

The Dermis and Subcutaneous Layers

{ Layers of the Skin

Note Expectations:

- ⌘ Cell phones and electronics are not in use.
- ⌘ No side conversations.
- ⌘ You are taking the notes.
- ⌘ You are helping the people at your table to answer the questions.
- ⌘ You are prepared to answer the questions.

&I can identify the three layers of skin.

&I can describe the function of the different layers of skin.

&I can list the structures found in each layer of skin.

- ⌘ The dermis is the innermost thickest layer of the skin.
- ⌘ It is made of living cells.
- ⌘ The dermis lies beneath the epidermis.

Dermis

& The dermis contains:

∅ Blood vessels

∅ Nerves

∅ Sweat and oil glands

∅ Sense organs

∅ Smooth muscles

∅ Hair follicles

∅ Lymph Vessels

- ⌘ The dermis is made of strong, flexible connective tissue.
- ⌘ It contains several cells that protect against microbial invasion, including: Macrophages, WBC's, and mast cells.
- ⌘ Why would the skin need these cells?
- ⌘ The dermis also contains fibroblasts that produce collagen.

Dermis

& The dermis has two main functions:

A) To provide nutrients and blood to the epidermis.

B) To control body temperature.

Dermis Functions

- & The blood vessels in the dermis help regulate body temperature.
- & When the body needs to conserve heat, the blood vessels in the dermis constrict or narrow.
- & This is why hypothermia results in a bluish color because blood is not reaching the surface of the skin.

Dermis

- ‡ When the body needs to release heat, the blood vessels dilate.
- ‡ This results in a loss of heat.
- ‡ The control of body temperature is another example of homeostasis.

Dermis

& The dermis consists of two layers:

A) Papillary Layer

B) Reticular Layer

Dermis Layers

- ⌘ The papillary layer is the upper part of the dermis.
- ⌘ It contains peg-like projections called dermal papillae.

The Dermis

& The dermal papillae contain capillary loops, free nerve endings, and touch receptors.

& The capillary loops provide the nutrients for the lower layers of the epidermis.

Dermal Papillae

- The papillae form ridges that increase friction and gripping abilities for the fingers and feet.
- The ridge pattern forms fingerprints.

Dermal Papillae

⌘ The reticular layer is formed from dense, fibrous connective tissue.

⌘ It contains blood vessels, sweat and oil glands, pressure receptors, and WBC's (white blood cells)

Reticular Layer

- ⌘ This layer is made of thick collagen fibers and elastic fibers.
- ⌘ Collagen fibers give skin strength and help to bind water.
- ⌘ Elastic fibers provide the stretch and recoil properties of skin.

Reticular Layer

As people age, they have fewer of these fibers, which causes the skin to lose elasticity and the skin sags and wrinkles.

Reticular Layer

- ⌘ Beneath the dermis is the hypodermis or subcutaneous layer.
- ⌘ The prefix hypo- and sub-mean below.
- ⌘ The subcutaneous layer is made of fat and collagen.

Subcutaneous

- ⌘ The purpose of the subcutaneous layer is to insulate the body.
- ⌘ The subcutaneous layer also acts as an energy reserve because of the fat present.
- ⌘ This layer also acts as a shock absorber, protecting the internal organs.

Subcutaneous

- & How does the dermis help to regulate body temperature?
- & Aside from maintaining body temperature, what is the other function of the dermis?
- & Which layer of the dermis provides nutrients to the epidermis?
- & Explain the purpose of collagen fibers.
- & Why do older people get wrinkles and saggy skin?
- & List the functions of the subcutaneous layers.

Accessory Organs of the Skin

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⌘ I can identify the accessory organs in the skin.

⌘ I can explain the structure and function of each of the accessory organs.

- ‡ The dermis contains two types of glands: sweat and sebaceous (oil).
- ‡ The glands pass through the epidermis and secrete their products on the surface of the skin.

Glands

&Sweat glands produce the watery secretion known as sweat.

&Sweat contains salt, water, and other compounds.

Glands

- & There are two types of sweat glands:
- & Eccrine sweat glands release sweat.
- & Sweat is 99% water and contains salts, vitamin C, antibodies, and wastes.
- & Eccrine glands are abundant on the palms, soles of feet, and forehead.
- & Eccrine glands cool the body through evaporative cooling.

Sweat Glands

- & Apocrine sweat glands are found in your armpits and genital areas.
- & They produce sweat that contains proteins and fatty acids.
- & When the apocrine sweat is decomposed by skin bacteria, the result is body odor.
- & These glands are activated at puberty.

