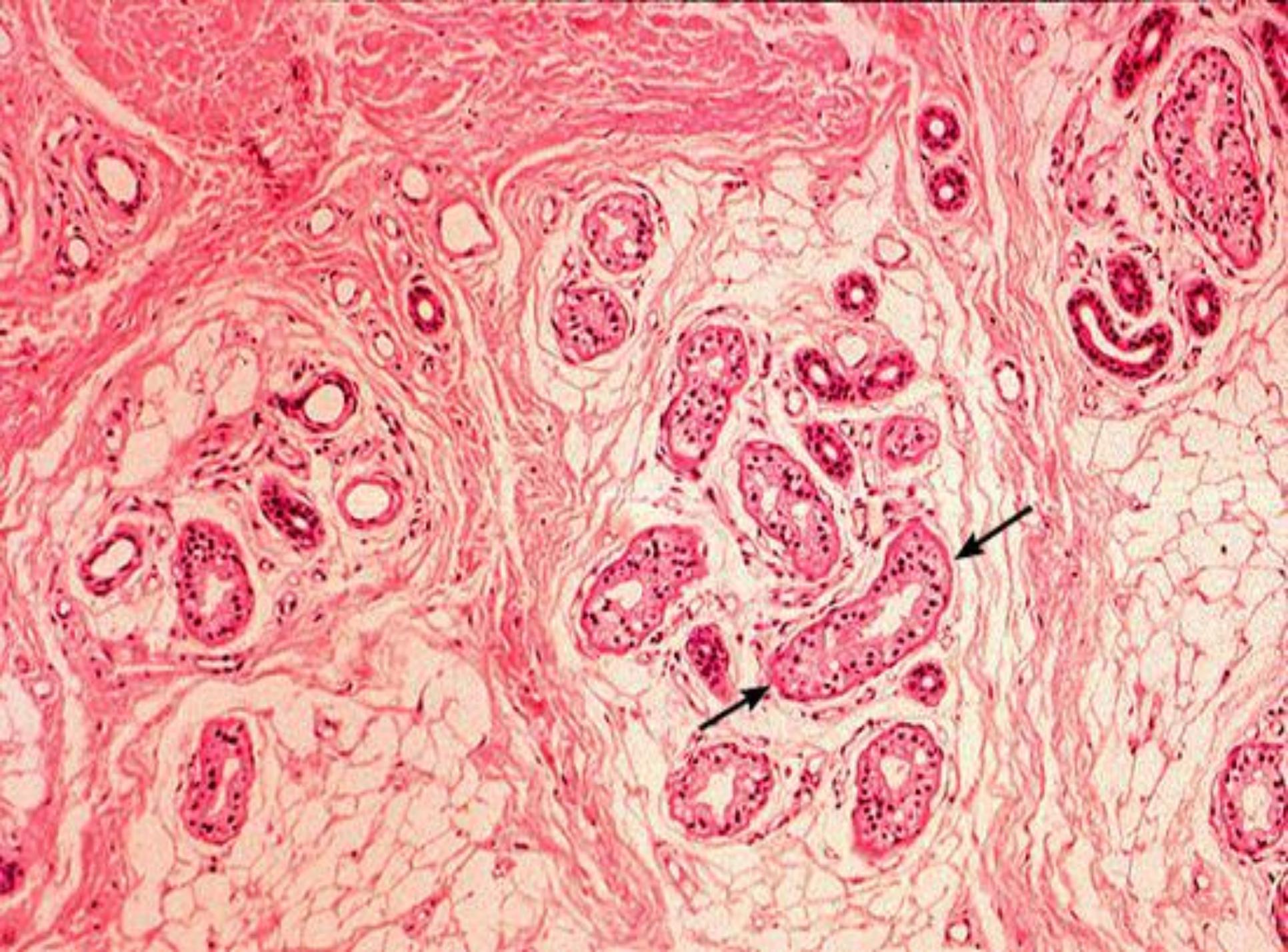


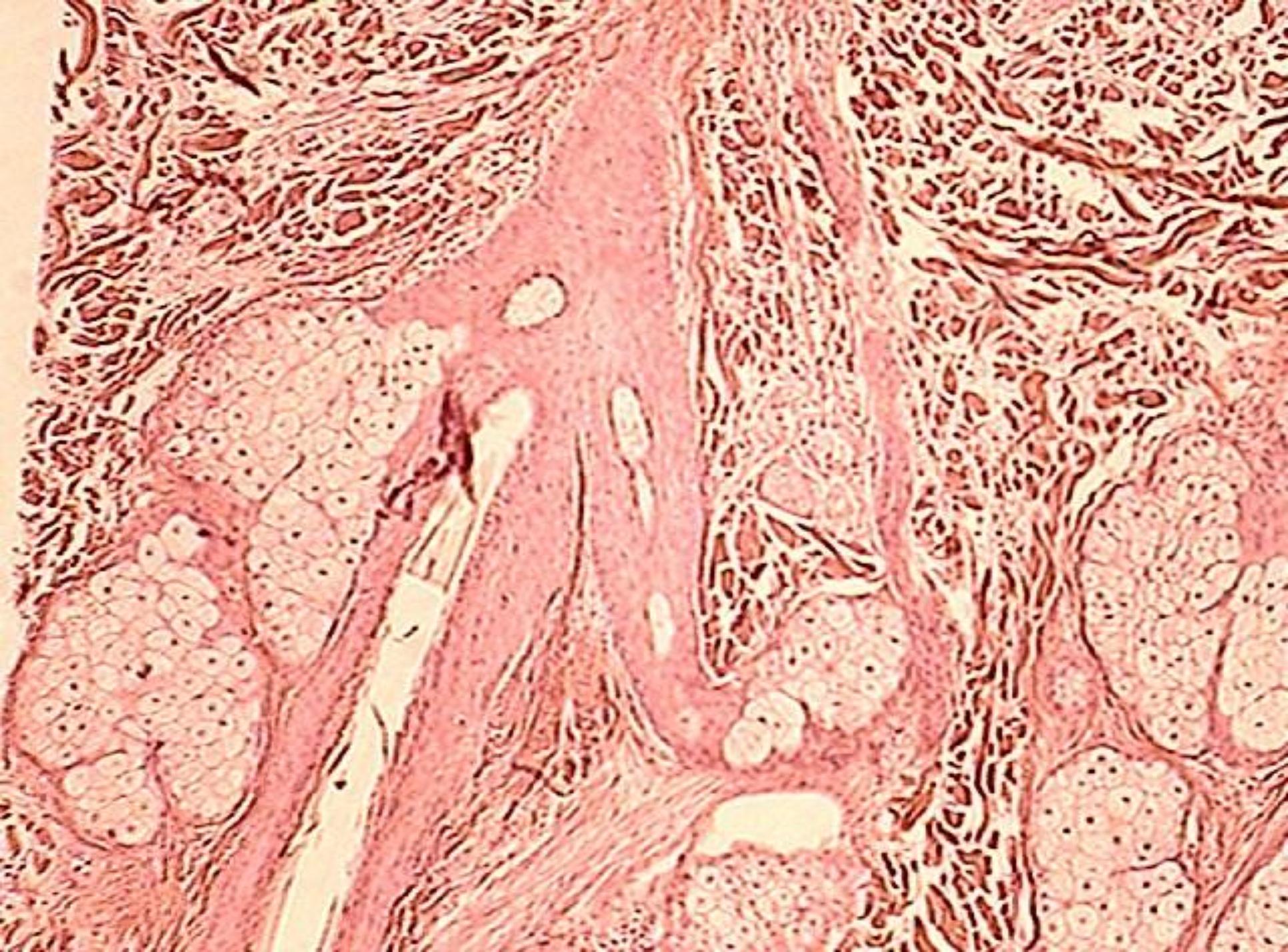
APPENDAGES OF THE SKIN

SEBACEOUS GLANDS:

- Holocrine in nature.
- Number of alveoli connected to broad duct that opens into hair follicle.
- Produces an oily secretion called sebum.







contd....

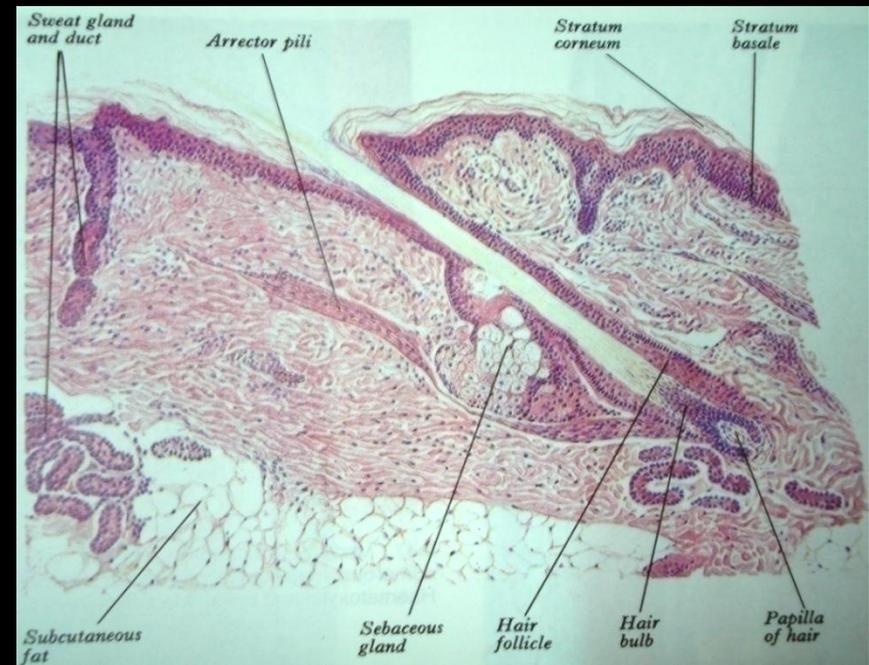
2 types:

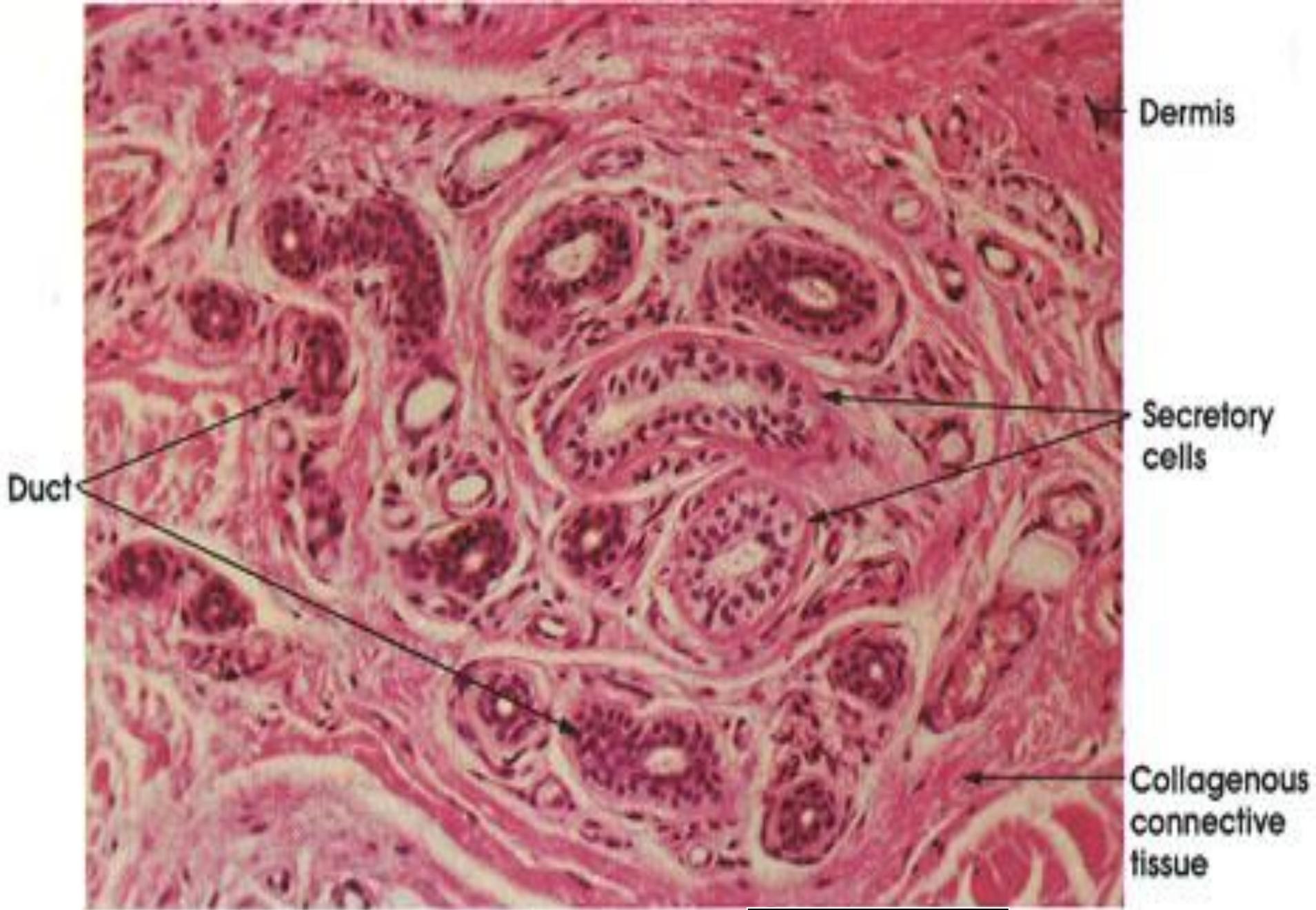
Eccrine:

- Most numerous in the soles & palms.
- Produces thin watery secretion.

Apocrine:

- Confined to axilla, eyelids (Moll's glands), nipple & areola of breast, perianal region, and the external genitalia.
- Produces thick odourous secretion.
- Ceruminous glands & lactating mammary glands are modified apocrine sweat glands.



