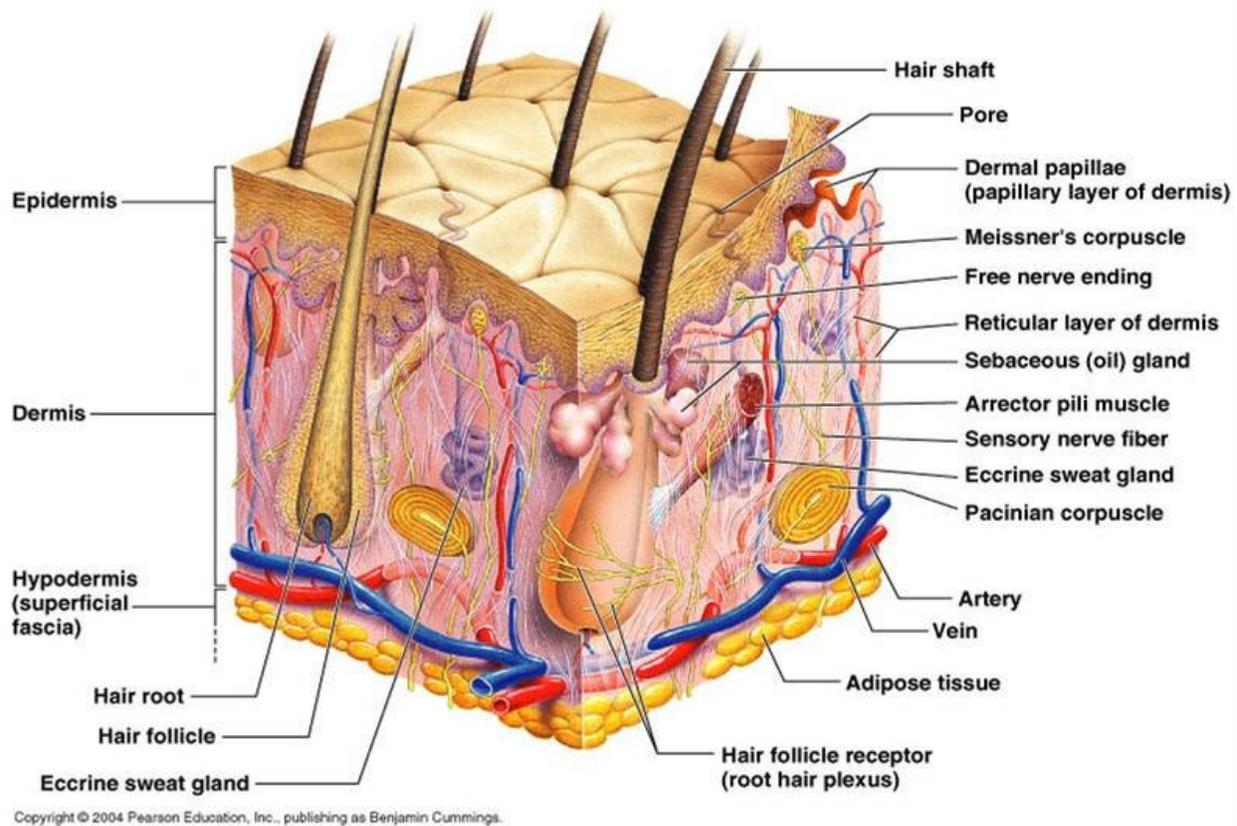


STRUCTURE OF THE SKIN



SKIN/ CUTANEOUS MEMBRANE

- largest organ of the body
- 22 square feet
- 4.5- 5kg
- 7% of total body weight

PRIMARY LAYERS

✚ EPIDERMIS

- composed of keratinized stratified squamous epithelium
- derived from the ectodermal germ layer of the embryo
- avascular
- nourished by diffusion from capillaries of the papillary layer

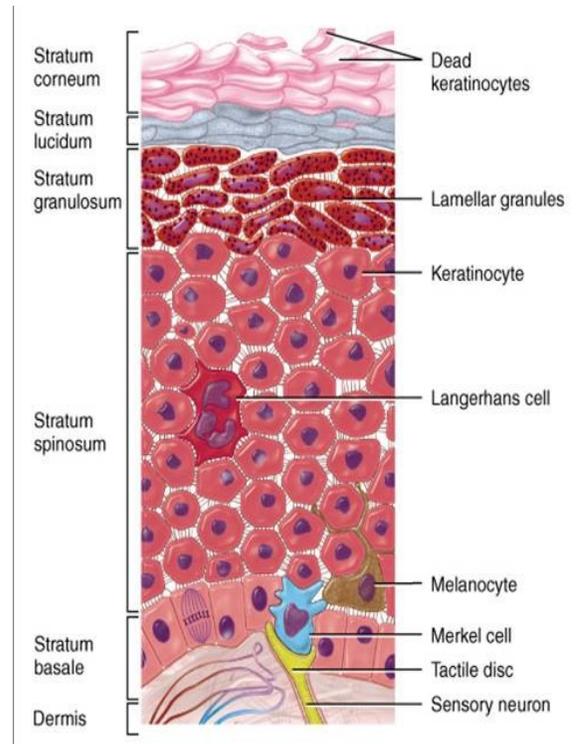
CELL TYPES

• KERATINOCYTES

- 90%
- 4-5 layers and produce the protein **keratin**- tough fibrous protein that helps protect the skin and underlying tissues from abrasions, heat, microbes and chemicals
- Produce **lamellar granules**- release water repellent sealant; inhibits entry of foreign materials

* CORNEOCYTES- flattened keratinocytes

- **MELANOCYTES**
 - 5%
 - Produce the pigment **melanin**- yellow- red or brown- black pigment
 - serve to decrease the amount of ultraviolet (UV) light that can penetrate into the deep layers of the skin
- **LANGERHANS CELLS/ EPIDERMAL DENDRITIC CELLS**
 - arise from red bone marrow and migrate to the epidermis
 - participate in the immune responses mounted against microbes that invade the skin
- **MERKEL CELLS/ TACTILE EPITHELIAL CELLS**
 - Least numerous of the epidermal cells
 - located in the deepest layer of epidermis
 - connect to sensory nerve endings to form structures that serve as light touch receptors



intermediate filaments (tonofilaments)

-undergo mitosis to produce new keratinocytes and then migrate through the other layers until they are shed

❖ **STRATUM SPINOSUM (spiny layer)**

- Cells arranged in 8- 10 layers with desmosomes that pull cells into spiny shapes

- cells rich in RNA

- Functions in the production of keratin fibers; formation of lamellar bodies

❖ **STRATUM GRANULOSUM (granular layer)**

- 3-5 layers of flattened keratinocytes that are undergoing **apoptosis**

- Functions in the production of keratohyalin granules;

CELL LAYERS

The cells of the epithelium are found in up to five distinct layers or *strata* (meaning "layer")

❖ **STRATUM BASALE (base layer)**

- Also called *stratum germinativum*

- Single layer of columnar cells

- contain scattered keratin

lamellar bodies release lipids from cells

❖ **STRATUM LUCIDUM (clear layer)**

- 4-6 rows of clear, flat, dead keratinocytes
- Cells filled with keratin precursor called eleidin
- absent in thin skin

❖ **STRATUM CORNEUM (horny layer)**

- Most superficial layer
- 25- 30 rows of dead, flat keratinocytes that contain mostly keratin
- prevents water loss by lipids surrounding cells
- Desquamation of most superficial cells resists abrasion

EPIDERMAL GROWTH AND REPAIRING

- Turnover or regeneration time refers to time required for epidermal cells to form in the stratum basale and migrate to the skin surface- about 35 days.
- *Epidermal Growth Factor (EGF)* regulates epidermal growth and repair
- Shortened turnover time will increase the thickness of the stratum corneum and result in callus formation
- 10%- 12% of all cells in stratum basale enters mitosis daily
- Each group of 8- 10 basal cells in mitosis with their vertical columns of migrating keratinocytes is called *epidermal proliferating unit or EPU*

* Excessive amount of keratinized cells shed from the skin of the scalp is called *dandruff*

➤ **DERMOEPIDERMAL JUNCTION (DEJ)**

-a basement membrane, with unique fibrous elements, and a polysaccharide gel serve to “glue” the epidermis to the dermis

✚ **DERMIS/ CORIUM**

- Sometimes called the “true skin”
- thicker than the epidermis
- Vascular
- composed of dense irregular connective tissue containing collagen and elastic fibers
- Ability to be stretched and recoiled easily

FUNCTION:

- Protection against mechanical injury and compression
- provides reservoir storage area for water and important electrolytes.