Apocrine Glands

& The production of sweat helps cool the body.

& Sweat production is stimulated by nerve impulses when body temperature is raised.

& Emotional sweating is stimulated by stress, anxiety, fear, and pain.

Glands

- & Sebaceous glands produce oil.
- & The oil is known as sebum.
- & The purpose of sebum is to waterproof the skin, soften and lubricate hair.

Glands

& Sebum keeps the keratinized cells of the epidermis flexible and waterproof.

& The production of sebum is stimulated by hormones.

Glands

& Sebaceous glands are usually attached by ducts to hair follicles.

& Sebum coats hair, prevents excessive water loss, and softens hair.

Glands

& Sebum also protects the skin because it is toxic to some bacteria.

Glands

⌘ Hair is distributed over our entire skin surface except the palms, soles of the feet, lips, and nipples.

⌘ Our body hair functions to sense insects on the skin before they sting us.

- ‡ Hair on the scalp guards the head against physical trauma, heat loss, and sunlight.
- ‡ Eyelashes shield the eyes.
- ‡ Nose hairs filter large particles out of the air we breathe.

Hair Functions

& Hair is produced by cells at the base of hair follicles.

& The cells at the base of the follicle are the only ones that divide.

Hair

- ⌘ Hair follicles are tube-like pockets of epidermal cells that extend into the dermis.
- ⌘ Individual hairs are long columns of dead cells.
- ⌘ The cells are filled with keratin as they are pushed to the top.

Hair

⌘ The keratin in hair is much harder than the keratin found in epidermal cells, which is good for two reasons:

- A) It is tougher and more durable.
- B) Its individual cells do not flake off.

& Hair protects and insulates the body.

& Most individual hairs grow for several years and then fall out.

Hair

&A bundle of smooth muscle cells are attached to the hair follicle at the root.

&The muscle is called the arrector pili muscle.

Hair

& Goose bumps are caused by contractions of the arrector pili muscle.

& This produces heat, just like shivering does.

Hair

- & Hair color is the result of melanin.
- & There are different types of melanin that are different colors.
- & The mixture of pigments results in your hair color.
- & Grey or white hair results from decreased melanin production.

Hair

& What do skin color and hair color have in common?

⌘ A nail is a scale like modification of the epidermis.

⌘ Nails form a clear protective covering on the dorsal surface at the end of a finger or toe.

&Nails grow from an area of rapidly dividing cells known as the nail matrix.

&The nail matrix is located near the tips of the fingers and toes.

Nails

& During cell division, the cells fill with keratin.

& The keratinized cells cover and protect the tips of finger and toes.

Nails

- ⌘ Nails rest on a bed of tissue filled with blood vessels, which is why they appear pink.
- ⌘ Nails grow at a rate of 0.5-1.2 mm per day, with fingernails growing faster than toenails.

Nails

& What do the growth of the epidermis, hair, and nails all have in common?

&The skin has several sensory receptors found in the dermis and subcutaneous layers.

Sensory Receptors

Receptor Name	Detects
Meissner's Corpuscles	Light touches
Pacinian Corpuscles	Deep pressure
Free Nerve Endings	Pain

Sensory Receptors

Unique Skin Features and Abnormalities

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- ⌘ Fingerprints are a result of rises in the epidermis due to the dermal papillae pushing up.
- ⌘ The raised areas of a fingerprint are called epidermal ridges.
- ⌘ The ridges increase friction and enhance gripping for fingers and feet.

Fingerprints

& What substance do you think causes fingerprints to be left behind on the things we touch?

& Sweat causes fingerprints to be left on things we touch.

& Genetics and the environment give each of us a unique set of fingerprints.

Fingerprints

⌘ Predict how you think freckles
form.

- & Freckles are flat brown or black spots that are the result of sun exposure.
- & The sun exposure causes an accumulation of melanin.
- & Freckles are most common on light skinned people who burn easily.

Freckles and Moles

& Moles are an abnormal collection of melanocytes in the skin.

& The melanocytes grow in a cluster instead of being spread throughout the skin.

Freckles and Moles

& Red or purple birthmarks are called port wine birthmarks.

& They are caused by a dense collection of dermal capillaries, just beneath the surface of the skin..

Birthmarks

&Port wine birthmarks grow as the body grows.

&Brown birthmarks are caused by an overproduction of melanin.

Birthmarks

&What do you think causes acne?

&Clogging of ducts of sebaceous glands results in acne.

&Acne is an active inflammation of sebaceous glands caused by bacterial infection.