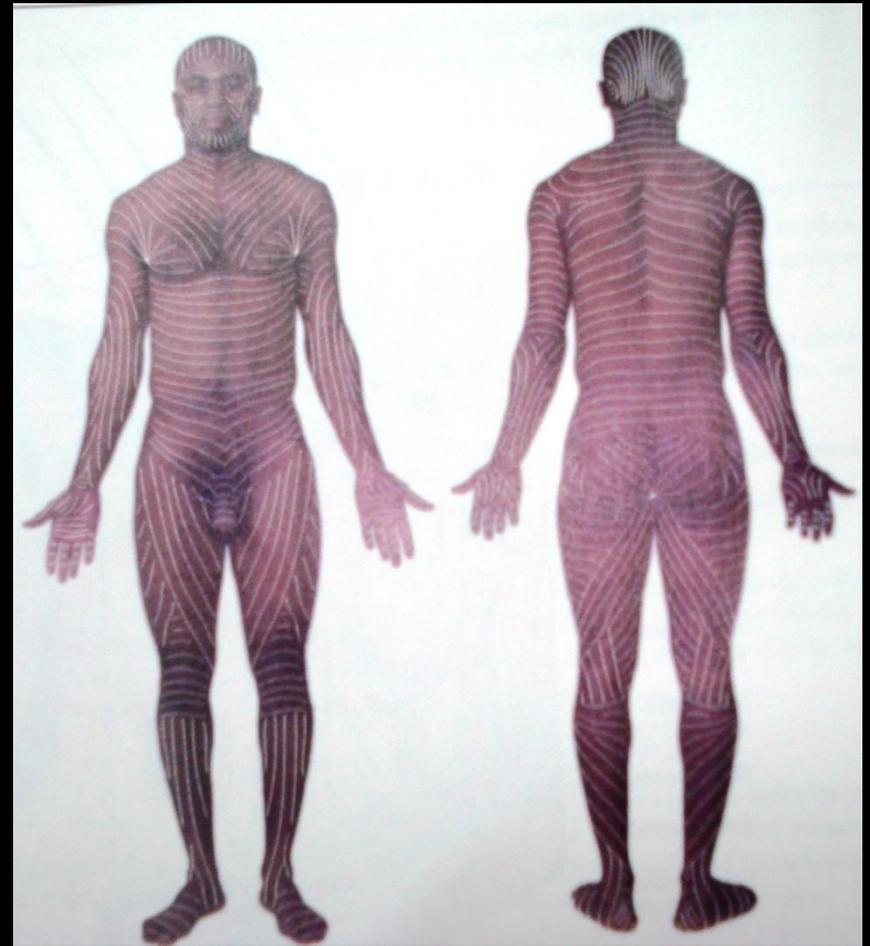


100 μm

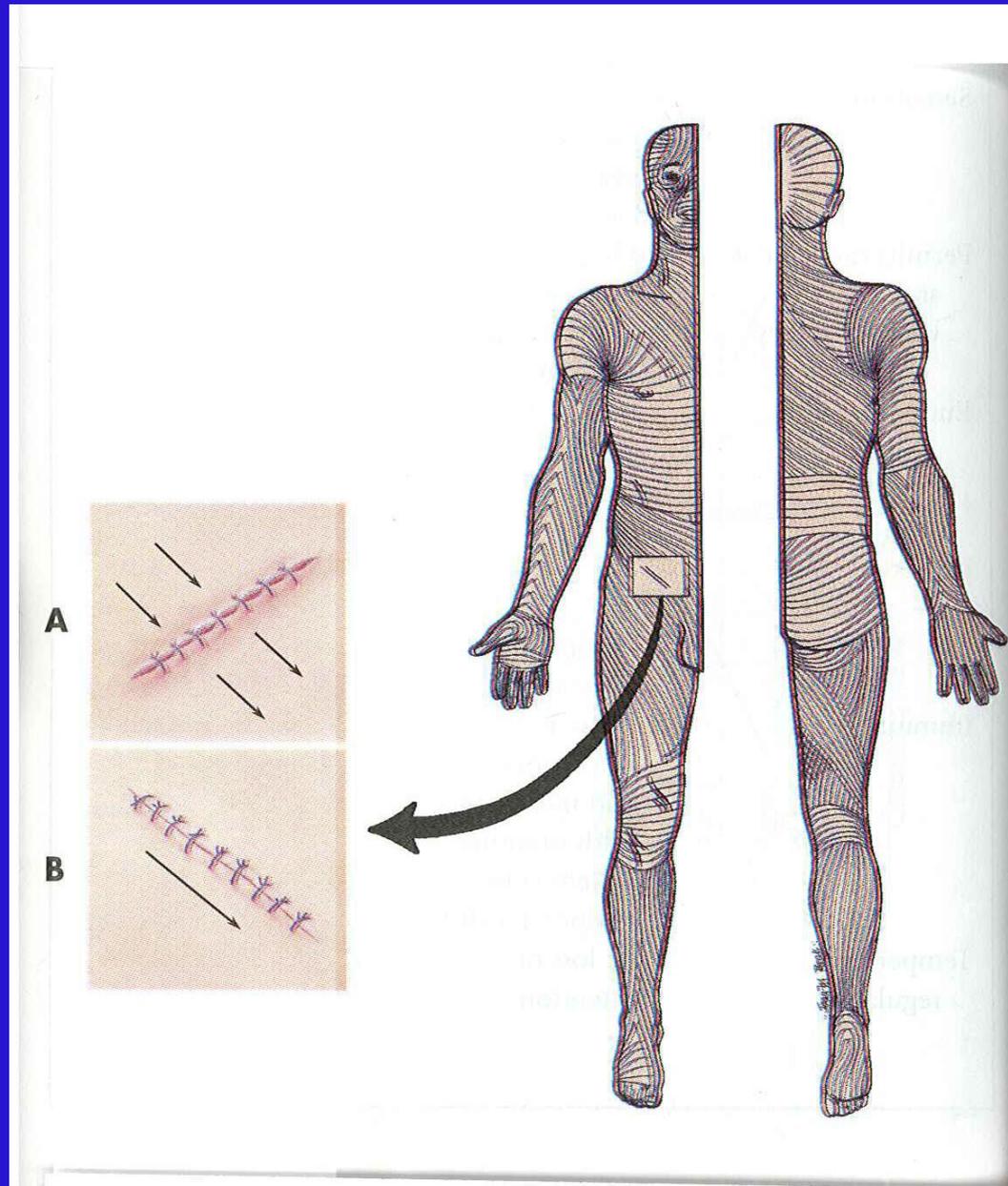
Sweat Gland

Langer's or Cleavage lines

- The lines along which the fibre bundles run.
- Represent the natural lines along which the skin tends to split when penetrated.
- Incisions in the direction of these lines gape much less than those at right angles to them.



Langer's Cleavage Lines



Linea gravidarum

- Rupture of fibre bundles of dermis due to excessive stretching result in prominent white lines.
- Seen in anterior abdominal wall in pregnancy.



Fig. 6.12a

Homeostatic Control of Body Temperature

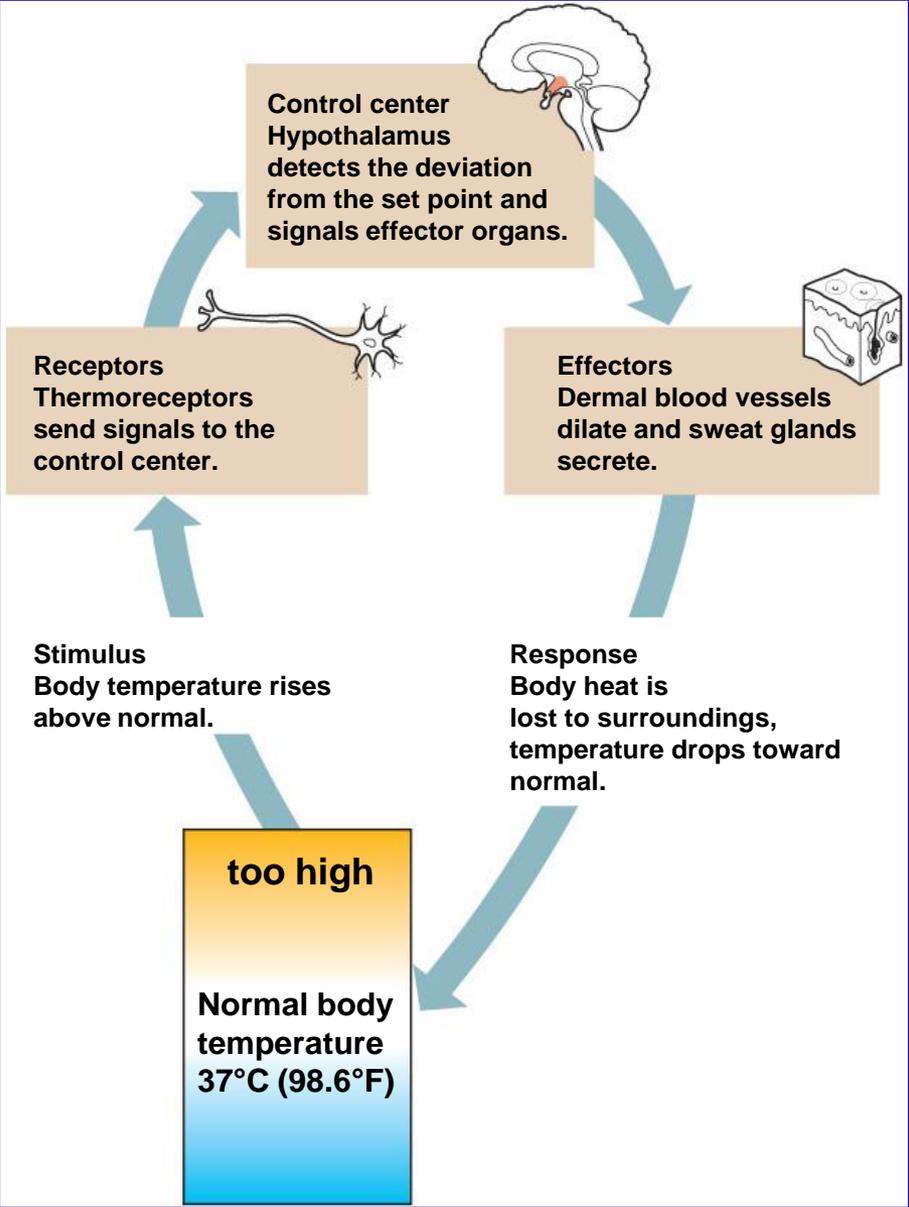
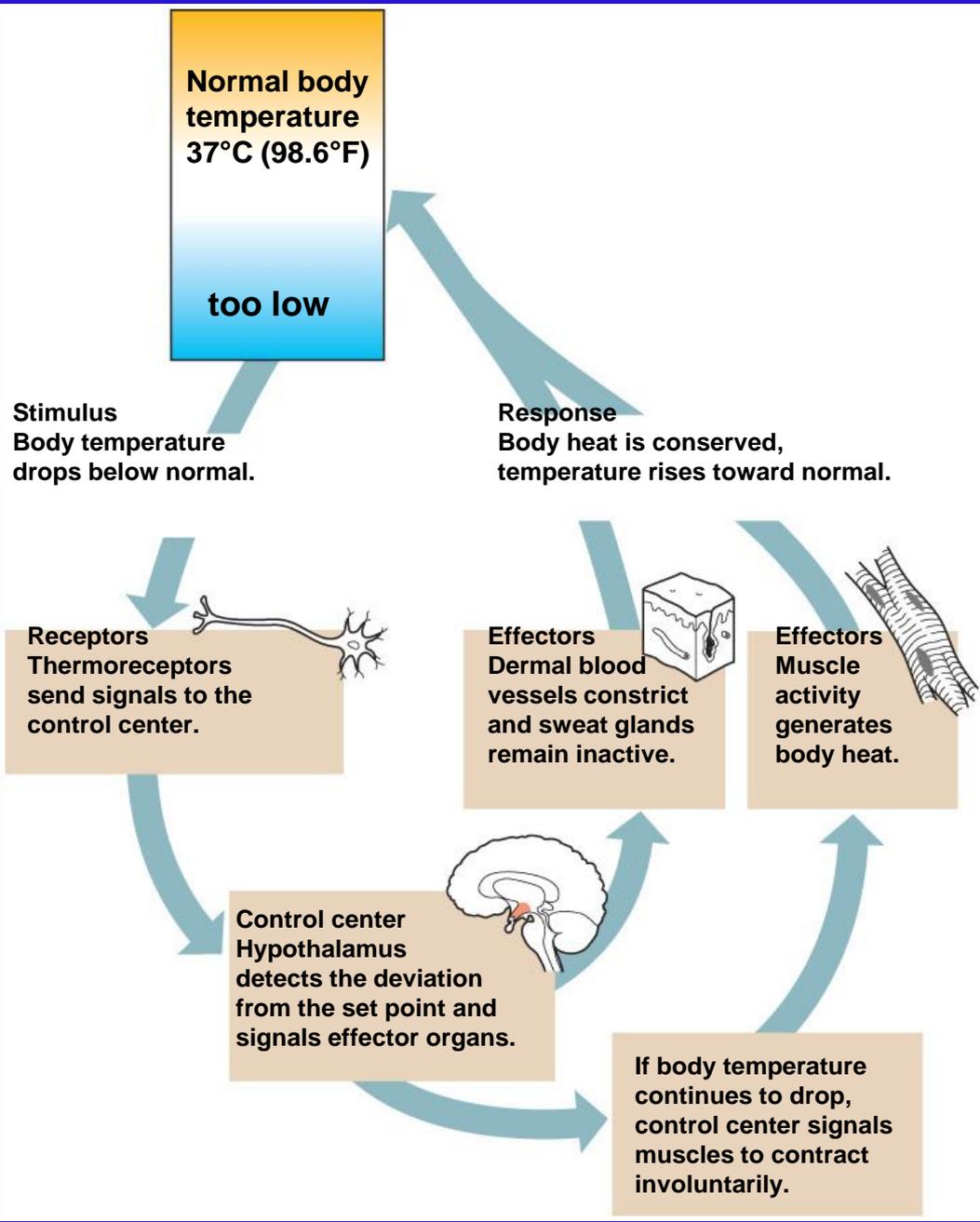


