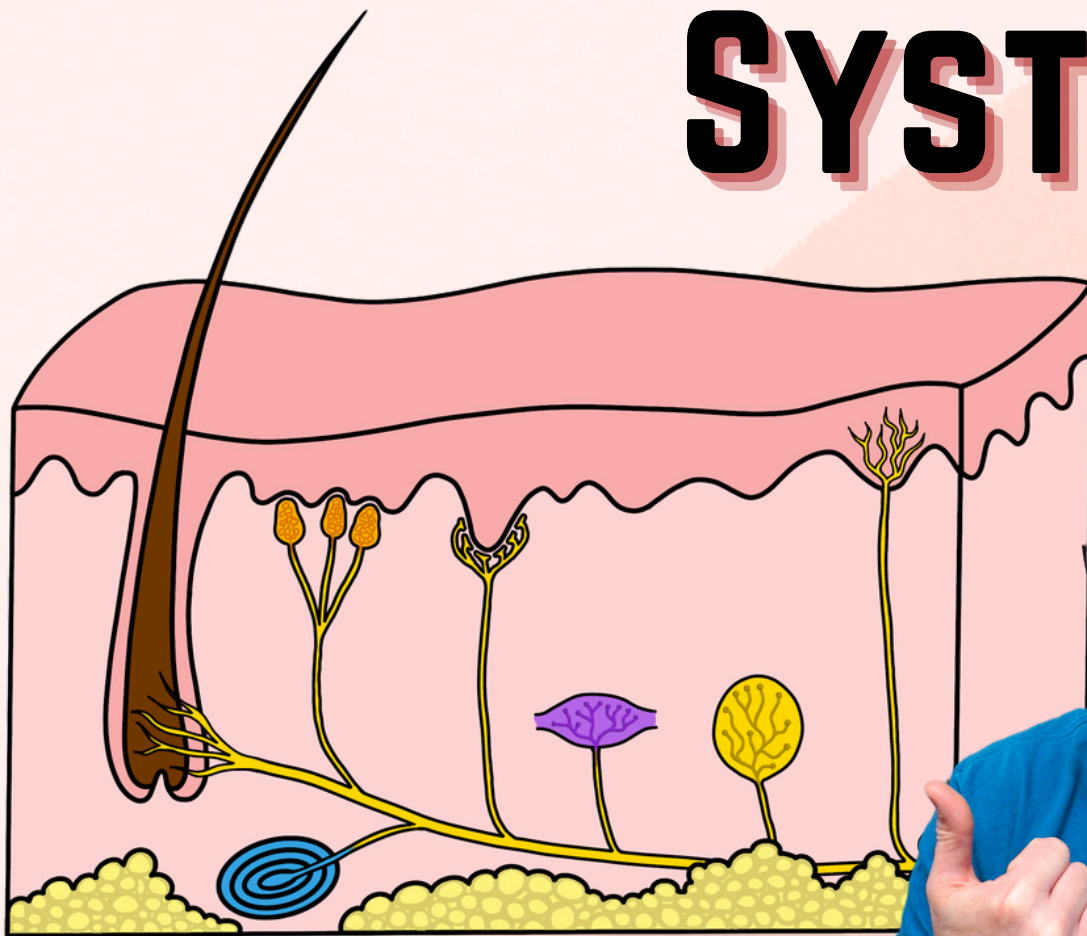




THE  
**COMPLETE GUIDE** TO THE  
**INTEGUMENTARY**  
**SYSTEM**



# Table of Contents

- 3** How to Use This Guide
- 4** Learning Checklist
- 5** Video Guide: Integumentary System
- 8** The Epidermis
- 10** The Dermis
- 11** The Hypodermis
- 12** Accessory Structures: Hair
- 13** Accessory Structures: Nails
- 14** Accessory Structures: Sudoriferous Glands
- 16** Accessory Structures: Sebaceous Glands
- 17** Accessory Structures: Receptors
- 18** Vitamin D Synthesis
- 19** Summary of the Integumentary System
- 21** Visual Representations
- 24** Active Learning Strategies: Encoding & Retrieval
- 27** Practice Questions: Retrieval
- 30** Answers
- 34** Sources