CONSISTS OF:

- Variety of living cells
- Sweat and oil glands
- Hair follicle
- Sensory receptors

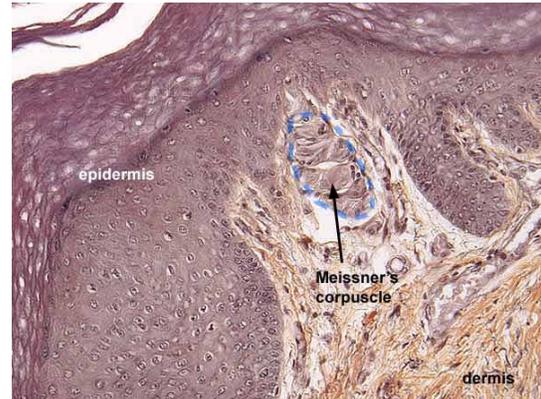
LAYERS OF DERMIS

❖ **PAPILLARY LAYER**

- Loose fibrous tissue with collagenous dense irregular fibrous tissue
- *Papilla* is the Latin word for “nipple”

* *epidermal ridges* form unique pattern in each of us- an anatomical fact made famous by the art of fingerprinting- well defined on the tips of fingers and toes

**dermal papillae*- bumps formed by the thin superficial layer of the dermis



CONTAINS VARIOUS STRUCTURE

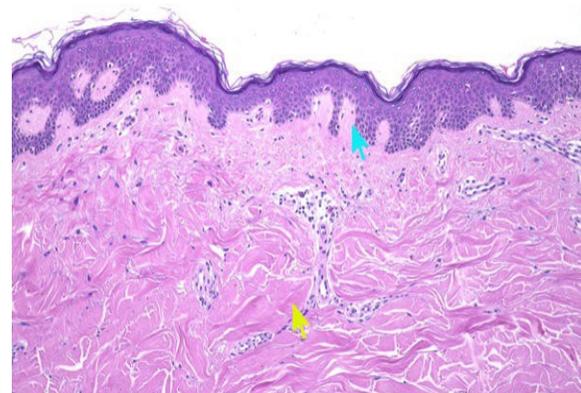
- Capillary loops
- Tactile receptors/ Meissner corpuscles
 - nerve endings that are sensitive to touch
- Free nerve endings
 - initiate signals that give rise to sensations of warmth, coolness, pain, tickling, and itching

❖ RETICULAR REGION

- attached to the subcutaneous layer
- contains dense, interlacing white collagenous fibers and elastic fibers
- Collagen fibers arranged in a netlike manner and have more regular arrangement
- Point of attachment for numerous skeletal and smooth muscle fibers



Skin Receptors. Receptors are sensitive nerve endings that make it possible for the skin to act as a sense organ.



▶ Papillary dermis

▶ Reticular dermis

DERMAL GROWTH AND REPAIR

- Dermis does not continually shed and regenerate itself
- During wound healing, fibroblasts begin forming an unusually dense mass of new connective fibers; if not replaced by normal tissue, this mass remains a scarlet
- Cleavage lines- patterns formed by the collagenous fibers of the reticular layer of the dermis; also called Langer's lines

HYPODERMIS/ SUBCUTANEOUS LAYER/SUPERFICIAL FASCIA

- Not part of the skin, but lies deep to the dermis
- Loose fibrous and adipose tissue
- Forms a connection between the skin and the underlying structures of the body

FUNCTIONS OF THE INTEGUMENTARY SYSTEM**PROTECTION**

- against abrasion and ultraviolet light
- prevents entry of microorganisms
- prevents dehydration by reducing water loss from the body

SENSATION

- sensory receptors that can detect heat, cold, touch, pressure, and pain

**TEMPERATURE REGULATION
(THERMOREGULATION)**

- control of blood flow through the skin and the activity of sweat glands

VITAMIN D PRODUCTION

-skin produces a molecule that can be transformed into Vitamin D whenever exposed to ultraviolet light

- calcitriol : the most active form of vitamin D; a hormone that aids in the absorption of calcium in foods from the gastrointestinal tract into the blood.

EXCRETION and ABSORPTION

-small amounts of waste products are lost through the skin and in gland secretions

- excretion : elimination of substances from the body

- absorption: the passage of materials from the external environment into body cells.

BLOOD RESERVOIR

-the dermis houses an extensive network of blood vessels that carry 8-10% of the total blood flow in a resting adult.

SKIN COLOR

- Melanin – causes the skin color to vary from pale yellow to reddish brown to black.
 - *pheomelanin* –yellow to red
 - *eumelanin*- brown to black

-*melanocytes*- melanin-producing cells; present in mucous membranes; differences in skin color are due mainly to the amount of pigments produced and transferred by the melanocytes to the keratinocytes.

- Carotene

-yellow-orange pigment that gives egg yolk and carrots their color; precursor of vitamin A ; used to synthesize pigments needed for vision

BURNS

Burn: tissue damage caused by excessive heat , electricity, radioactivity, and corrosive chemicals break down the proteins in the skin cells.

Partial-thickness Burns

First-degree burn- only in epidermis; mild pain and redness but no blister; 3-6 days of healing

Example: sunburn

Second-degree burn- destroys the epidermis and part of the dermis; some skin functions are lost; redness, blister formation, edema, and pain result

Full-thickness Burn

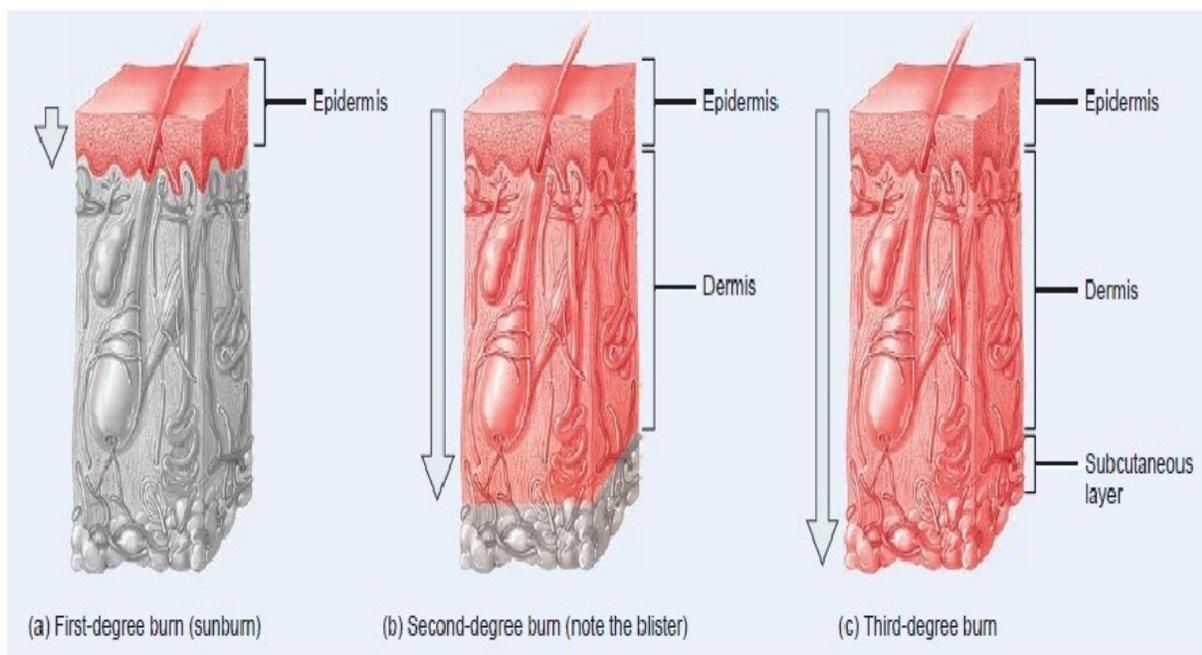
Third-degree burn- epidermis, dermis, and subcutaneous layer are destroyed; slow regeneration