Fig. 6.12b

Homeostatic Control of Body Temperature



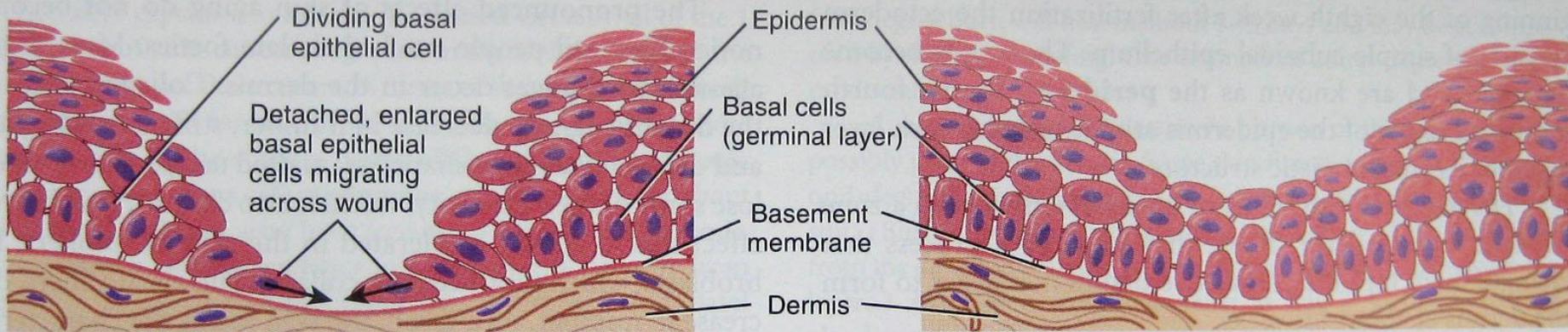
Vitamin D

- Functions as a hormone for the incorporation of ingested calcium into the bones
- Skin exposed to the ultraviolet rays of the sun converts pro-Vitamin D to Vitamin D₃
- Vitamin D₃ is then modified in the liver & kidney to Vitamin D
- In northern latitudes, many months of the year sun exposure is inadequate for the necessary amount of Vitamin D to be manufactured and supplements containing Vitamin D₃ are necessary

Epidermal Wound Healing

Figure 5.6 Epidermal wound healing.

 In an epidermal wound, the injury does not extend into the dermis.

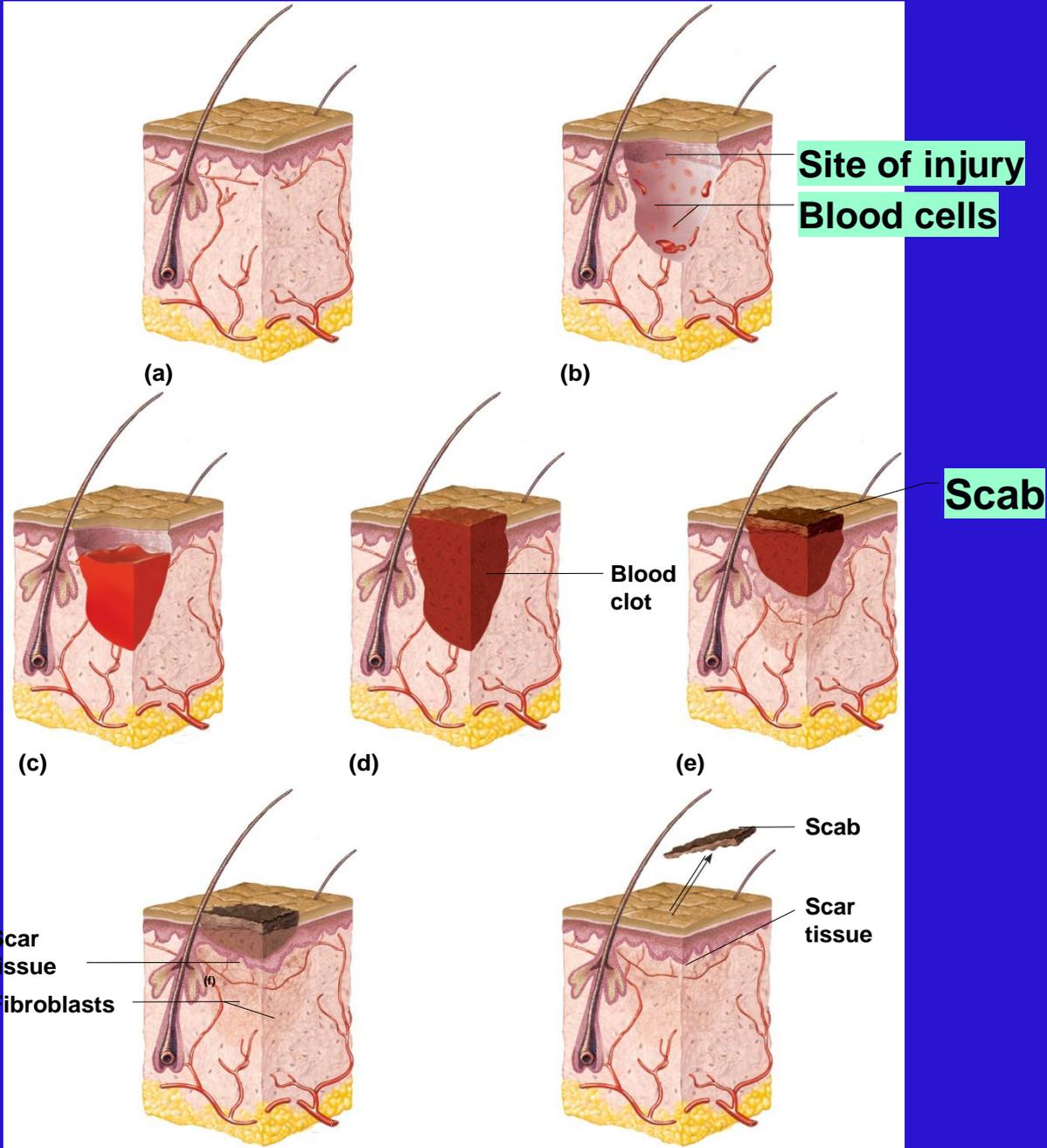


(a) Division of basal epithelial cells and migration across wound

(b) Thickening of epidermis

Fig. 6.13

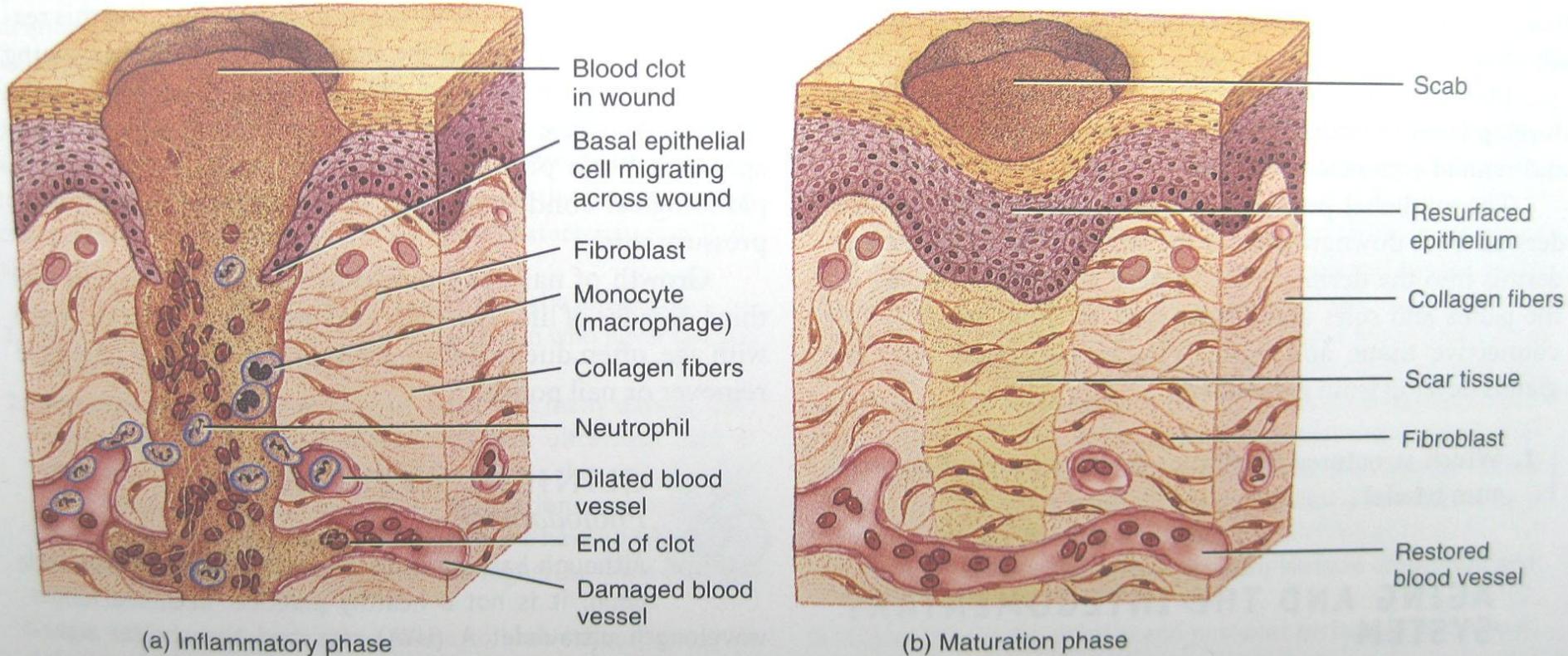
Wound Healing



Deep Wound Healing

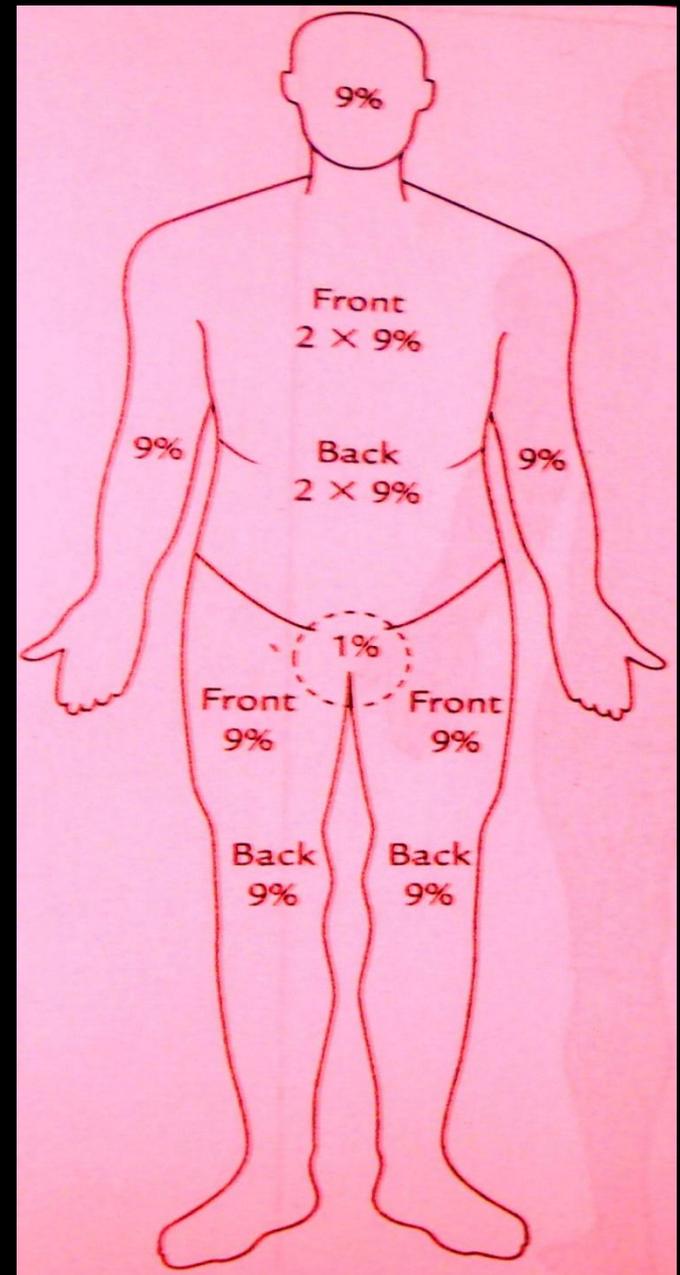
Figure 5.7 Deep wound healing. The initial inflammatory phase (a) is followed by a migratory phase, a proliferative phase, and finally a (b) maturation phase.

 In a deep wound, the injury extends deep to the epidermis.

