


The Human Animal: Skin




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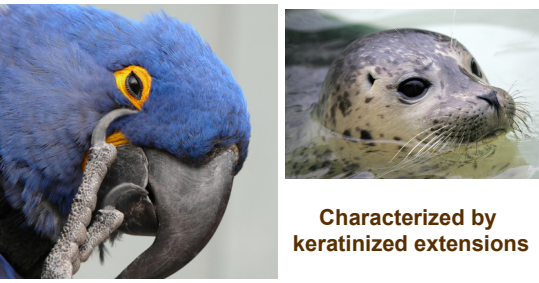
Tetrapod Skin



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Tetrapod Skin



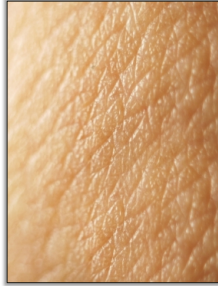
Characterized by keratinized extensions

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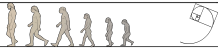


Skin Function

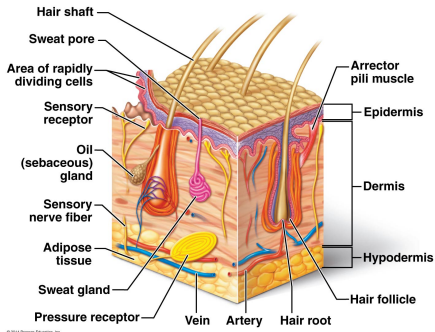
- Protection: mechanical, chemical, thermal, bacterial
- Water-proofing
- Regulate body temperature
- Makes proteins associated with immune function
- Synthesized Vitamin D
- Important sensory role



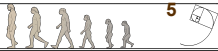
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Skin: Structure and Function



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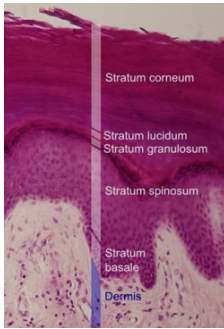
Epidermis



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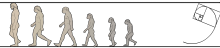


Epidermis

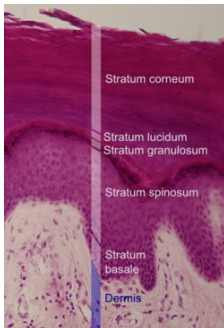


- **Stratum basale:**
 - 1-3 cell layers thick
 - Contains keratinocytes
 - Divides to give rise to upper layers
 - Also contains melanocytes, Langerhaus cells & Merkel cells

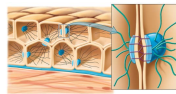
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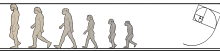
Epidermis



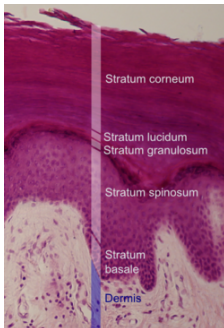
- **Stratum spinosum:**
 - Looks spiny because of shrunk microfilaments
 - Keratinization begins here
 - Can see cell nuclei because actively linking cells with desmosomes



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Epidermis



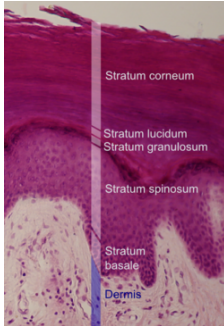
- **Stratum granulosum:**
 - Keratin fibres bound together by keratohyalin proteins
 - Secretes lamellar bodies into extracellular space



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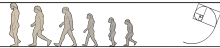


Epidermis



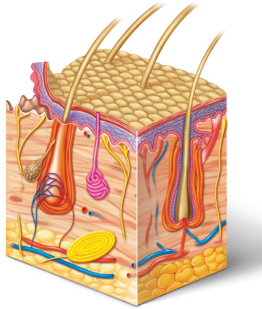
- **Stratum lucidum:**
 - 3-5 cell layers
 - Dead, clear cells
 - Final stages of formation and cell filling with keratin

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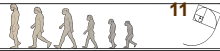


Dermis

- **Stratum papillare**
 - Finger-like projections
 - Blood capillaries
 - Sensory receptors for touch and pain
- **Reticulum layer**
 - Collagen rich connective tissue
 - Provide elasticity
 - Blood vessels
 - Follicles and glands