Systemic effects of burn

- 1) Large loss of water, plasma and plasma proteins which causes shock
- 2) Bacterial infection
- 3) Reduced circulation of blood
- 4) Decreased production of urine
- 5) Diminished immune responses

Rule of nines

- a) Count 9% if both the anterior and posterior surfaces of the head and neck are affected
- b) Count 9% for both the anterior and posterior surfaces of each upper limb
- c) Count 36% for both the anterior and posterior surfaces of the trunk, including the buttocks.
- d) Count 9% for the anterior and 9% for the posterior surfaces of each lower limb as far up as the buttocks.
- e) Count 1% for the perineum.



APPENDAGES OF THE SKIN

HAIR

- Or pili
- Present on most skin surfaces except the palms, soles, lips, nipples, parts of the genitalia, plantar surfaces of the feet and the distal segments of the fingers and toes
- Composed of dead keratinized epithelial cells

Functions of a Hair

- a. Hair on the head guards the scalp from injury and the sun's rays
- b. Decrease heat loss from the scalp
- c. Eyebrows and eyelashes protect the eyes from foreign particles, also the hair in the nostrils and external ear canal
- d. Functions in sensing light touch

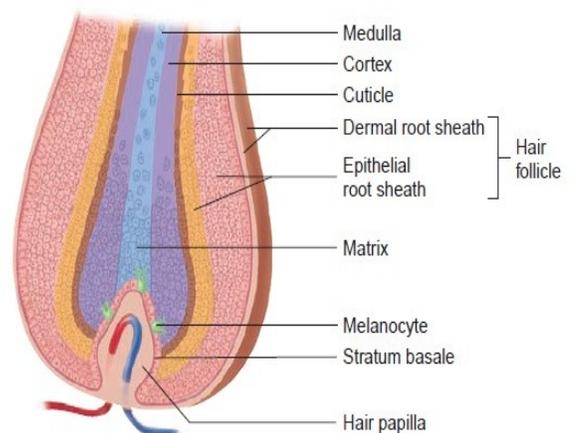
Parts of a Hair

- a. **Hair Shaft** – superficial portion of the hair that protrudes above the surface of the skin
- b. **Hair Root** – part of the hair deep to the shaft that penetrates into the dermis and sometimes into the subcutaneous layer
- c. **Medulla** – the inner core of a hair; composed of two or three rows of irregularly shaped cells

- d. **Cortex** - forms the major part of the shaft and consists of elongated cells
- e. **Cuticle** – the covering layer; a single layer of overlapping cells that holds the hair in the hair follicle
- f. **Hair follicle** – tube like invagination of the epidermis into the dermis from which the hair develops ; surrounds the hair root

Consists of:

- a. **Dermal root sheath** – portion of the dermis that surrounds the epithelial root sheath
- b. **Epithelial root sheath** - made up of an external root sheath and an internal root sheath

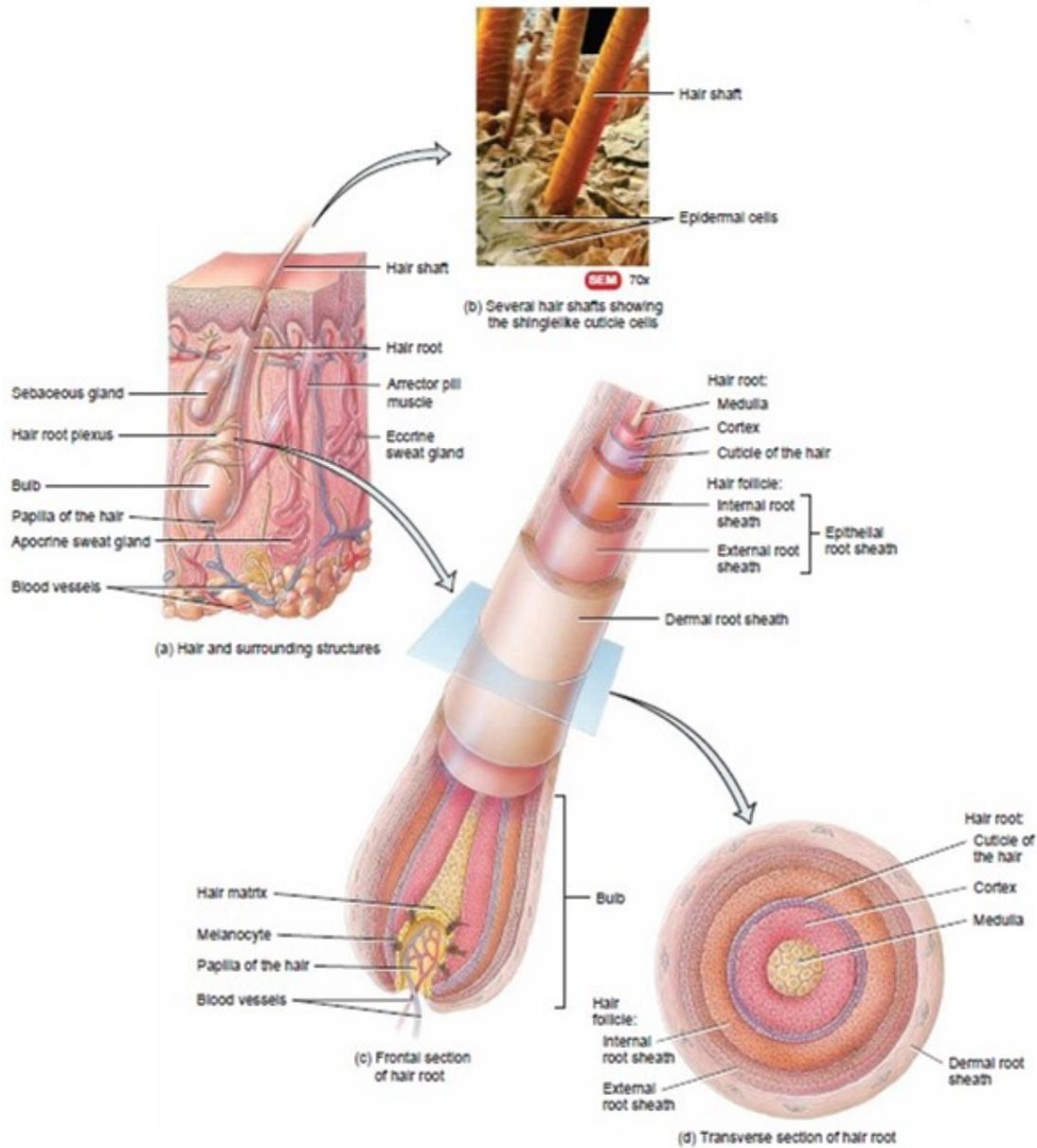


- g. **Hair Bulb** – onion-shaped base structure of each hair follicle
- h. **Hair Papilla** – nipple-shaped indentation; contains areolar connective tissue and many blood vessels that nourish the growing hair follicle
- i. **Hair Matrix** – site of cell division
- j. **Hair Root Plexuses** – dendrites of neurons that surround hair follicles; sensitive to touch

***ARRECTOR PILI MUSCLE** – associated with hair follicle; smooth muscle cells; Contraction of the arrector pili muscle causes the hair to become more perpendicular to the skin’s surface, or to “stand on end”, and also produces a raised area of skin called “goose flesh”.