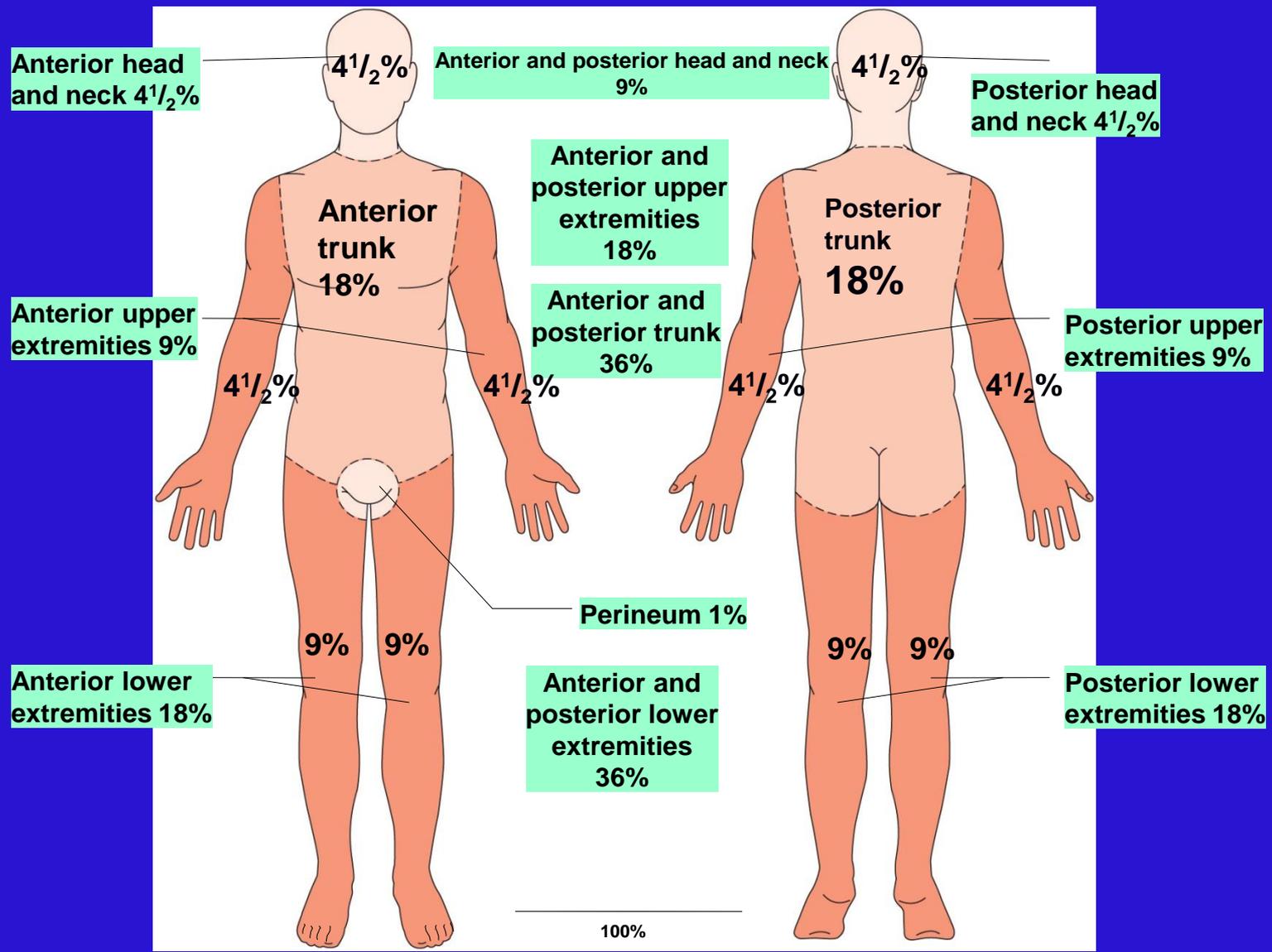


Rule of Nine: To estimate the extent of damaged skin in burn injuries.

- First degree burn- only epidermis.
- Second degree burn- epidermis + upper region of dermis.
- Third degree burn- entire thickness of skin.

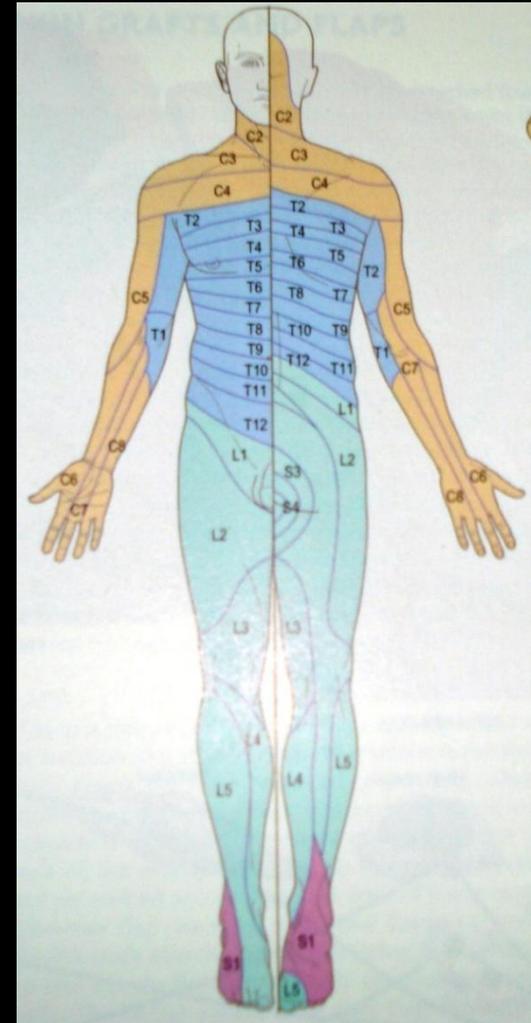


Rule of Nines



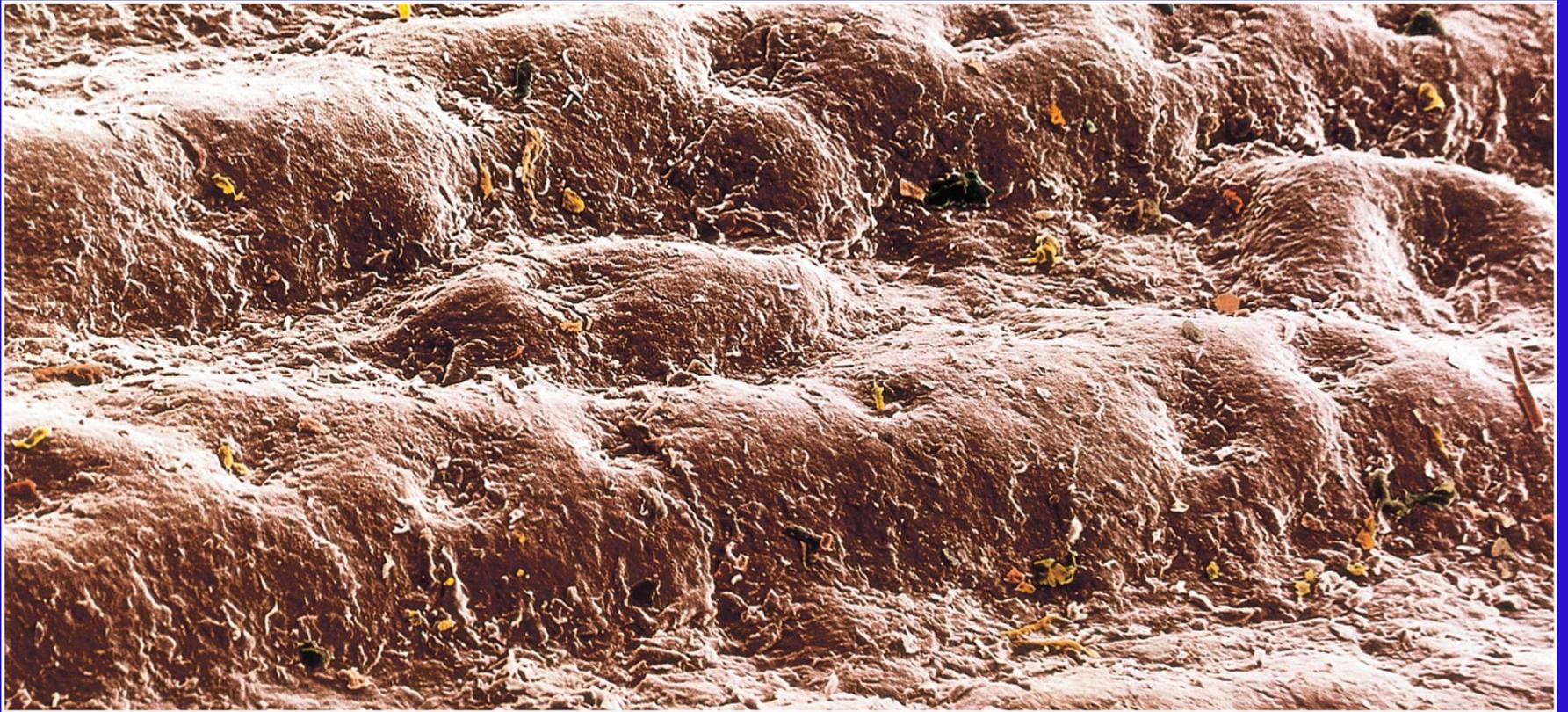
Dermatomes

- The strip of skin supplied by a single spinal nerve is called dermatome.



OVERVIEW

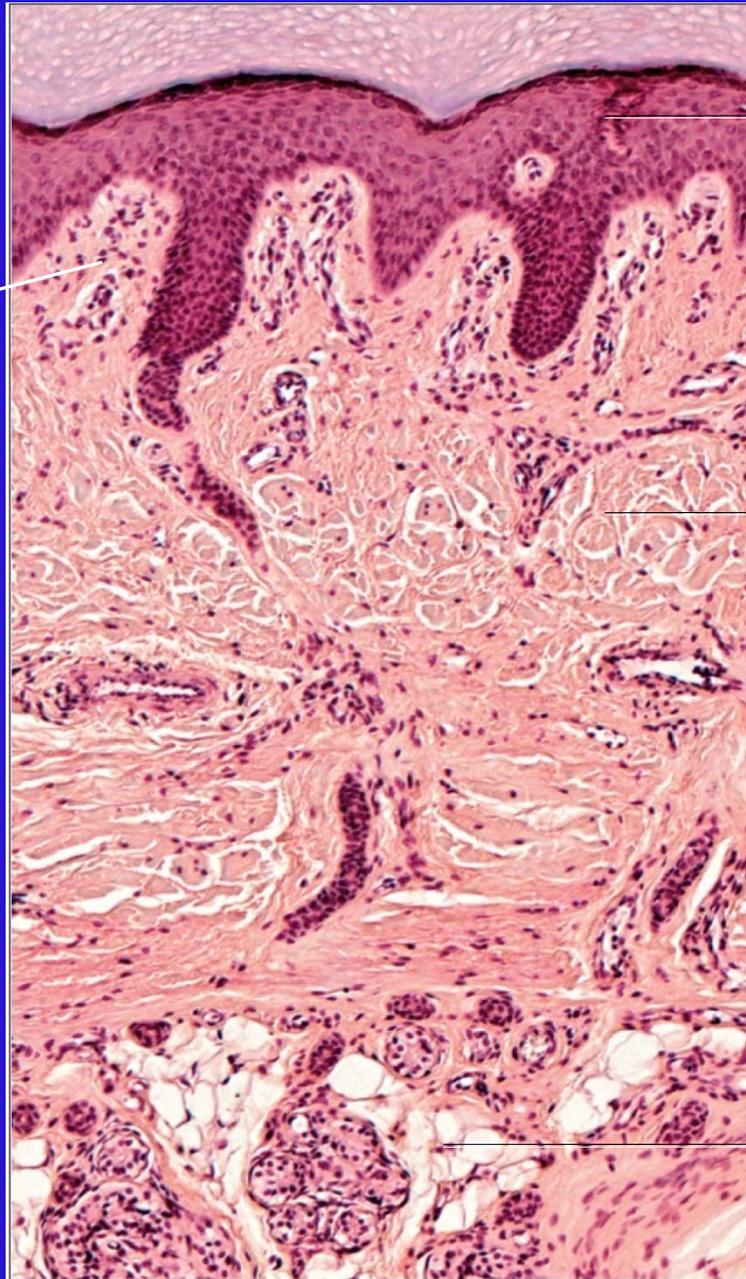
- SKIN ANATOMY
- HAIR
- GLANDS
- NAILS



© Dr. Jeremy Burgess/SPL/Photo Researchers, Inc.

