The Integumentary System – lecture outline

1. Functions

A. Protection

Covers the entire body
Is water-tight
Cannot easily be ruptured
Pathogens cannot easily penetrate it
If pathogens do enter, Langerhans cells phagocytize them
Melanin protects DNA from UV damage
Oils produced by the sebaceous glands retard bacterial growth

B. Water Regulation

Dead skin cells on surface create a water-proof layer preventing both entry and loss of water

C. Vitamin D Production

Some skin cells get converted into Vitamin D when exposed to UV
UV exposure is in small amounts
Vitamin D leaves the skin cells and enters the liver and kidneys
There it gets converted into a hormone
This hormone helps the digestive and the skeletal systems

D. Sensory Organ: Nerve endings that reside in the epidermis and dermis

Detect stimuli
Pass on the information to the CNS

E. Body Temperature Regulation

Conserves or releases heat by activating or deactivating sweat glands
Sweat is a mixture of water, salt, ammonia, urea and other wastes
In hot weather,

- sweat glands are activated
- blood vessels are dilated
- blood is brought to the surface of the body

In cold weather,

- sweat glands are deactivated
- blood vessels are constricted
- blood is kept away from the surface of the body

2. Layers of the skin: 2 (or 3 depending on different classifications)

A. Epidermis

Outermost layer

B. Dermis

Deeper and thicker portion of skin
Located underneath the epidermis

C. Hypodermis (subcutaneous layer)

Below the dermis

3. Structure and Function of Skin Components

A. Epidermis

Made up of stratified squamous epithelium
Cells are tightly packed and there is no blood vessel
Penetrated by sweat glands and hairs

1. Cells
    a. Keratinocytes:
    - make waterproof protein called keratin,
    - synthesized in the stratum corneum
    b. Melanocytes:
    - make melanin,
    - synthesized in the stratum Basale
2. Layers
    a. Stratum Basale: layer where there is high mitosis
    b. [Stratum lucidum]: transitional layer, associated with calluses
    c. Stratum corneum: layer of dead cells

B. Dermis

Made up of irregular connective (blood, nerve) tissues
Roof of the dermis is corrugated due to numerous papillae
Dermal papillae create fingerprints or epidermal ridges
Blood vessels and other tissues present
Layers:

a. Papillary layer:
- thin, superficial layer
- includes dermal papillae wrapped in free nerve endings (Meissners corpuscles) and capillaries

b. Reticulate layer:
- deeper layer, thick
- 80% of the dermis
- collagen fibers abound

C. Hypodermis

Made up of loose connective and fat tissues
Layers may be variable:
Little to none: skinny body
Medium: rounded body
Excessive: leads to obesity

1. Blood vessels: transport blood, regulate temperature
2. Sensory nerves: detect environmental cues, and relay information to CNS
3. Adipose tissue: acts as shock absorbers, insulate body from heat loss
4. Connective tissue: anchors skin to muscle

4. Structure and Function of Accessory Skin tissues:

A. Hair: protein (keratin), dermal origin

1. Function: sensory, protective (heat loss, sunburn, suspended particulate matter)
2. Hair Follicle: complex structures associated with hairs, capillaries, and nerve endings
    a. root: below the surface
    b. Shaft: above the surface
    c. Base: in the follicles, where there is high mitosis
3. Arrector pili muscle: muscles associated with follicles whose contraction causes hairs to stand on end.

B. Nail: protein (keratin), epidermal origin
1. root: epithelial cells, invisible part, become keratinized as they grow out of the nail bed
2. cuticle: fold of skin that hides the nail root
3. lanula: rapidly reproducing cell region at the base of the visible nail
4. body: visible part of nail

5. Exocrine glands
Exocrine: produce and secrete substances into ducts
A. Sweat Glands: tubular glands that secrete sweat for temperature regulation
B. Sebaceous (oil) glands: lumps of tissue associated with hair follicles
C. Mammary glands: tubular glands that are activated and produce milk only after child birth

6. Membrane: phospholipid bilayer reinforced by proteins and other macromolecules
A. Mucus: or mucosae; singular: mucosa, are linings of mostly endodermal origin, covered in epithelium, and are involved in absorption and secretion
B. Serous: line and enclose several body cavities and organs, known as serous cavities, where they secrete a lubricating fluid which reduces friction from muscle movement

1. Parietal: cover body cavities
2. Visceral: cover organs
3. Body cavities: are between the parietal and visceral membranes and contain serous fluid

C. Synovial: line joint capsules

D. Cutaneous: cover and protect the body (e.g., skin)

E. Endothelium: line blood vessels and the heart

F. Meninges: line the CNS