Development of Hair

Before birth, tiny tubular pockets, hair follicles, begin to develop in parts of the skin. By about the sixth month of pregnancy the developing fetus is all but covered by an extremely fine and soft hair coat, called lanugo. Soon after birth, any lanugo hair



that remains is lost and then replaced by vellus hair, which is stronger, fine, and usually less pigmented. Hair growth appears first on the scalp, eyelids and eyebrows. At puberty, the coarse pubic and axillary hair is called terminal hair.

Hair Growth

a. Growth (Anagen) Stage

Cells of the hair matrix divide and undergo keratinization.

The hair grows longer as these cells are added to the base of the hair within the hair bulb.

b. Regression (Catagen) Stage

The cells of the hair matrix stop dividing, the hair follicles atrophies, and the hair stops growing.

c. Resting (Telogen) Stage

A new hair is formed, and the old hair falls out.

Hair Color

Hair color is determined by varying amounts and types of melanin. Dark-colored hair contains mostly eumelanin (brown to black); blond and red hair contain variants of pheomelanin (yellow to red). With age, the amount of melanin in hair can decrease, causing the hair to become faded in color, or the hair can have no melanin and be white.

SKIN GLANDS

a. Sebaceous Glands (Oil Glands)

- Simple, branched acinar (rounded) glands
- Most are connected by a duct to the superficial part of a hair follicle
- Absent in the palms and soles

- Secrete an oily white substance called Sebum
- Sebum – a mixture of triglycerides, cholesterol, proteins, and inorganic salts. Sebum lubricates the hair and the surface of the skin, which prevents drying and protects against some bacteria

b. Sudoriferous Glands (Sweat Glands)

- About three to four million

1. Eccrine Sweat Glands

- Simple, coiled tubular glands
- Most numerous in palms and soles
- The sweat produced consists of water, ions, urea, uric acid, ammonia, amino acids, glucose and lactic acid

• Functions:

1. Thermoregulatory Sweating

Helps the body to achieve thermoregulation

*Insensible Perspiration – sweat that evaporates from the skin before it is perceived as moisture

*Sensible Perspiration – sweat that is excreted in larger amounts and is seen as moisture on the skin

2. Elimination of wastes – urea, uric acid, and ammonia from the body

3. Emotional Sweating or Cold Sweat – sweat in response to emotional stress such as fear or embarrassment

2. Apocrine Sweat Glands

- Simple, coiled tubular glands
- Found mainly in the skin of the axilla, groin, areolae of the breasts, and bearded regions of the face of adult males
- Sweat appears milky or yellowish in color
- Begin to function until puberty
- Interacts with bacteria producing body odor
- Active during emotional sweating, secrete sweat during sexual activities
- Do not play a role in thermoregulation

COMPARISON OF ECCRINE AND APOCRINE SWEAT GLANDS

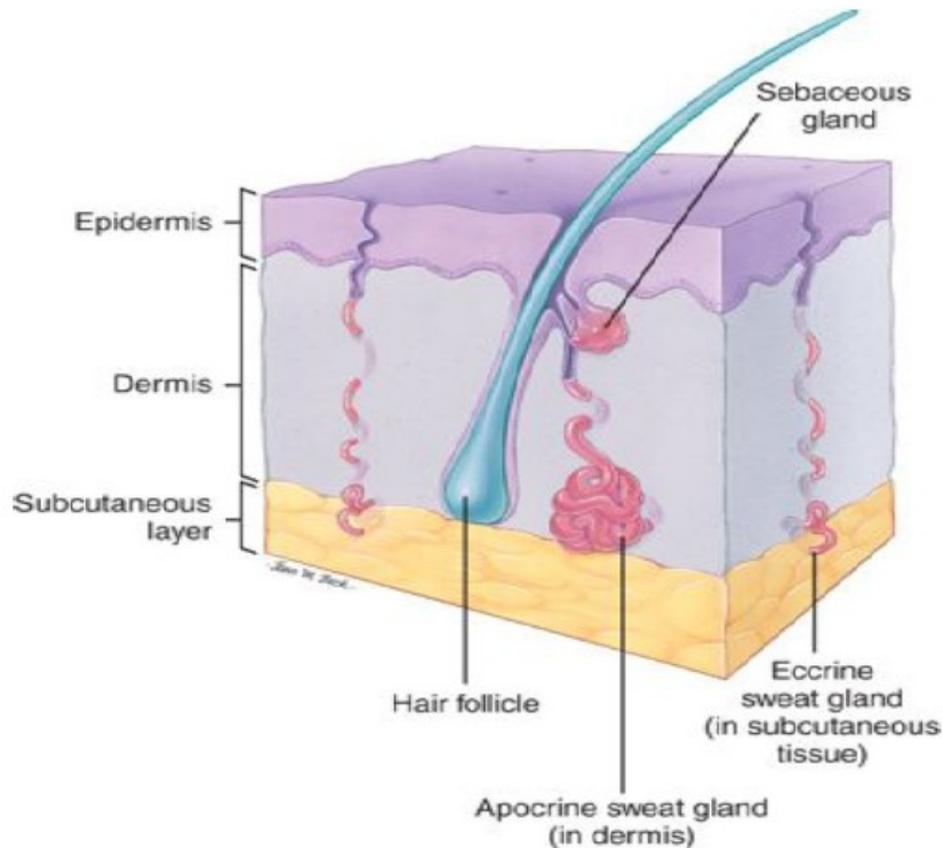
FEATURE	ECCRINE SWEAT GLANDS	APOCRINE SWEAT GLANDS
Distribution	Throughout skin of most regions of the body, especially in skin of forehead, palms, and soles	Skin of the axilla, groin, areolae, bearded regions of the face, clitoris, and labia minora
Location of secretory portion	Mostly in deep dermis	Mostly in subcutaneous layer
Termination of excretory duct	Surface of epidermis	Hair follicle
Secretion	Less viscous; consists of water, ions (Na ⁺ , Cl ⁻), urea, uric acid, ammonia, amino acids, glucose, and lactic acid	More viscous; consists of the same components as eccrine sweat glands plus lipids and proteins
Functions	Regulation of body temperature, waste removal, and stimulated during emotional stress	Stimulated during emotional stress and sexual excitement
Onset of function	Soon after birth	Puberty

c. Ceruminous Glands

- Modified sweat glands in the external ear
- Produce a waxy lubricating secretion
- Cerumen or Earwax – a yellowish that is a combined secretion of the ceruminous and sebaceous glands

d. Mammary Glands

- Modified apocrine sweat glands located in the breasts
- Produce milk



NAILS

- A thin plate, consisting of layers of dead stratum corneum cells that a very hard type of keratin
- Nails grow at an average rate of 0.5–1.2 mm per day, and fingernails grow more rapidly than toenails.