70x

Fig. 6.1



Dermal papilla

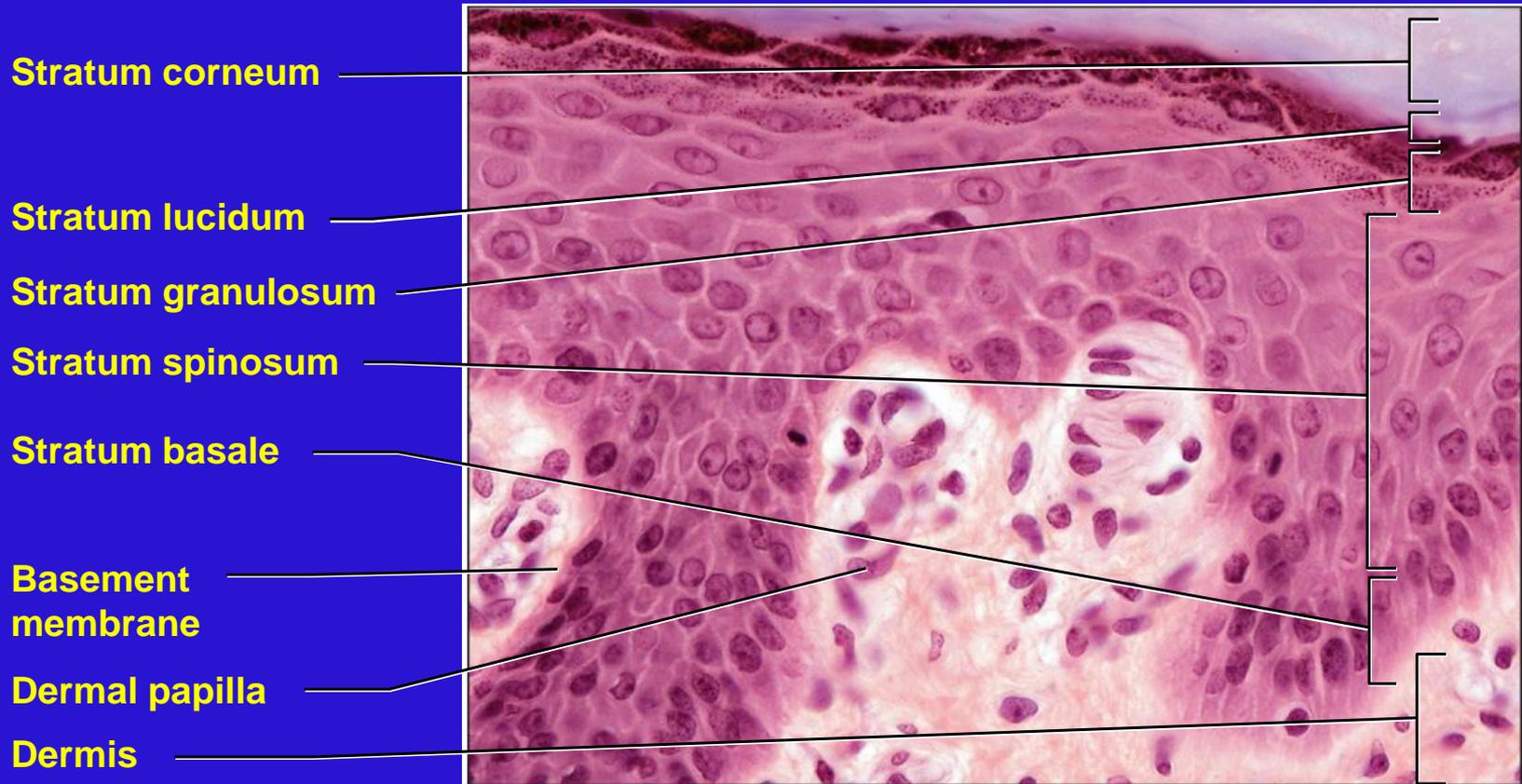
Stratified squamous epithelium

Dense irregular connective tissue

30x

Adipose tissue

Epidermis Stained and Viewed with Light Microscope



120x

© The McGraw-Hill Companies, Inc./Al Telsler, photographer

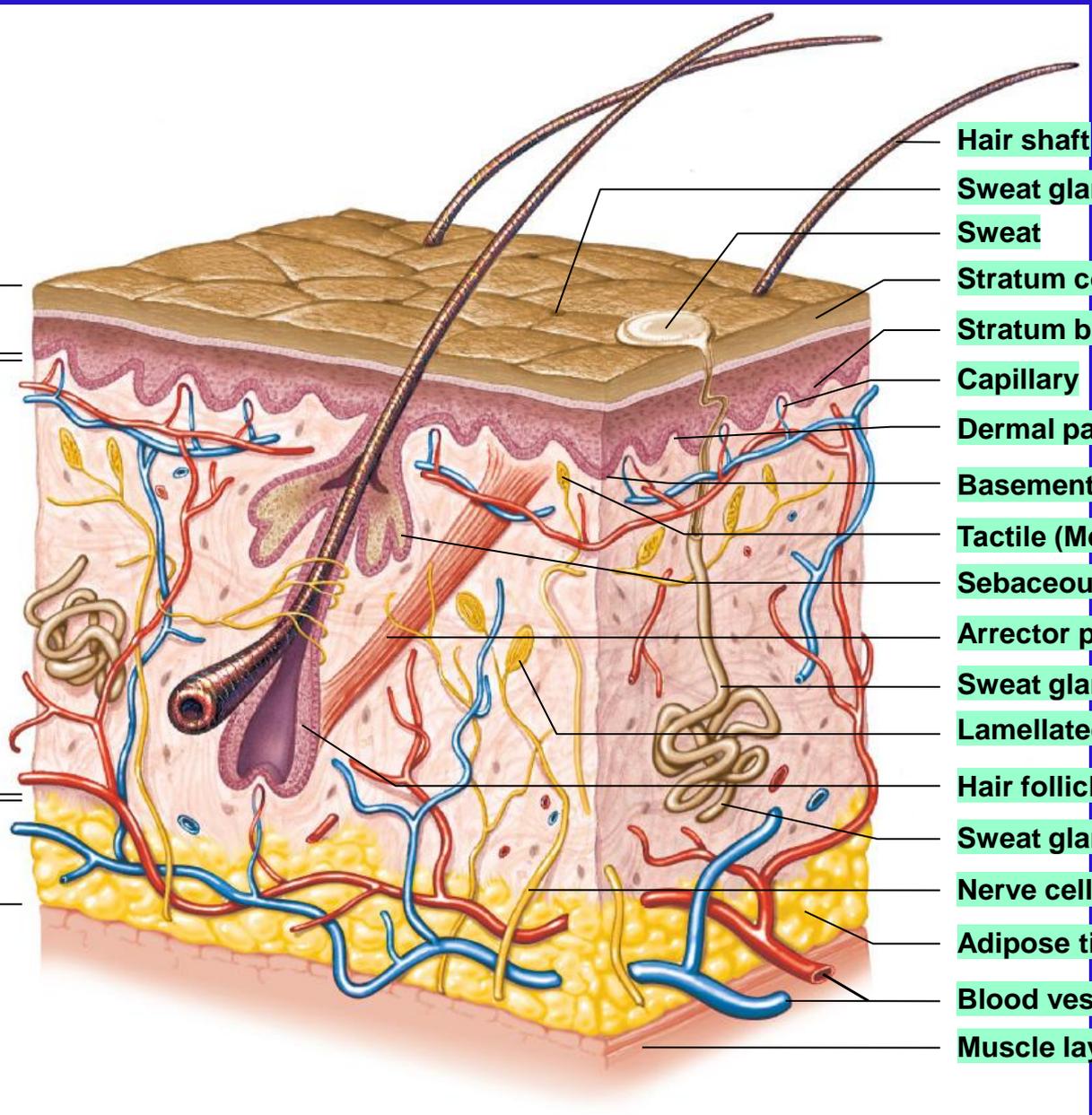
Fig. 6.2a

Skin and Subcutaneous Layer

Epidermis

Dermis

Subcutaneous layer



Hair shaft

Sweat gland pore

Sweat

Stratum corneum

Stratum basale

Capillary

Dermal papilla

Basement membrane

Tactile (Meissner's) corpuscle

Sebaceous gland

Arrector pili muscle

Sweat gland duct

Lamellated (Pacinian) corpuscle

Hair follicle

Sweat gland

Nerve cell process

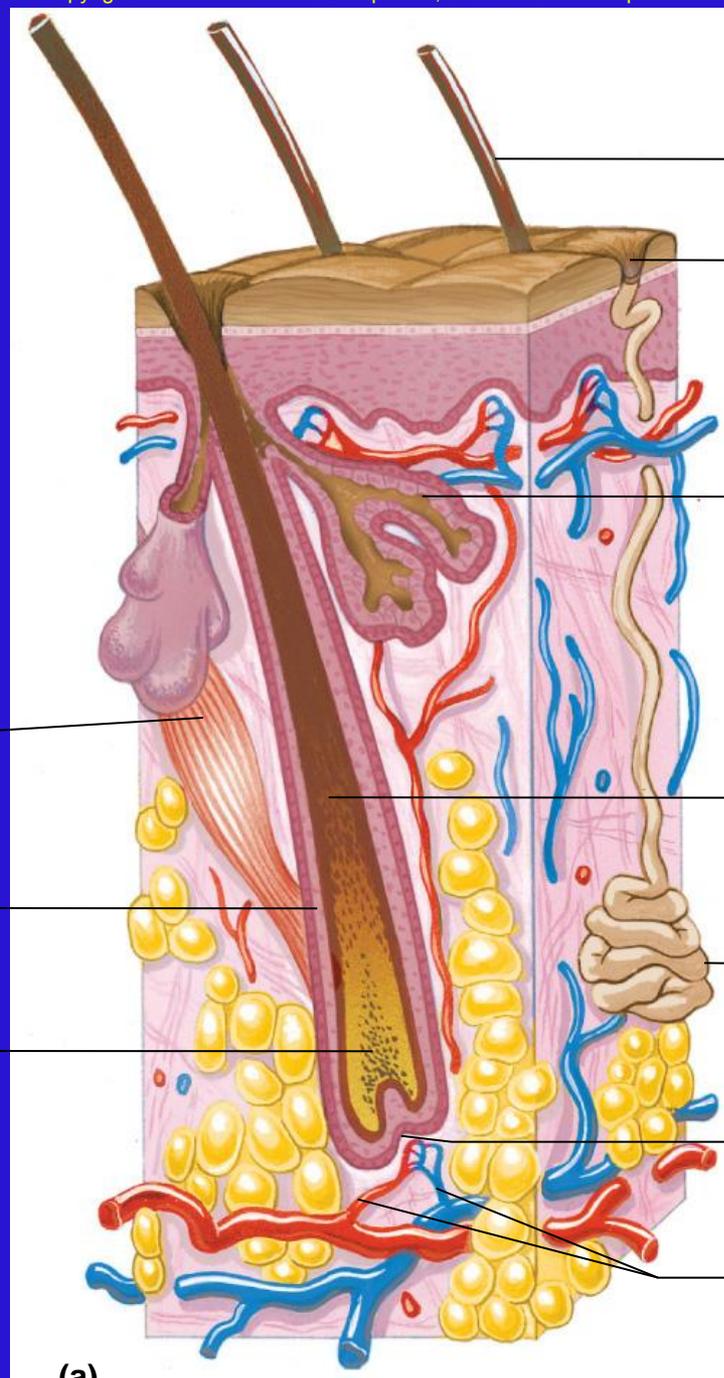
Adipose tissue

Blood vessels

Muscle layer

Fig. 6.7a

Hair Follicle



Hair shaft

Pore

Sebaceous gland

Hair root (keratinized cells)

Eccrine sweat gland

Hair papilla

Dermal blood vessels

Arrector pili muscle

Hair follicle

Region of cell division

(a)

Fig. 6.7b

Hair Follicle

175x



Hair
follicle

Hair root

Adipose
tissue

Region of
cell division

Fig. 6.8

Hair Shaft



**Keratinized cells
of hair shaft**

875x

**Keratinized
squamous cells
of epidermis**

Fig. 6.6

Lunula Nail bed Nail plate

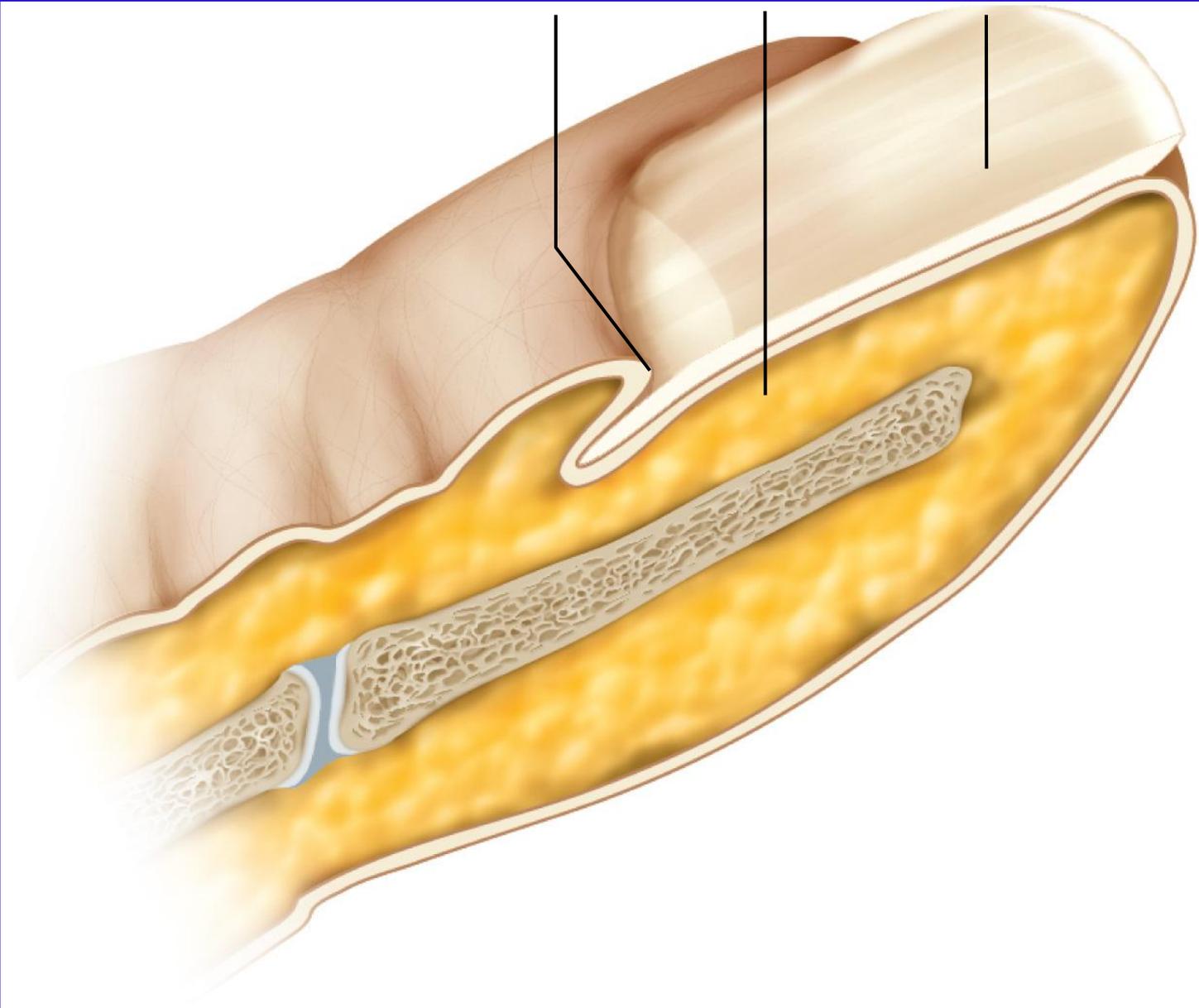
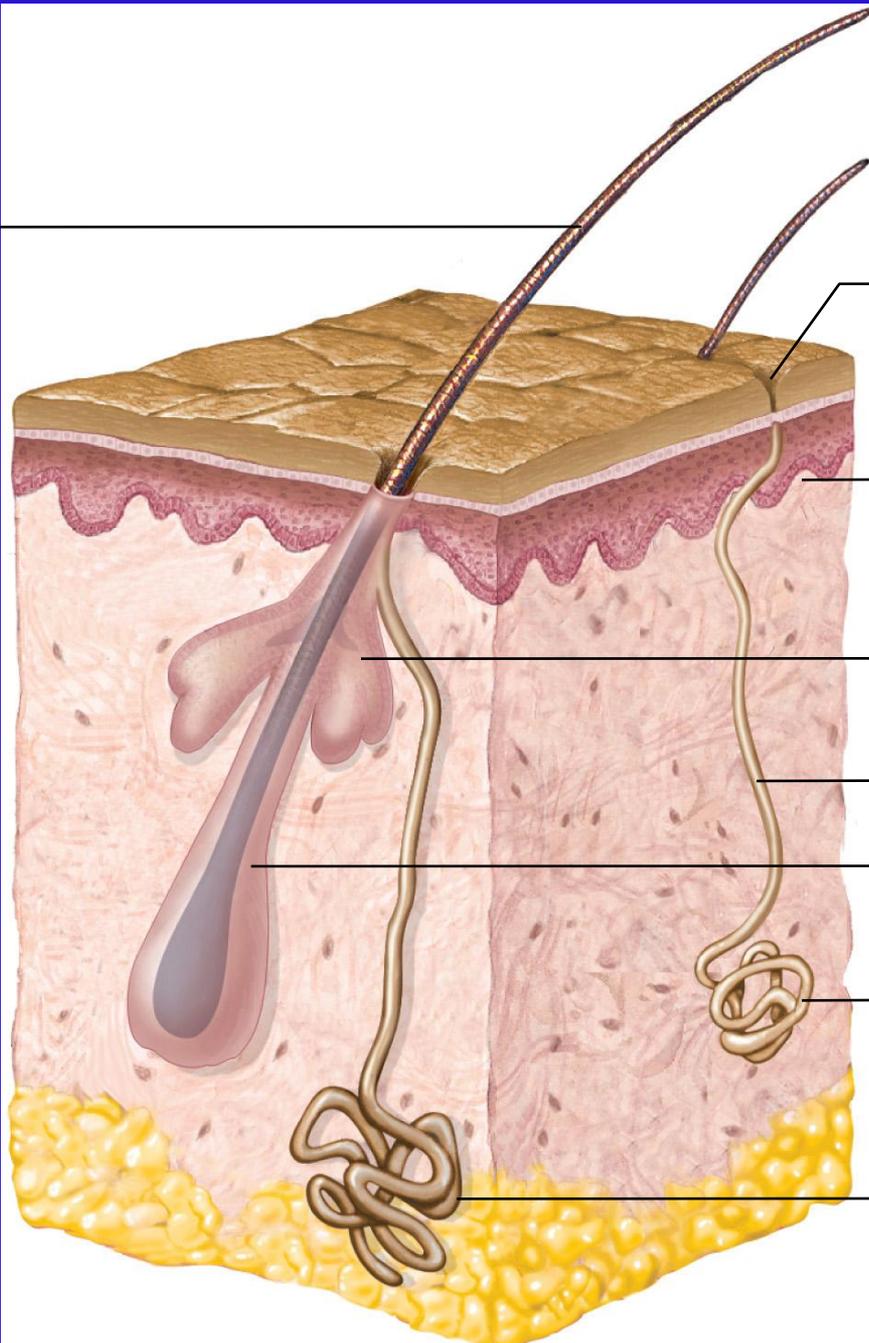