# The Epidermis

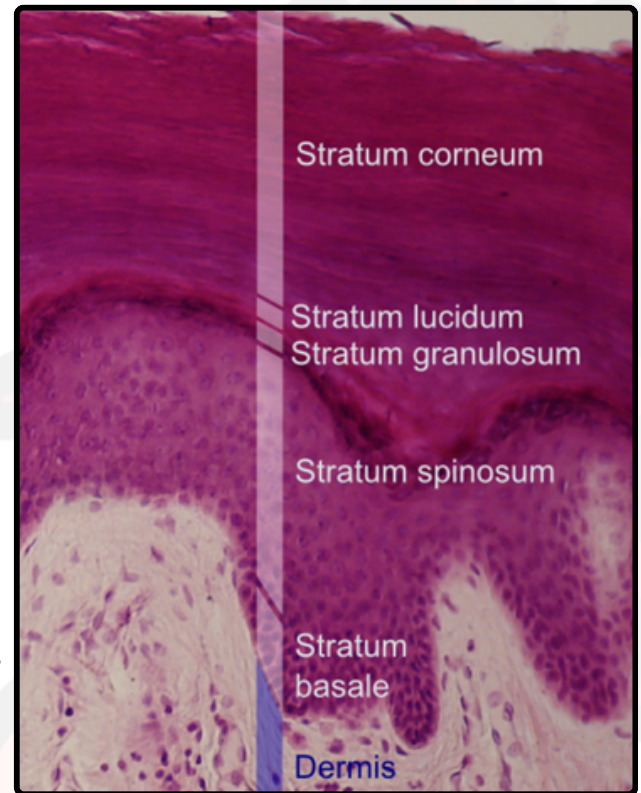
## Characteristics of the Epidermis:

- The epidermis is **avascular** (lacks blood vessels)
- The cells of all the layers outside of the stratum basale are known as **keratinocytes**
- Together, the epidermis + the dermis make the **cutaneous membrane**

## Layers of the Epidermis

### Stratum basale (or stratum germinativum)

- 1 cell layer thick; generally cuboidal-shaped cells
- The cells of this layer are called **basal cells**, which are the precursors to **keratinocytes**
- Very **mitotic**; most adequately-nourished cells of the epidermis
- Connected to the **basement membrane**, and then the dermis.
  - Cells in the body are generally not allowed to divide unless they are attached to a substratum (this is called **anchorage dependence**). Cancer cells break this rule!
- Found among the basal cells:
  - **Merkel cells**- touch receptors. Found abundance on the palms and soles.
  - **Melanocytes**- cells that deposit **melanin** into skin cells
    - There are two types of melanin: **pheomelanin** (red-yellow) and **eumelanin** (black-brown)
    - Genetics determine the amount of melanin produced, along with the amount of each type of melanin; this ultimately creates your skin color.
    - People with darker skin do NOT have more melanocytes than someone with lighter skin.
    - Skin color is impacted by other pigments as well:
      - **Hemoglobin**- reddish color)
      - **Carotene**- yellow-orange color
  - When exposed to UV radiation, melanin is secreted and forms a “cap” that protects the nucleus/DNA of epidermal cells. Melanin (rather than the DNA) absorbs incoming UV radiation, preventing DNA damage.



Epidermal Layers.png by Mikael Häggström. CC BY 3.0.

What is the connection between these words? Write out your answer.  
basal cell, basement membrane, anchorage dependence



# The Epidermis, continued

## Stratum spinosum

- The stratum basale creates the 8-10 layers of cells that become the stratum spinosum; these cells continue to move upwards over time
- The cells die as they move away from the basal layer
- In the spinosum, the cells are officially called **keratinocytes**; here, they start to make **keratin**
- **Langerhans cells** are also found in this layer. They are a type of immune cell/**macrophage** that cleans up damaged tissue, bacteria, etc.