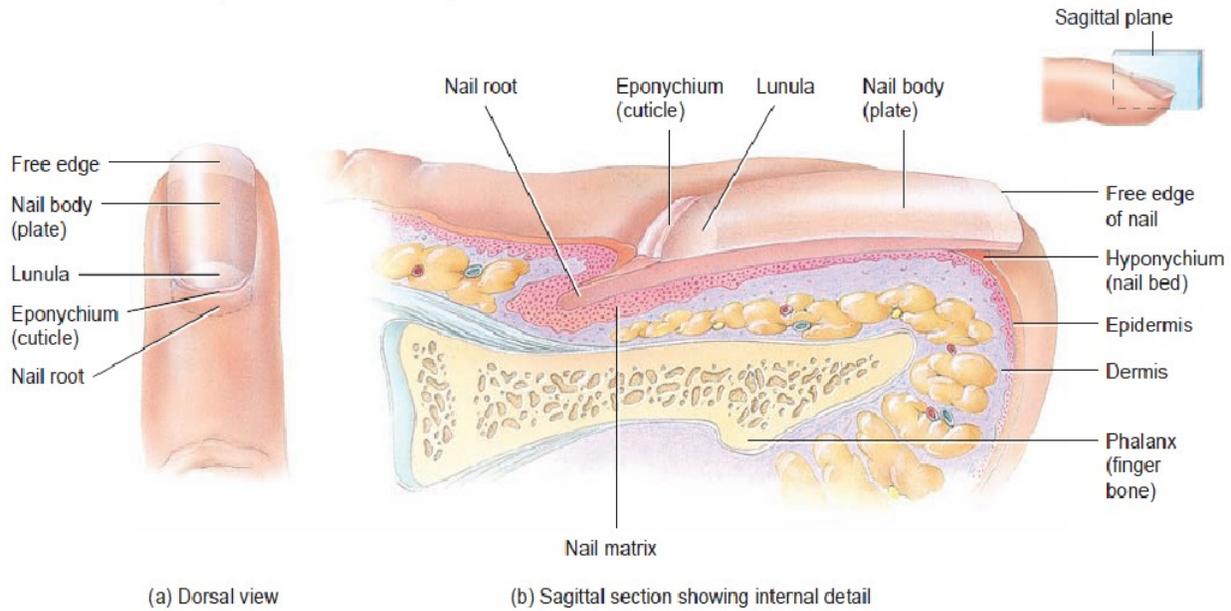
- e. **Lunula** – whitish, crescent-shaped area at the base of the nail
- f. **Hyponychium or Nail Bed** – secures the nail to the fingertip
- g. **Nail Matrix** – proximal portion of the epithelium deep to the nail root. Nail matrix cells divide mitotically producing new ones

Parts of a nail

- a. **Nail Body** – visible part of the nail
- b. **Free edge** – part of the nail body that may extend past the distal end of the digit
- c. **Nail Root** – part of the nail covered by skin
- d. **Eponychium or Cuticle** – stratum corneum that extends onto the nail body

Functions of a nail

- a. Protect the distal ends of the digits
- b. Provide support and counterpressure to the palmar surface of the fingers to enhance touch perception and manipulation
- c. Allow humans to grasp and manipulate small objects

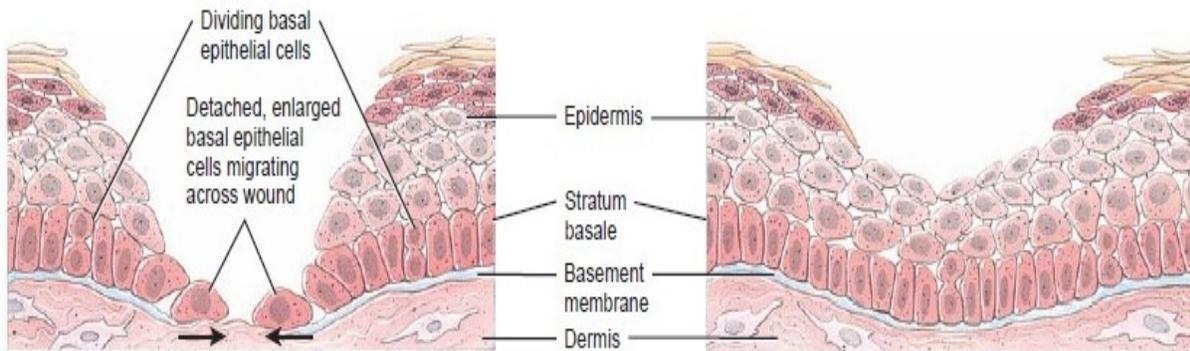
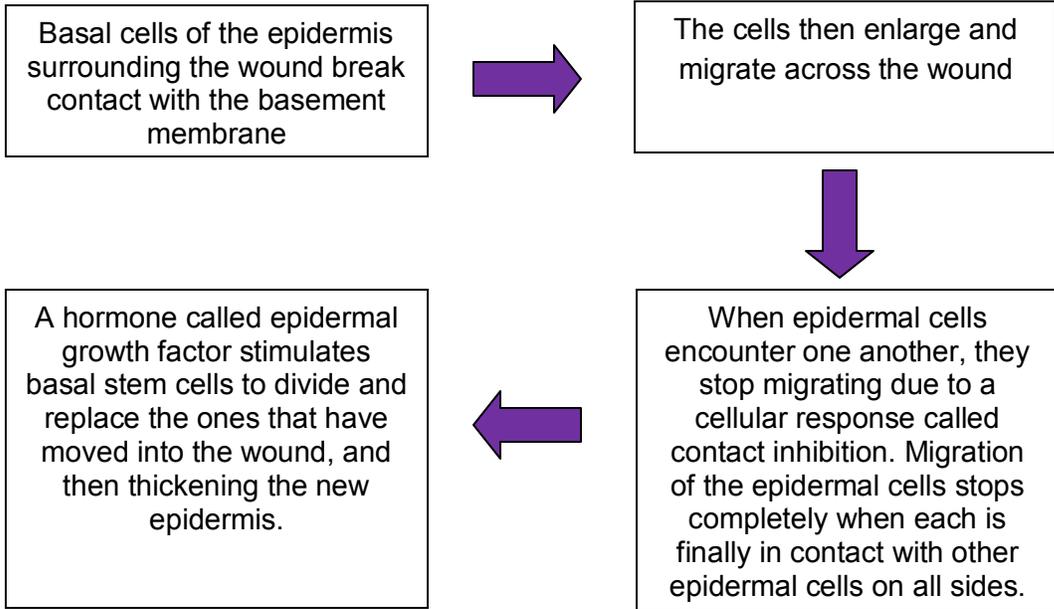


**COMPARISON OF TYPES OF SKIN
(THIN AND THICK SKIN)**

FEATURE	THIN SKIN	THICK SKIN
Distribution	All parts of the body except areas such as the palms and palmar surface of digits, and soles	Areas such as the palms, palmar surface of digits, and soles
Epidermal Thickness	0.10 – 0.15 mm (0.004 – 0.006 in.)	0.6 – 4.5 mm (0.024 – 0.28 in.)
Epidermal Strata	Stratum lucidum essentially lacking; thinner strata spinosum and corneum	Thick strata lucidum, spinosum, and corneum
Epidermal Ridges	Lacking due to poorly developed and fewer and less-well-organized dermal papillae	Present due to well-developed and more numerous dermal papillae organized in parallel rows
Hair Follicles and Arrector Pili muscles	Present	Absent
Sebaceous Glands	Present	Absent
Sudoriferous Glands	Fewer	More numerous
Sensory Receptors	Sparser	Denser

MAINTAINING HOMEOSTASIS: SKIN WOUND HEALING

Epidermal Wound Healing



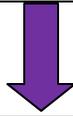
(a) Division of basal epithelial cells and migration across wound

(b) Thickening of epidermis

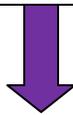
Epidermal wound healing

Deep Wound Healing

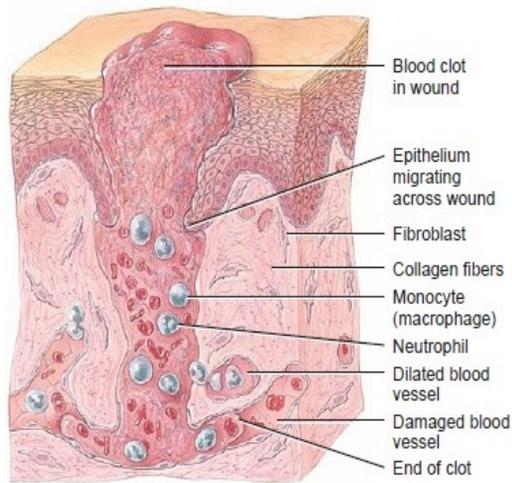
Inflammatory phase - a blood clot forms in the wound and loosely unites the wound edges. This phase of deep wound healing involves inflammation, a vascular and cellular response that helps eliminate microbes, foreign material, and dying tissue in preparation for repair.