Fig. 6.10

Eccrine And Apocrine Sweat Glands

Hair shaft



Pore

Dermal
papilla

Sebaceous
gland

Duct

Hair
follicle

Eccrine
sweat
gland

Apocrine
sweat
gland

Fig. 6.9

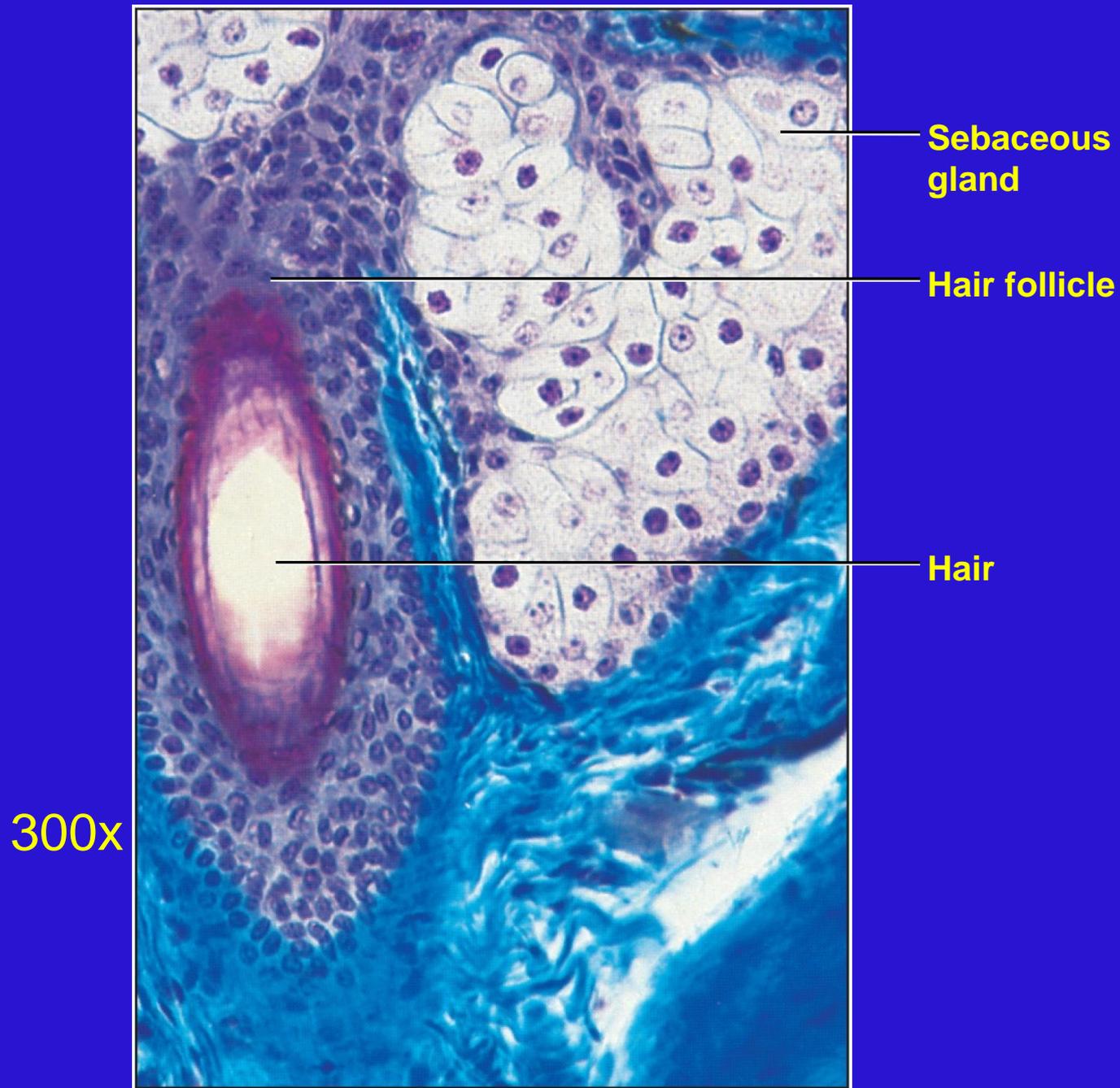
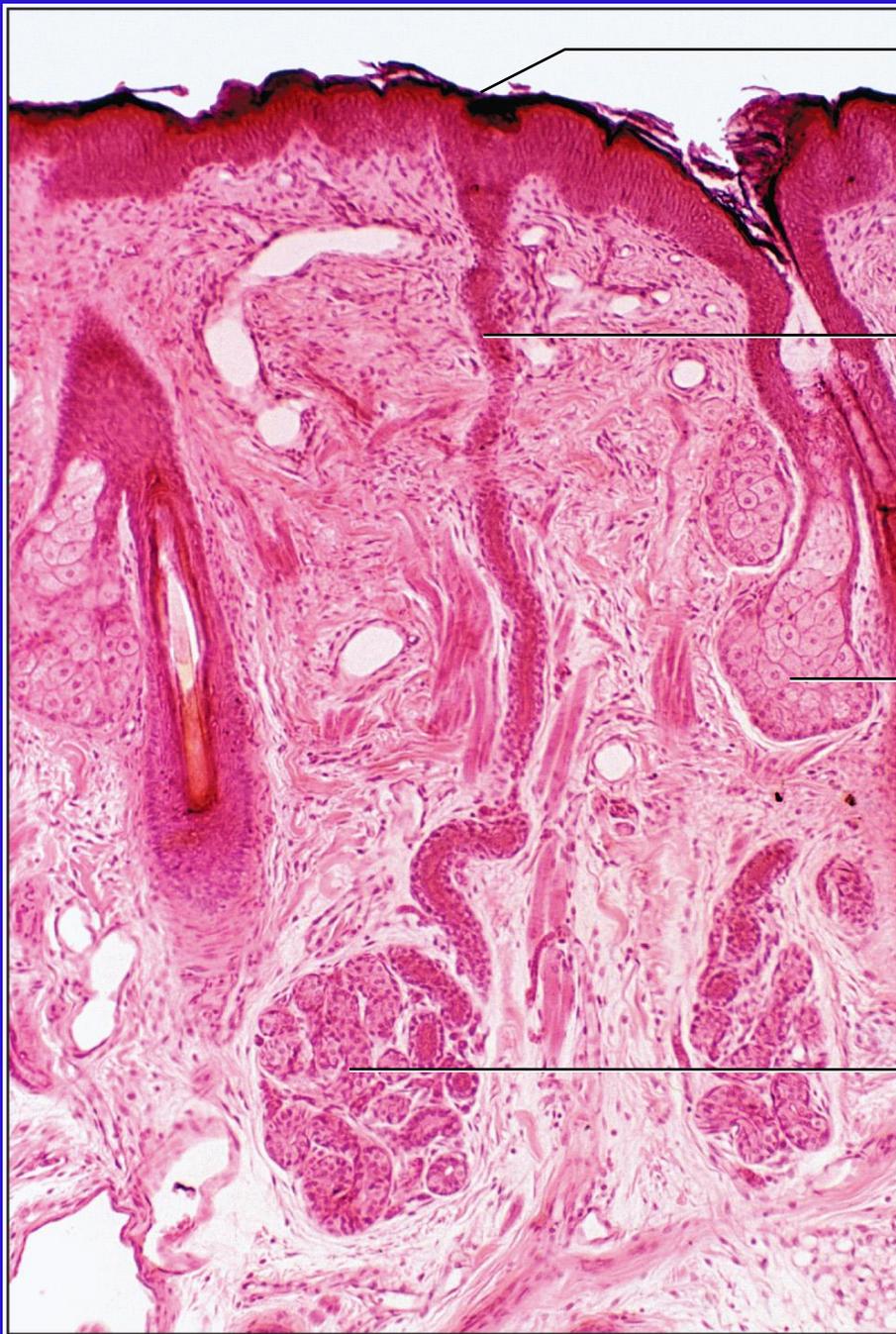