## Stratum granulosum

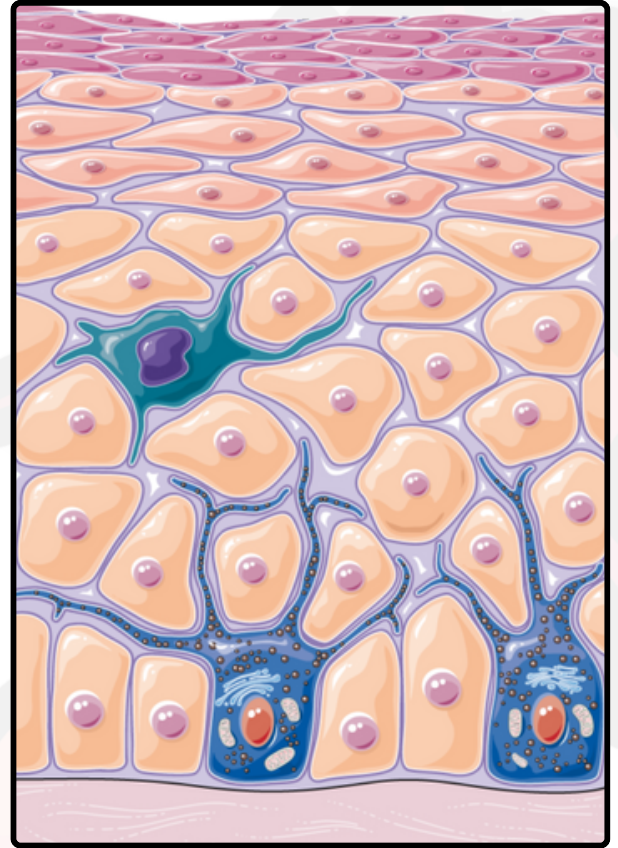
- 2-5 cell layers thick
- Cells are much flatter, thinner, and packed with keratin
- Internal cellular structures begin to disappear, making these cells essentially just bags of keratin

## Stratum lucidum

- Clear, translucent layer that is only found on the soles of the feet, the palms of the hands, and the thick skin of the fingers and toes
- The cells here are very flat and very dead

## Stratum corneum

- While it's 15-30 cell layers thick, the cells are so squished and densely packed that this layer appears very thin
- This layer is extremely water-resistant and inhibits bacterial growth
- The cells are shed (a lot of the dust particles in the air are just dead skin cells!) and replaced by cells from below
- The cells here are very flat and very dead



Epidermis by Smart Servier Medical Art. CC BY 4.0.

A key idea in anatomy & physiology is that "structure informs function." Why is having an extra epidermal layer important in the palms, soles, and pads of the digits?



# Practice Questions: Retrieval

View the microscope image to the right.

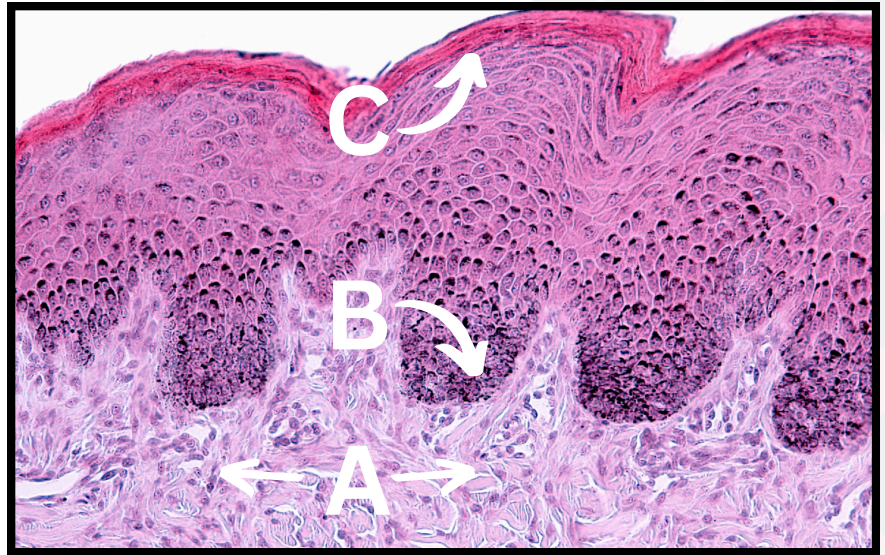
\_\_\_1. Which letter represents the dermis?

\_\_\_2. Which letter represents the most superficial epidermal layer?

\_\_\_3. Which epidermal layer has the oldest cells?

\_\_\_4. Which layer of cells receives nutrition from the dermis?

\_\_\_5. Which layer consists of connective tissue?



6. Name the layers found between B and C. Assume this is **thin** skin. \_\_\_\_\_

View the illustrated image to the right.

\_\_\_7. Which letter represents an involuntary smooth muscle?

\_\_\_8. Identify **ALL** the exocrine glands shown in the diagram.

\_\_\_9. Identify **ALL** the features that play a role in thermoregulation.

\_\_\_10. Identify the structure associated with the term **telogen**.

\_\_\_11. Which letter represents the layer composed of adipose and areolar tissue?

\_\_\_12. Which letter represents sensory receptors?

\_\_\_13. Identify the structure that releases sebum.

\_\_\_14. Identify **ALL** the features that would **NOT** be found on the palms of the hands.