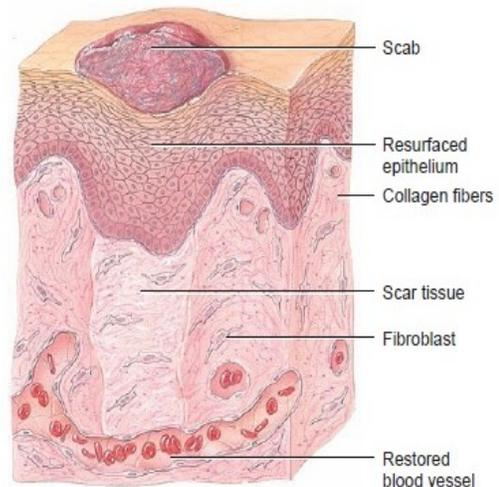
Migratory phase - the clot becomes a scab, and epithelial cells migrate beneath the scab to bridge the wound. Fibroblasts migrate along fibrin threads and begin synthesizing scar tissue (collagen fibers and glycoproteins), and damaged blood vessels begin to regrow. During this phase, the tissue filling the wound is called granulation tissue.



Maturation phase - the scab sloughs off once the epidermis has been restored to normal thickness. Collagen fibers become more organized, fibroblasts decrease in number, and blood vessels are restored to normal.



(c) Inflammatory phase



(d) Maturation phase

Deep wound healing

DISEASE MECHANISMS

Acne

Acne is a skin disease marked by pimples on the face, chest, and back. The most common skin disease. Increased levels of androgens cause the sebaceous glands to secrete an excessive amount of sebum into hair follicles. The excess sebum combines with dead, sticky skin cells to form a hard plug that blocks the follicle.



Albinism

Albinism refers to a group of inherited conditions. People with albinism have absent or reduced pigment in their eyes, skin or hair. They have inherited genes that do not make the usual amounts of a pigment called melanin which is essential for the full development of the retina.



Alopecia Areata

Is an autoimmune skin disease that causes the body's immune system to attack the hair follicles, causing baldness in patches. Hair is lost in some or all regions of the body, mostly the scalp, thereby, resulting into baldness. This condition is also known as spot baldness as it conduces to bald spots on the scalp in the initial stages.

**Athlete's foot**

Athlete's foot is a common fungus infection in which the skin between the toes becomes itchy and sore, cracking and peeling away. Properly known as tinea pedis, the infection received its common name because the infection causing fungi grow well in warm, damp areas such as in and around swimming pools, showers, and locker rooms (areas commonly used by athletes). It is contagious fungal infection of the foot



Atopic dermatitis

Atopic dermatitis is a very common, often long-lasting skin disease that affects a large percentage of the world's population. It is a special type of allergic hypersensitivity that includes a triad of conditions that includes asthma, inhalant allergies (hay fever), and a chronic dermatitis (eczema). There is a known hereditary component of the disease, and it is more common in affected families. Criteria that enable your doctor to diagnose it include the typical appearance and distribution of the rash in a patient with a personal or family history of asthma and/or hay fever.

**Cellulitis**

Cellulitis is a bacterial infection of the skin and tissues beneath the skin. It is an infection that also involves the skin's deeper layers: the dermis and subcutaneous tissue. Cellulitis is fairly common and affects people of all races and ages. Men and women appear to be equally affected. Although it can occur in people of any age, it is most common in middle-aged and elderly people.



Chloasma

Patchy discoloration of the face. It is splashes of darkened skin that may appear on the forehead, nose, and cheeks in a mask-like configuration on some pregnant women — more often in dark-skinned women.

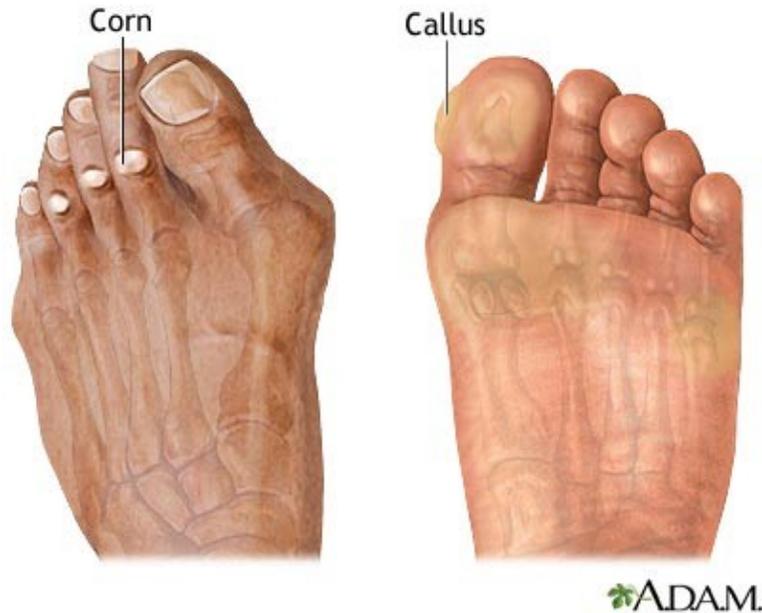
**Contact dermatitis**

A skin condition caused by contact between skin and some substance. Includes irritant contact dermatitis (a rash brought on purely by repeated irritation from a substance such as water causing "dish pan hands") and allergic contact dermatitis (involving a specific sensitivity or allergy to a specific substance such as poison ivy).



Corns and Callouses

Corns and calluses are annoying and sometimes painful thickenings that form in the skin in areas of pressure. The medical term for the thickened skin that forms corns and calluses is hyperkeratosis. A callus refers to a more diffuse, flattened area of thick skin, while a corn is a thick, localized area that usually has a conical or circular shape. Corns, also known as helomas, sometimes have a dry, waxy, or translucent appearance.

**Dandruff**

Dandruff is sometimes caused by frequent exposure to extreme heat and cold. As it is normal for skin cells to die and flake off, a small amount of flaking is normal and common.



Decubitus Ulcer (Pressure Sore)

A bed sore, a skin ulcer that comes from lying in one position too long so that the circulation in the skin is compromised by the pressure, particularly over a bony prominence such as the sacrum (sacral decubitus).

**Dermatitis**

The word dermatitis is a general term used to describe inflammation of the skin. There are different types of dermatitis, including seborrheic dermatitis and atopic dermatitis (eczema). This disorder can have scores of causes and can surface in various forms, starting out as an itchy rash and spreading to increase with redness and swelling. This skin disorder is not life-threatening or contagious, however, it can cause one to feel really uncomfortable and self-conscious.



Eczema

A disease in a form of dermatitis, or inflammation of the epidermis. The term "eczema" is broadly applied to a range of persistent skin conditions. These include dryness and recurring skin rashes that are characterized by one or more of these symptoms: redness, skin edema (swelling), itching and dryness, crusting, flaking, blistering, cracking, oozing, or bleeding. Areas of temporary skin discoloration may appear and are sometimes due to healed lesions, although scarring up is rare. Eczema is often likely to be found on the flexor aspect of joints.

**Furuncles (Boils)/Carbuncles**

A boil, also known as a furuncle is a skin abscess, a painful bump that forms under the skin - it is full of puss. A carbuncle is collection of boils that develop under the skin. When bacteria infect hair follicles they can swell up and turn into boils.



Herpes Simplex I/ Cold Sores

Herpes simplex virus (HSV) can cause infections that affect the mouth, the face, the genitals, the skin, the buttocks, and the anal area. Many people acquire the virus and have no symptoms. For others, painful blisters appear near the area where the virus entered the body. Typically, the blisters heal completely but reappear at some point in the future when least expected.

**Herpes zoster/Shingles**

Shingles is a skin rash caused by a nerve and skin inflammation from the same virus that previously caused chickenpox. This virus is called the varicella zoster virus (VZV) and belongs to the herpes family of viruses. After an individual has chickenpox, this virus lives dormant in the nervous system and is never fully cleared from the body.