Fig. 6.11

30x



Pore

Duct of eccrine sweat gland

Sebaceous gland

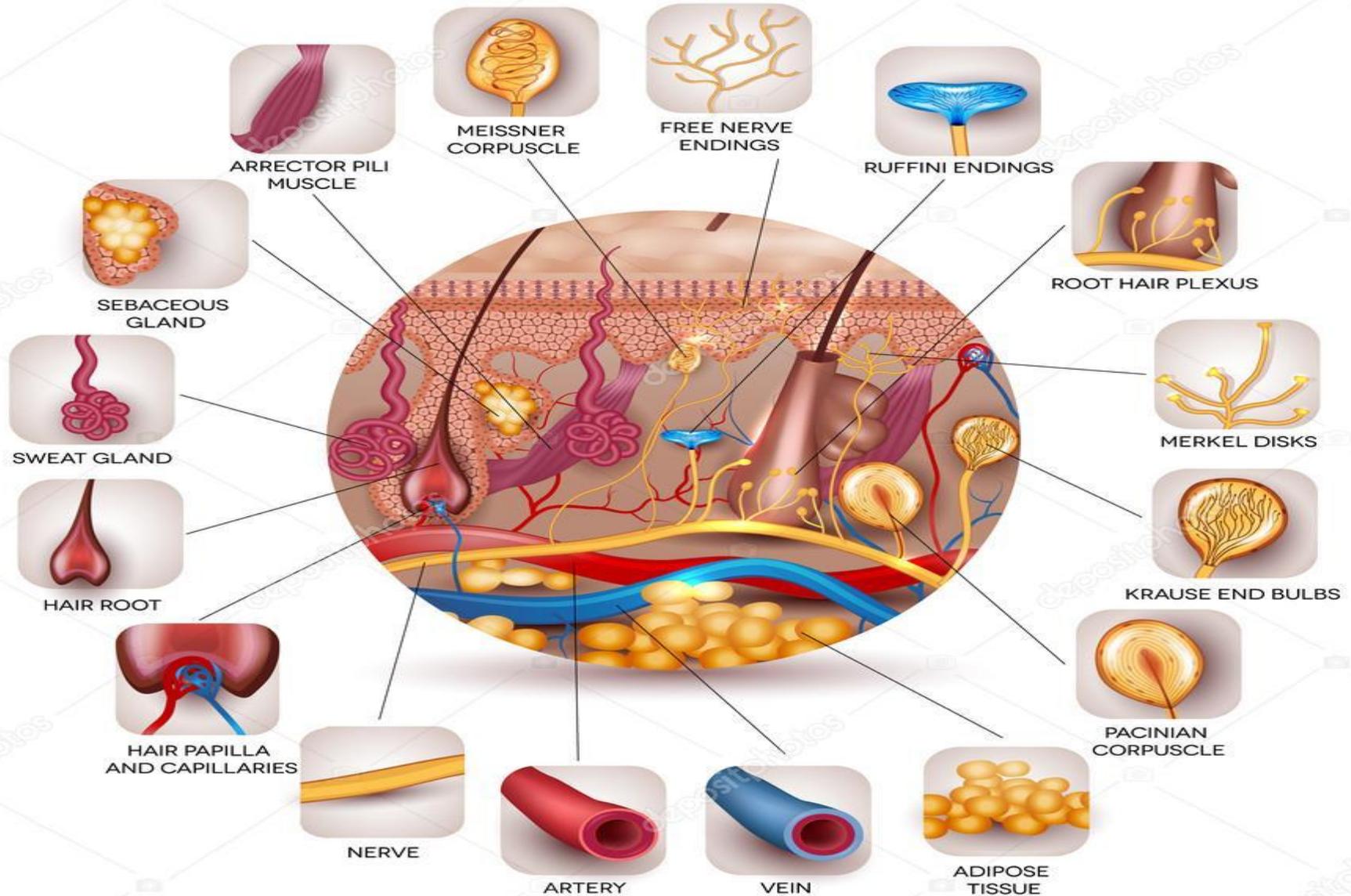
Eccrine sweat gland

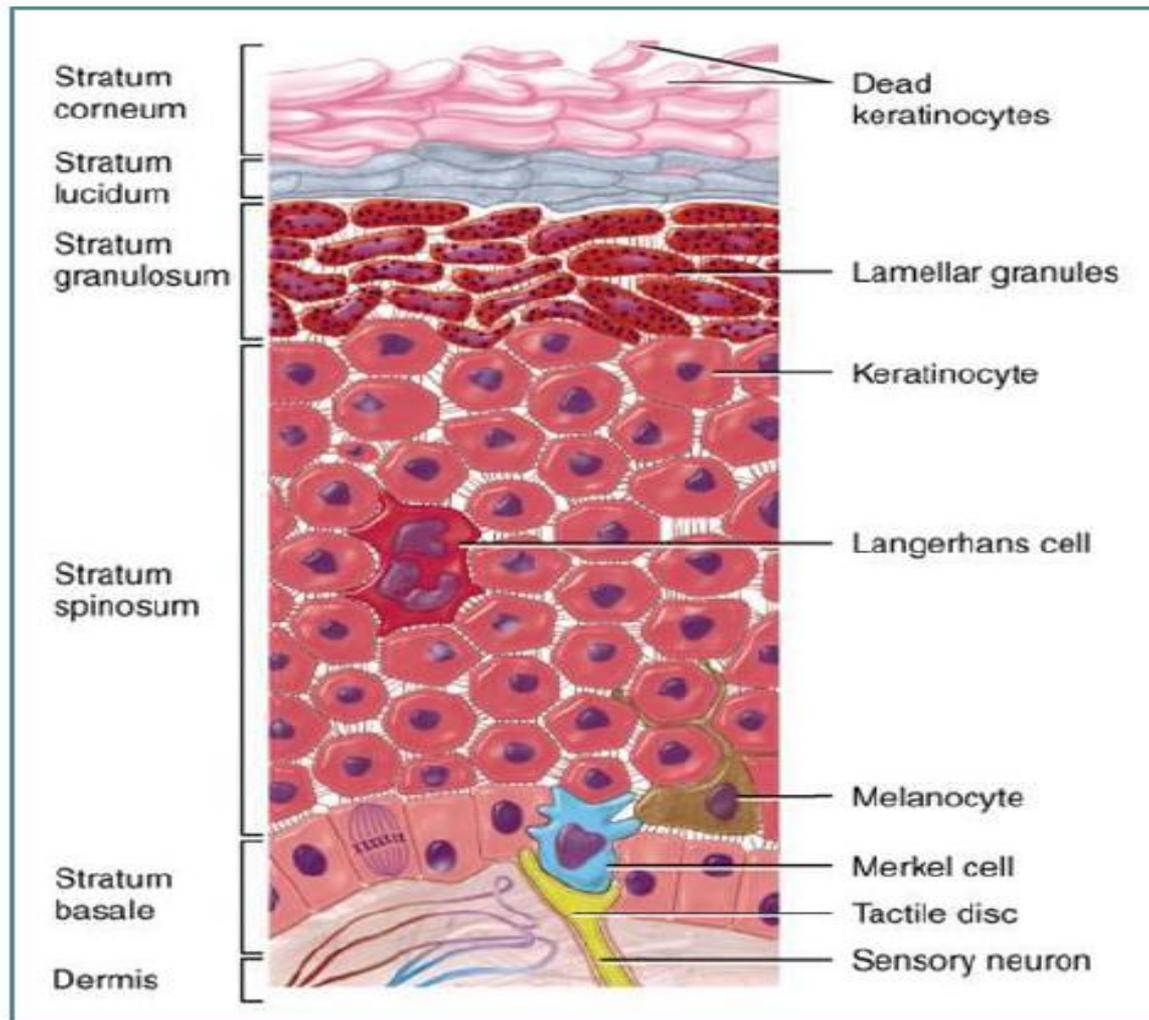
Hairless Skin of Fingertip

Sweat Duct Pores

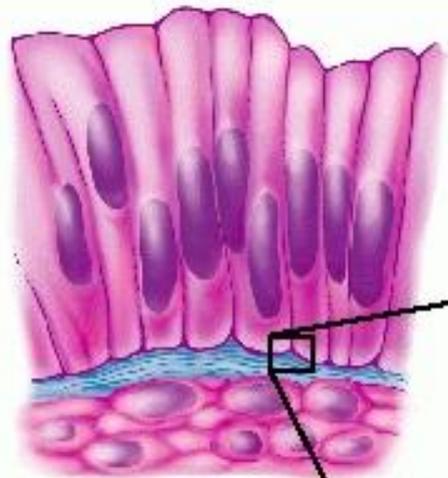


THE SKIN

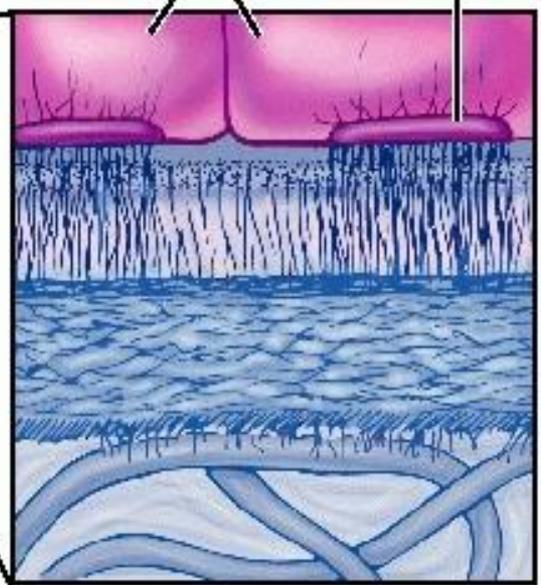




Εικόνα 2: Οι στοιβάδες της επιδερμίδας και τα είδη κυττάρων της. <http://www.imperial.edu>