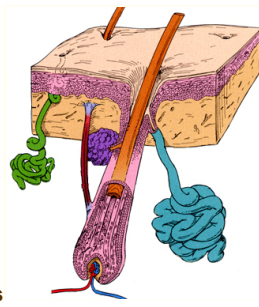


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Glands

- **Sebaceous**
 - Sebum
 - Fatty acids, cholesterol, wax
- **Eccrine Sweat**
 - Water, salts, minerals
- **Apocrine Sweat**
 - Water, molecules
 - Stress and sexual communication
 - Armpits, genitals, nipples



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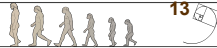


Apocrine Glands and Mate Choice

- Role of Major Histo-compatibility Complex (MHC)
- Determine health status
- Inbreeding avoidance

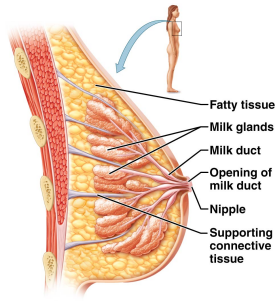


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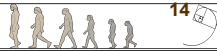


Mammary Glands

- Reduced to 2 nipples containing 15-25 glands each
- Specialized form of apocrine glands
- Production promoted by estrogen, inhibited by testosterone



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Evolution of Mammary Glands

- Lactation may have evolved from apocrine glands to incubate eggs and keep moist and free from infection
- Monotremes do not have nipples but lay eggs



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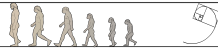


Skin Colour

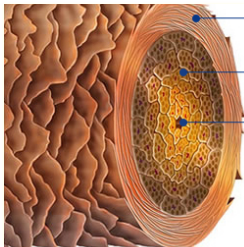
- **Melanin**
 - Eumelanin (brown and black)
 - Pheomelanin (red)
- **Carotene**
 - Yellow and orange from diet
- **Hemoglobin**
 - Oxygenated is more red, otherwise more purple



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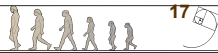


Hair Follicle Structure and Function



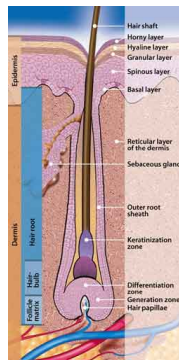
- **Cuticle**
 - Overlapping scales protect
- **Cortex**
 - Contains melanin
- **Medulla**
 - Core, sometimes absent

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Follicle Structure

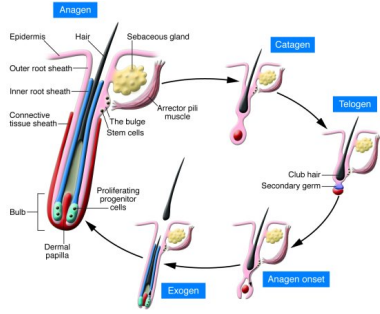
- **Four regions**
 - Shaft
 - Root
 - Bulb
 - Matrix
- **Hair papillae**
 - Vascularized
 - Hair generation
 - Contains melanocytes



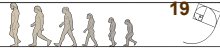
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Hair Follicle Growth

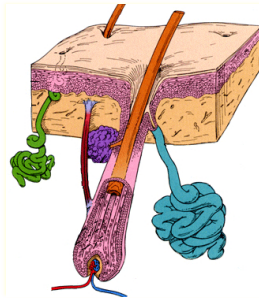


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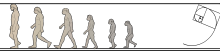


Hair Function

- Thermoregulation
- Protection
 - Skin
 - Eyes
 - Filters airways
- Disperse pheromones
- Social communication

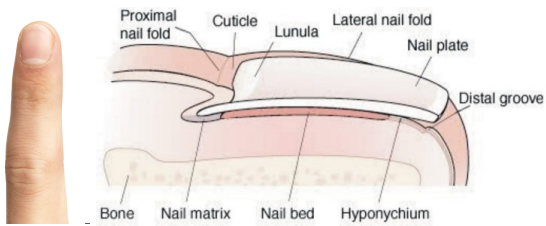


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Finger and Toe Nails



- Hardened keratin with continual growth (3mm/month)



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Fingerprints and Wrinkles as an Adaptation to Wetness




Changizi et al. (2011). *Brain, Behavior and Evolution*, 77: 286-290

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Questions?



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