Hirsutism

Hirsutism is excessive hair growth in certain areas of a woman's face and body, such as the mustache and beard area, that creates a "male pattern" of hair. Women normally can have fine, pale, faintly visible hair in these areas, but heavy hair growth in a male pattern with coarse or colored hair is not expected.

**Ichthyosis Vulgaris**

Ichthyosis vulgaris is a skin disorder in which skin takes on the appearance of fish scales. The Mayo Clinic says ichthyosis vulgaris typically presents itself in childhood but can be present at birth. Specific symptoms include dry skin, a flaky scalp, tile-like scales on the skin and painful cracks in the palms of the hands and soles of the feet.



Impetigo

Impetigo is a highly contagious skin infection that is most common in children, it is caused by the *staphylococcus aureus*, or more rarely *streptococcus pyogenes* bacteria. Children account for about 70% of all cases. The first sign of impetigo is a patch of red, itchy skin. In colder countries most cases of impetigo are caused by *staphylococcus aureus*, while in warmer countries the infection can be caused by both types of bacteria.

**Kaposi's sarcoma**

Kaposi's sarcoma (KS) is a tumor caused by Human herpesvirus 8 (HHV8), also known as Kaposi's sarcoma-associated herpesvirus (KSHV). It differs from other cancers as it starts in several areas of the body at once, while other forms of cancer start in one place and then spread.



Lupus Erythematosus

Lupus is an autoimmune disease characterized by acute and chronic inflammation of various tissues of the body. Autoimmune diseases are illnesses that occur when the body's tissues are attacked by its own immune system. People with lupus produce abnormal antibodies in their blood that target tissues within their own body rather than foreign infectious agents. These antibodies are referred to as autoantibodies.

**Psoriasis**

Psoriasis is a non-contagious, autoimmune disease characterized by inflamed lesions with silvery-white scabs of dead skin. . In this disease, red and scaly patches or lesions can be observed on the skin. These scaly patches are called psoriatic plaques and are areas of inflammation and increased skin production. The excessive production of skin conduces to accumulation of skin cells that take on a silvery-white appearance. These plaques can be mostly found on the elbows and knees, however, they can even affect the scalp and genitals.



Paronychia

An infection that develops along the edge of the fingernail or toenail is called a paronychia (pear-ah-NIK-ee-ah). It is the most common hand infection and, if left untreated, can progress to a more severe infection of the entire finger or toe. It can start suddenly (acute paronychia) or gradually (chronic paronychia).

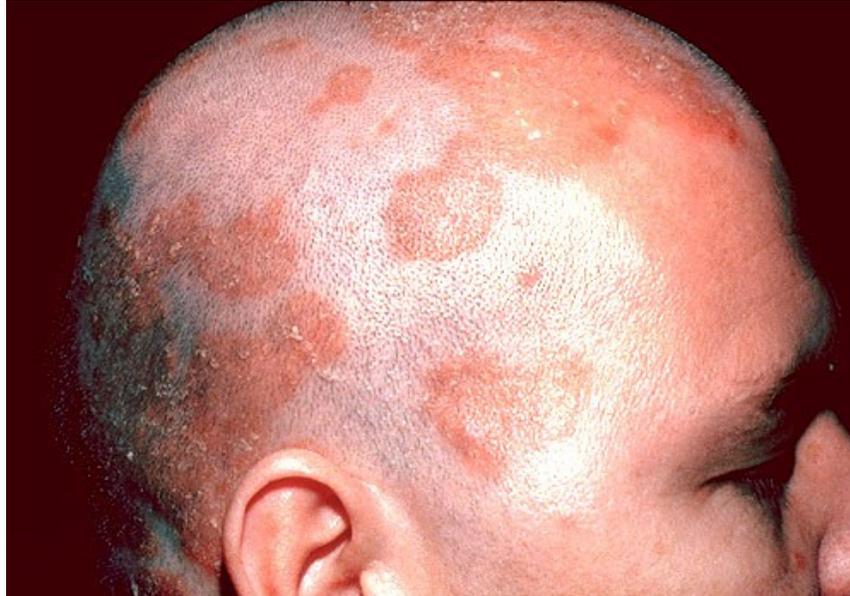
**Pilonidal Cyst**

A pilonidal cyst is a cystic structure that develops along the tailbone (coccyx) near the cleft of the buttocks, approximately 4 cm-5 cm from the anus. These cysts usually contain hair and skin debris. Individuals with a pilonidal cyst may not have any symptoms at all (termed asymptomatic), whereas others may develop an infection of the cyst with associated pain and inflammation.



Seborrheic Dermatitis

An advanced form of seborrhea, is a non-contagious skin disease that causes excessive oiliness of the skin, most commonly in the scalp, caused by overproduction of sebum, the substance produced by the body to lubricate the skin where hair follicles are present. Seborrhea is the form of the disease where oiliness only occurs without redness and scaling. The disease commonly occurs in infants, middle-aged people, and the elderly, and is commonly known in infants as cradle cap

**Scleroderma**

Scleroderma is an autoimmune disease of the connective tissue featuring skin thickening, spontaneous scarring, blood vessel disease, varying degrees of inflammation, associated with an overactive immune system. Scleroderma is characterized by the formation of scar tissue (fibrosis) in the skin and organs of the body. This leads to thickness and firmness of involved areas. Scleroderma, when it's diffuse or widespread over the body, is also referred to as systemic sclerosis.



Tinea (Dermatophytosis)

Dermatophytosis (tinea) infections are fungal infections caused by dermatophytes - a group of fungi that invade and grow in dead keratin. Several species commonly invade human keratin and these belong to the *Epidermophyton*, *Microsporum* and *Trichophyton* genera. They tend to grow outwards on skin producing a ring-like pattern - hence the term 'ringworm'. They are very common and affect different parts of the body. They can usually be successfully treated but success depends on the site of infection and on compliance with treatment.

**Urticaria**

urticaria is a condition where an itchy rash suddenly develops. The rash may be triggered by an allergy, or by another factor such as heat or exercise. In most cases the rash lasts 24-48 hours and is not serious. You may not require any treatment, but antihistamines can ease the symptoms until the rash clears.



Vitiligo

Vitiligo is a pigmentation disorder in which melanocytes (the cells that make pigment) in the skin are destroyed. As a result, white patches appear on the skin in different parts of the body. Similar patches also appear on both the mucous membranes (tissues that line the inside of the mouth and nose) and the retina (inner layer of the eyeball). The hair that grows on areas affected by vitiligo sometimes turns white.

**Warts**

Warts are small growths caused by a viral infection of the skin or mucous membrane. The virus infects the surface layer. Warts are contagious. They can easily pass from person to person. They can also pass from one area of the body to another on the same person. Hand warts grow around the nails, on the fingers, and on the backs of the hands. They appear mostly in areas where the skin is broken. Foot warts (also called plantar warts) usually appear on the ball of the foot, the heel, or the flat part of the toes. Foot warts do not stick up above the surface like hand warts. If left untreated, they can grow in size and spread into clusters of several warts. If located on a pressure point of the foot, these warts can be painful.



CLINICAL CONNECTIONS

SKIN GRAFTS

New skin cannot regenerate if an injury destroys a large area of the stratum basale and its stem cells. Skin wounds of this magnitude require skin grafts in order to heal. A **skin graft** is the transfer of a patch of healthy skin taken from a donor site to cover a wound. To avoid tissue rejection, the transplanted skin is usually taken from the same individual (*autograft*) or an identical twin (*isograft*). If skin damage is so extensive that an autograft would cause harm, a self-donation procedure called *autologous skin transplantation* may be used. In this procedure, performed most often for severely burned patients, small amounts of an individual's epidermis are removed, and the keratinocytes are cultured in the laboratory to produce thin sheets of skin. This new skin is transplanted back to the patient so that it covers the burn wound and generates a permanent skin. Also available as skin grafts for wound coverage are products (Apligraf and Transite) grown in the laboratory from the foreskins of circumcised infants.