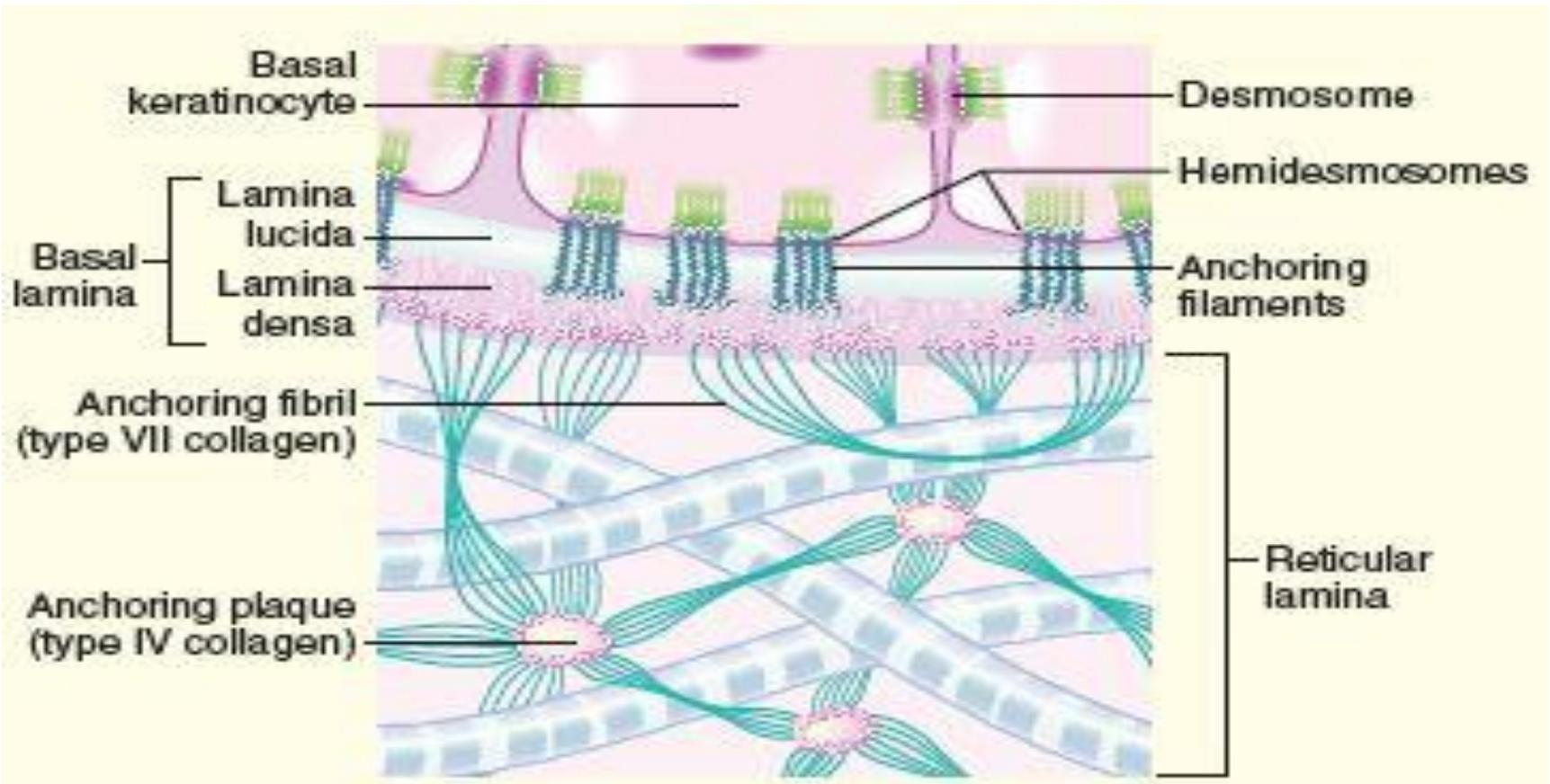


Epithelial cells Hemidesmosome

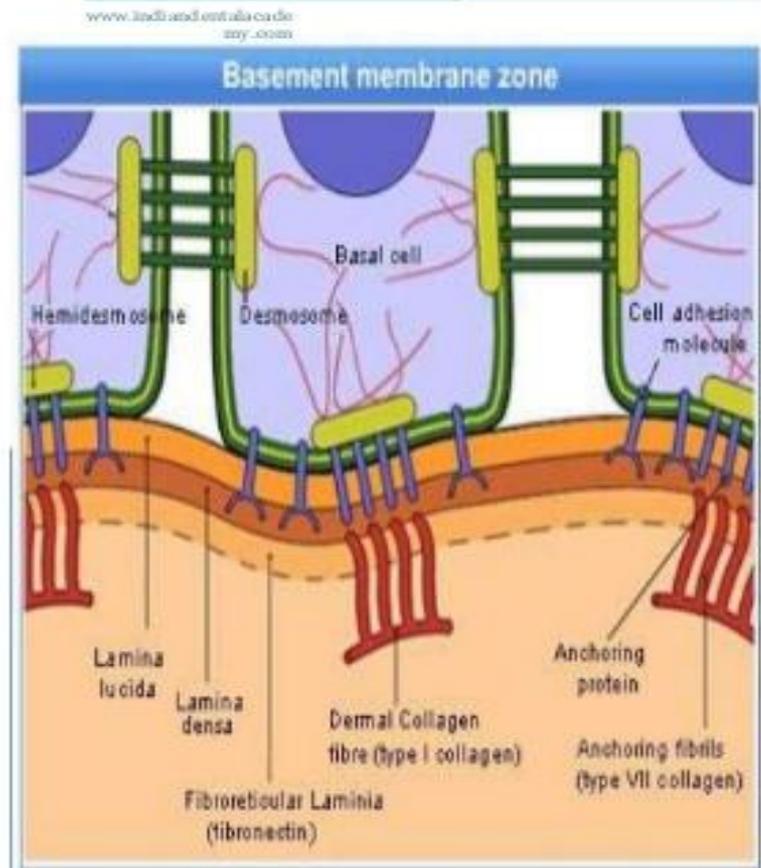


Lamina lucida
Lamina densa
Reticular lamina

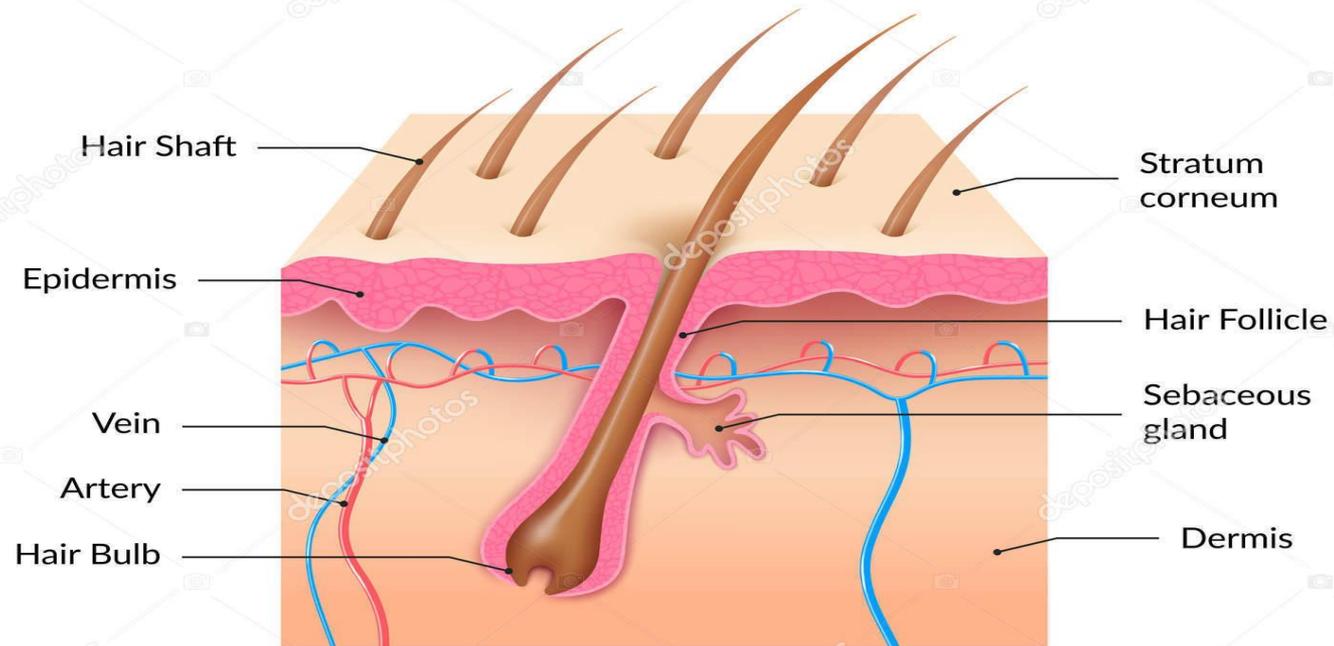
Basal lamina

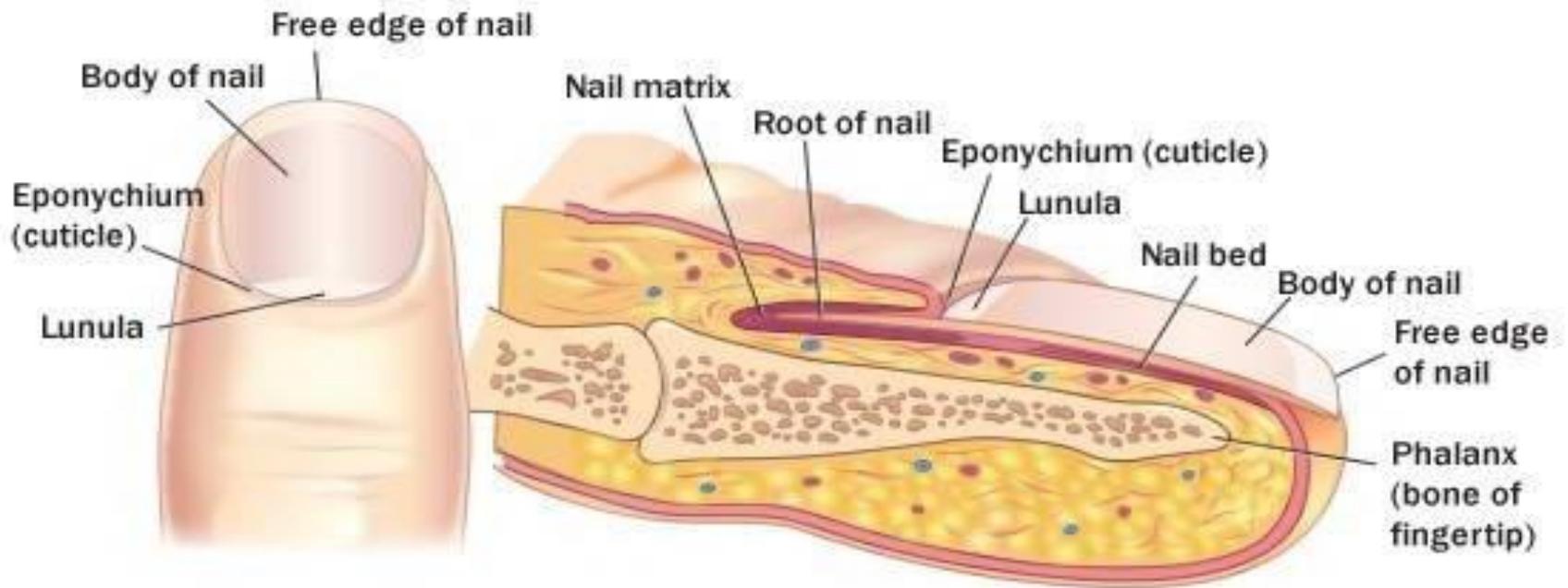


- The lamina lucida, consisting of laminin, an adhesive glycoprotein that mediates not only attachment between type IV collagen and the lamina densa, but also keratinocyte differentiation, migration, and morphogenesis.
- The lamina densa, consisting of type IV collagen that is coated by heparan sulfate, a glycosaminoglycan, and anchoring fibrils, that are composed of type VII collagen and extend from the lamina densa to the connective tissue.



STRUCTURE OF THE HAIR





The Skin Cutis/Derma

The effect of ultraviolet light on the skin

UV-A rays (longer wavelength) penetrate the sensitive stratum in the epidermal layer from damaging UV rays. UV-A rays cause responsible damage to the connective tissue in the dermis. This also may delay, hinder healing, and speed anti-wrinkle lines.

UV-B rays penetrate only the epidermal and, after 2-3 days, reach down to the same formation of molecules. Darker-skinned people have better tanning ability. UV-B rays can damage the genes related to the cell nuclei of the skin. If the cells are no longer able to repair this damage or if they do not die, they can degenerate to skin cancer.

UV Index

The index measures the maximum daily value of UV rays that cause outdoors. The higher the UV index is, the higher the risk of sunburn. It ranges from 0-12. The UV index is used to inform the public about the effects of intense UV rays.

Epidermis

The epidermis is made up of a continuous layer of living cells. It is composed of several layers of cells. The outermost layer is the stratum corneum, which is made up of dead, flattened, squamous cells that are constantly peeling off and being replaced by new cells. The stratum corneum is the thickest layer of the epidermis. Below it are the stratum granulosum, stratum spinosum, and stratum basale. The stratum basale is the deepest layer of the epidermis and is where new cells are formed. The stratum spinosum is the layer of the epidermis that contains the most cells. It is made up of large, polygonal cells that are connected to each other by desmosomes. The stratum granulosum is a thin layer of cells that is located just above the stratum basale. It is made up of small, flattened cells that are filled with keratohyalin granules. The stratum corneum is the outermost layer of the epidermis and is made up of many layers of dead, flattened cells. It is the thickest layer of the epidermis and is responsible for the skin's barrier function.

Dermis (cutis)

The dermis is the middle layer of the skin. It is made up of a dense network of collagen fibers, elastin fibers, and other connective tissue proteins. It also contains blood vessels, lymphatic vessels, and nerves. The dermis is responsible for the skin's elasticity and strength. It is the layer of the skin that contains the most cells. The dermis is also where most of the skin's sensory receptors are located. The dermis is the layer of the skin that contains the most cells. It is made up of large, polygonal cells that are connected to each other by desmosomes. The dermis is also where most of the skin's sensory receptors are located. The dermis is the layer of the skin that contains the most cells. It is made up of large, polygonal cells that are connected to each other by desmosomes. The dermis is also where most of the skin's sensory receptors are located.

Subcutis (tela subcutanea)

The subcutis is the deepest layer of the skin. It is made up of adipose tissue, which is stored fat. The subcutis is responsible for the skin's insulation and energy storage. It is the layer of the skin that contains the most fat. The subcutis is also where most of the skin's blood vessels and nerves are located. The subcutis is the layer of the skin that contains the most fat. It is made up of adipose tissue, which is stored fat. The subcutis is responsible for the skin's insulation and energy storage. It is the layer of the skin that contains the most fat. The subcutis is also where most of the skin's blood vessels and nerves are located.



The Hair (pilum)

The hair is a keratinized structure that grows from the surface of the skin. It is made up of a bulb at the base, a root, and a shaft. The bulb is the part of the hair that is embedded in the skin. The root is the part of the hair that is visible above the skin. The shaft is the part of the hair that is visible above the skin. The hair is made up of a central core called the medulla, which is surrounded by a layer of cells called the cortex. The cortex is the part of the hair that gives it its strength and color. The hair is also surrounded by a protective layer called the cuticle. The hair is made up of a central core called the medulla, which is surrounded by a layer of cells called the cortex. The cortex is the part of the hair that gives it its strength and color. The hair is also surrounded by a protective layer called the cuticle.

The Nail (unguis)

The nail is a keratinized structure that grows from the surface of the skin. It is made up of a nail plate, which is a thick, flat, translucent structure. The nail plate is made up of a central core called the nail bed, which is surrounded by a layer of cells called the nail matrix. The nail matrix is the part of the nail that gives it its strength and color. The nail is also surrounded by a protective layer called the cuticle. The nail is made up of a central core called the nail bed, which is surrounded by a layer of cells called the nail matrix. The nail matrix is the part of the nail that gives it its strength and color. The nail is also surrounded by a protective layer called the cuticle.

Horny layer (stratum corneum)

The outermost layer of the skin consists of several layers of flattened, squamous cells. These cells are constantly peeling off and being replaced by new cells. The stratum corneum is the thickest layer of the epidermis and is responsible for the skin's barrier function.

Mucin layer (stratum mucosum)

This layer is located just below the stratum corneum. It is made up of a thin layer of cells that are filled with mucin. The mucin is a substance that gives the skin its elasticity and strength. The mucin layer is also where most of the skin's sensory receptors are located.

Granular layer (stratum granulosum)

This layer is located just below the mucin layer. It is made up of a thin layer of cells that are filled with granules. The granules are made up of keratin and other proteins. The granular layer is also where most of the skin's sensory receptors are located.

Spinosum layer (stratum spinosum)

This layer is located just below the granular layer. It is made up of a thick layer of cells that are connected to each other by desmosomes. The spinosum layer is the layer of the epidermis that contains the most cells. It is also where most of the skin's sensory receptors are located.

Basal layer (stratum basale)

This layer is the deepest layer of the epidermis. It is made up of a single layer of cells. The basal layer is where new cells are formed. It is also where most of the skin's sensory receptors are located.

Basal membrane

The basal membrane is a thin layer of cells that separates the epidermis from the dermis. It is made up of a single layer of cells. The basal membrane is where new cells are formed. It is also where most of the skin's sensory receptors are located.

Rash

A rash is a skin condition that is characterized by redness, swelling, and itching. It is caused by an allergic reaction to a substance. The rash is made up of small, raised bumps called papules. The rash is also where most of the skin's sensory receptors are located.

Psoriasis

Psoriasis is a chronic skin condition that is characterized by red, scaly patches on the skin. It is caused by an overgrowth of skin cells. The psoriasis is made up of small, raised bumps called papules. The psoriasis is also where most of the skin's sensory receptors are located.

Eczema

Eczema is a chronic skin condition that is characterized by red, itchy patches on the skin. It is caused by an allergic reaction to a substance. The eczema is made up of small, raised bumps called papules. The eczema is also where most of the skin's sensory receptors are located.

Dermatitis

Dermatitis is a general term for a group of skin conditions that are characterized by redness, swelling, and itching. It is caused by an allergic reaction to a substance. The dermatitis is made up of small, raised bumps called papules. The dermatitis is also where most of the skin's sensory receptors are located.

Acne

Acne is a skin condition that is characterized by red, inflamed bumps on the skin. It is caused by a clogged pore. The acne is made up of small, raised bumps called papules. The acne is also where most of the skin's sensory receptors are located.

Sunburn

Sunburn is a skin condition that is characterized by redness, swelling, and pain on the skin. It is caused by overexposure to ultraviolet light. The sunburn is made up of small, raised bumps called papules. The sunburn is also where most of the skin's sensory receptors are located.

Allergy

Allergy is a skin condition that is characterized by redness, swelling, and itching on the skin. It is caused by an allergic reaction to a substance. The allergy is made up of small, raised bumps called papules. The allergy is also where most of the skin's sensory receptors are located.

Dermatitis

Dermatitis is a general term for a group of skin conditions that are characterized by redness, swelling, and itching. It is caused by an allergic reaction to a substance. The dermatitis is made up of small, raised bumps called papules. The dermatitis is also where most of the skin's sensory receptors are located.

Acne

Acne is a skin condition that is characterized by red, inflamed bumps on the skin. It is caused by a clogged pore. The acne is made up of small, raised bumps called papules. The acne is also where most of the skin's sensory receptors are located.

Sunburn

Sunburn is a skin condition that is characterized by redness, swelling, and pain on the skin. It is caused by overexposure to ultraviolet light. The sunburn is made up of small, raised bumps called papules. The sunburn is also where most of the skin's sensory receptors are located.

Allergy

Allergy is a skin condition that is characterized by redness, swelling, and itching on the skin. It is caused by an allergic reaction to a substance. The allergy is made up of small, raised bumps called papules. The allergy is also where most of the skin's sensory receptors are located.

Dermatitis

Dermatitis is a general term for a group of skin conditions that are characterized by redness, swelling, and itching. It is caused by an allergic reaction to a substance. The dermatitis is made up of small, raised bumps called papules. The dermatitis is also where most of the skin's sensory receptors are located.



Combining Forms

Adip/o

Lip/o

Steat/o



All mean FAT

Adip/osis

Abnormal condition of fat

Lip/oid

Resembling fat

Steat/oma

Tumor of fat

Cutane/o

Dermat/o

Derm/o



skin

Subcutaneous

Pertaining to under the skin

Dermatology

Study of the skin

hypodermic

Pertaining to under the skin

Hidro/o sweat

Anhidrosis - abnormal condition of sweat

Kerat/o horny tissue

keratosis- - abnormal condition of hard tissue

Myc/o fungus

Onychomycosis – abnormal condition of fungal toenails

References

1. diFiore's Atlas of Histology with functional Correlations, 12th Edition.
2. Textbook of Human Histology. Inderbir Singh, 1st Edition.
3. Textbook of Histology. GP Pal, 3rd Edition.

MCQ

Q1. Which layer is present only in thick skin:

- a. Stratum basale
- b. Stratum spinosum
- c. Stratum granulosum
- d. Stratum lucidum

MCQ

Q2. The characteristic feature of reticular layer of dermis is:

- a. High mitotic activity
- b. Contains keratin granules
- c. Dense irregular connective tissue
- d. Finger like processes

MCQ

Q3. Secretion of sebaceous glands is aided by contraction of:

- a. Arrector pilorum muscle
- b. Myoepithelial cells
- c. Papillary layer of dermis
- d. Reticular layer of dermis

MCQ

Q4. Langerhans cells are present in:

- a. Stratum basale
- b. Stratum spinosum
- c. Stratum granulosum
- d. Stratum lucidum

MCQ

Q5. The sensory cells of epidermis are:

- a. Melanocytes
- b. Keratinocytes
- c. Langerhans cells
- d. Merkel cells