Acne

- ‡ The ducts can become clogged with excessive amount of sebum, dead cells, and bacteria.
- ‡ Whiteheads are the result of a blocked sebaceous gland.
- ‡ Blackheads are the result of oxidized sebum that dries out.

Acne

- ⌘ Predict what you think causes a blister.
- ⌘ Predict what you think causes a callus.

& Excessive friction causes blisters.

& Blisters are caused by the separation of the epidermis from the dermis.

Blisters and Calluses

& Blisters often fill with fluid to try and heal the epidermis.

& When the skin is under continuous pressure, the rate of mitosis increases.

Blisters and Calluses

- ⌘ This creates a thicker layer of epidermis.
- ⌘ The end result is a callus.

Blisters and Calluses

Homeostatic Imbalances of the Skin {

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⌘ I can describe imbalances in the skin that indicate disease.

⌘ I can define skin cancer.

⌘ I can explain the causes of skin cancer.

⌘ I can describe factors that increase the risk of skin cancer.

• Burns are caused by flames,
hot water, steam, sun,
electricity, and chemicals.

Burns

& The severity of burns ranges from minor to life threatening.

& Classification of burns is based on the amount of damage.

Burns

& What are the three types of burns?

& What is the most damaging type of burn?

& In first degree burns, only the top layer of the epidermis is burned.

& First-degree burns cause the death of epidermal cells.

Burns

- ⌘ They are painful, but no blistering occurs.
- ⌘ An example of a first degree burn is a sun burn.
- ⌘ In second degree burns, the deeper layers of the epidermis are affected and the upper layer of the dermis.

Burns

- ⌘ Second-degree burns often result in pain, inflammation, and blisters.
- ⌘ In third degree burns, the entire epidermis and dermis is destroyed.

Burns

⌘ If the nerves in the dermis are destroyed, third-degree burns are not painful.

Burns

& Why are 3rd degree burns
life threatening?

⌘ Third-degree burns are the most dangerous because the body's first defense is gone.

⌘ In third-degree burns, living tissue is exposed to the environment and is susceptible to infection and dehydration.

Burns

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Burns

- ⌘ Extreme stretching of the skin, like during periods of rapid growth and pregnancy results in dermal tearing.
- ⌘ The tearing leaves white scars known as stretch marks.

Stretch Marks

- ⌘ If blood oxygen is restricted to the skin cells, the cells die and cause ulcers.
- ⌘ Bedridden patients need to be turned regularly to increase blood flow.

Bedsores

& Poorly oxygenated blood results in a blue color at the skin's surface.

Cyanosis

⌘ Reddened skin can indicate embarrassment, fever, high blood pressure, inflammation, or allergy.

Redness

&Pale skin can indicate
anemia, low blood pressure,
fear, or anger.

Pale Skin (Pallor)

&Jaundice is caused by a liver disorder.

&It results in a yellow tone to the skin.

&The yellow tone is the result of bilirubin build up (bile pigment).

&Many babies are born with jaundice.

&The bilirubin will break down under UV light.

Jaundice

&A bronze, metallic appearance of the skin is a sign of Addison's disease, which is the result of an overactive adrenal gland.

Bronzing

⌘ Bruises are the result of
blood clots under the skin.

Bruises

- & Affects 1 in 5 Americans.
- & Caused by UV damage to DNA
- & Cancer is the uncontrolled growth of cells.
- & Skin cancer affects specific skin cells.
- & There are 3 basic types of skin cancer.

Skin Cancer

&The prefix carcin- means cancer.

&The suffix –oma means tumor or growth.

&Basal cell carcinoma is the most common skin cancer and the least malignant.

&It affects the basal cells in the stratum basale layer.

Basal Cell Carcinoma

- &Most commonly found on sun-exposed areas of the face.
- &Signs of the cancer include a shiny, dome-shaped nodule.
- &Slow growing cancer that rarely spreads.
- &Removal by surgery.

Basal cell carcinoma

- & 2nd most common type of skin cancer.
- & Affects the keratinocytes of the stratum spinosum.
- & Signs include a scaly, reddened bump.
- & Grows rapidly and can spread (metastasize) if not removed.
- & Removal by surgery or radiation therapy.

Squamous Cell Carcinoma

- ⌘ Most dangerous type of skin cancer.
- ⌘ Highly metastatic, resistant to chemotherapy.
- ⌘ 1/3 of all cases are from moles (spreading brown to black patch)
- ⌘ The key to fighting melanoma is early detection.
- ⌘ Surgery is required.

Melanoma