LINES of CLEAVAGE and SURGERY

In certain regions of the body, collagen fibers tend to orient more in one direction than another. **Lines of cleavage (tension lines)** in the skin indicate the predominant direction of underlying collagen fibers. The lines are especially evident on the palmar surfaces of the fingers, where they are aligned with the long axis of the digits. Knowledge of lines of cleavage is especially important to plastic surgeons. For example, a surgical incision running parallel to the collagen fibers will heal only a fine scar. A surgical incision made across the rows of fibers disrupts the collagen, and the wound tends to gape open and heal in a broad, thick scar.

SKIN COLOR as a DIAGNOSTIC CLUE

The color of skin and mucous membranes can provide clues for diagnosing certain conditions. When blood is not picking up an adequate amount of oxygen from the lungs, as in someone who has stopped breathing, the mucous membranes, nail beds, and skin appear bluish or **cyanotic**. **Jaundice** is due to a buildup of the yellow pigment bilirubin in the skin. This condition gives a yellowish appearance to the skin and the whites of the eyes, and usually indicates liver disease. **Erythema**, redness of the skin, is caused by engorgement of the capillaries in the dermis with blood due to skin injury, exposure to heat, infection, inflammation, or allergic reactions. **Pallor** or paleness of the skin may occur in conditions such as shock or anemia. All skin color changes are observed most readily in people with lighter-colored skin and may be more difficult to discern in people with darker skin. However, examination of the nail beds and gums can provide some information about circulation individuals with darker skin.

HAIR REMOVAL

A substance that removes hair is called a **depilatory**. It dissolves the protein in the hair shaft, turning it into a gelatinous mass that can be wiped away. Because the hair root is not affected, regrowth of the hair occurs. In **electrolysis**, an electric current is used to destroy the hair matrix so the hair cannot regrow. **Laser treatments** may also be used to remove hair.

CHEMOTHERAPY and HAIR LOSS

Chemotherapy is the treatment of disease, usually cancer, by means of chemical substances or drugs. Chemotherapeutic agents interrupt the life cycle of rapidly dividing cancer

cells. Unfortunately, the drugs also affect other rapidly dividing cells in the body, such as the hair matrix cells of a hair. It is for this reason that individuals undergoing chemotherapy experience hair loss. Since about 15% of the hair matrix cells of the scalp hairs are in the resting stage, these cells are not affected by chemotherapy. Once chemotherapy is stopped, the hair matrix cells replace lost hair follicles and hair growth resumes

HAIR and HORMONES

At puberty, when the testes begin secreting significant quantities of androgens (masculinizing sex hormones), males develop the typical male pattern of hair growth throughout the body, including a beard and a hairy chest. In females at puberty, the ovaries and the adrenal glands produce small quantities of androgens, which promote hair growth throughout the body including the axillae and pubic region. Occasionally, a tumor of the adrenal glands, testes, or ovaries produces an excessive amount of androgens. The result in females or prepubertal males is **hirsutism**, a condition of excessive body hair.

Surprisingly, androgens must also be present for occurrence of the most common form of baldness, **androgenic alopecia** or **male-pattern baldness**. In genetically predisposed adults, androgens inhibit hair growth. In men, hair loss usually begins with a receding hairline followed by hair loss in the temples and crown. Women are more likely to have thinning of hair on top of the head. The first drug approved for enhancing scalp hair growth was minoxidil (Rogaine). It causes vasodilation (widening of blood vessels), thus increasing circulation. In about a third of the people who try it, minoxidil improves hair growth, causing scalp follicles to enlarge and lengthening the growth cycle. For many, however, the hair growth is meager. Minoxidil does not help people who are already bald.

IMPACTED CERUMEN

Some people produce an abnormally large amount of cerumen in the external auditory canal. If it accumulates until it becomes impacted (firmly wedged), sound waves may be prevented from reaching the eardrum. Treatments for **impacted cerumen** include periodic ear irrigation with enzymes to dissolve the wax and removal of wax with a blunt instrument by trained medical personnel. The use of cotton-tipped swabs or sharp objects is not recommended for this purpose because they may push the cerumen further into the external auditory canal and damage the eardrum.

TRANSDERMAL DRUG ADMINISTRATION

Most drugs are either absorbed into the body through the digestive system or injected into subcutaneous tissue or muscle. An alternative route, **transdermal (transcutaneous) drug administration**, enables a drug contained within an adhesive skin patch to pass across the epidermis and into the blood vessels of the dermis. The drug is released continuously at a controlled rate over a period of one to several days. This method of administration is especially useful for drugs that are quickly eliminated from the body because such drugs, if taken in other forms, would have to be taken quite frequently. Because the major barrier to penetration of most drugs is the stratum corneum, transdermal absorption is most rapid in regions of the skin where this layer is thin, such as the scrotum, axilla, and scalp. A growing number of drugs are available for transdermal administration, including nitroglycerin, for prevention of angina pectoris (chest pain associated with heart disease); scopolamine, for motion sickness; estradiol, used for estrogen-replacement therapy during menopause; ethinyl estradiol and norelgestromin in contraceptive patches; nicotine, used to help people to stop smoking; and fentanyl, used to relieve severe pain in cancer patients.

SUN DAMAGE, SUNSCREENS, and SUNBLOCKS

Although basking in the warmth of the sun may feel good, it is not a healthy practice. There are two forms of ultraviolet radiation that affect the health of the skin. Longer-wavelength ultraviolet A (UVA) rays make up nearly 95% of the ultraviolet radiation that reaches the earth. UVA rays are not absorbed by the ozone layer. They penetrate the furthest into the skin, where they are absorbed by melanocytes and thus are involved in sun tanning. UVA rays also depress the immune system. Shorter-wavelength ultraviolet B (UVB) rays are partially absorbed by the ozone layer and do not penetrate the skin as deeply as UVA rays. UVB rays cause sunburn and are responsible for most of the tissue damage (production of oxygen free radicals that disrupt collagen and elastic fibers) that results in wrinkling and aging of the skin and cataract formation. Both UVA and UVB rays are thought to cause skin cancer. Long-term overexposure to sunlight results in dilated blood vessels, age spots, freckles, and changes in skin texture.

Exposure to ultraviolet radiation (either natural sunlight or the artificial light of a tanning booth) may also produce **photosensitivity**, a heightened reaction of the skin after consumption after consumption of certain medications or contact with certain substances. Photosensitivity is characterized by redness, itching, blistering, peeling, hives, and even shock. Among the medications or substances that may cause photosensitivity reaction are certain antibiotics (tetracycline), nonsteroidal inflammatory drugs (ibuprofen or naproxen), certain herbal supplements (St. John's Wort), some birth control pills, some high blood pressure medications, some antihistamines, and certain artificial sweeteners, perfumes, after shaves, lotions, detergents, and medicated cosmetics.

Self-tanning lotions (sunless tanners), topically applied substances, contain a color additive (dihydroxyacetone) that produces a tanned appearance by interacting with proteins in the skin.

Sunscreens are topically applied preparations that contain various chemical agents (such as benzophenone or one of its derivatives) that absorb UVB rays, but let most of the UVA rays pass through.

Sunblocks are topically applied preparations that contain substances such as zinc oxide that reflect and scatter both UVB and UVA rays.

Both sunscreens and sunblocks are graded according to a *sun protection factor (SPF)* rating, which measures the level of protection they supposedly provide against UV rays. The higher the rating, presumably the greater the degree of protection. As a precautionary measure, individuals who plan to spend a significant amount of time in the sun should use a sunscreen or a sunblock with an SPF of 15 or higher. Although sunscreens protect against sunburn, there is considerable debate as to whether they actually protect against skin cancer. In fact, some studies suggest that sunscreens increase the incidence of skin cancer because of the false sense of security they provide.