

Though its shape reminds one of the rings of Saturn, the image above is a cross section of a hair follicle. The central red area is the follicle, which is surrounded by two layers of skin cells that have been packed together.

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Overview of the Integumentary (Skin) System

Center for
Educational Outreach
Baylor College of Medicine



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Overview of the Integumentary (Skin) System

Image Reference

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<http://www.welcomeimages.org>

Key Words

integumentary system, skin

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Major Components of the System

- The skin can be subdivided into three layers:
 - Epidermis
 - Dermis
 - Hypodermis
- Subcutaneous tissue anchors skin to underlying organs.
- Hair and nails are derived from the epidermis.

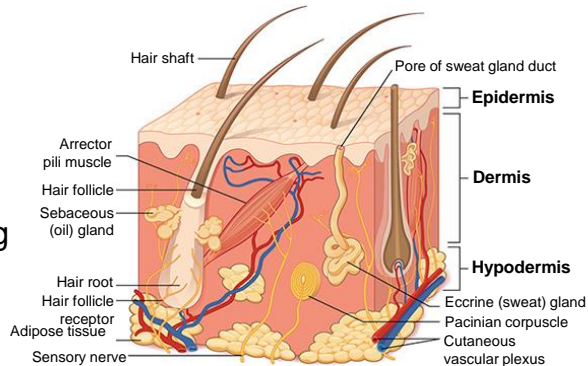


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Major Components of the System

The skin is composed of three layers: the epidermis, the dermis and a subcutaneous layer of fat. The epidermis is the outermost layer. It acts as an overall protective covering for the body. Also, hair and nails are derived from the epidermis. The dermis lies beneath the epidermis. It is embedded with blood vessels, nerves, and sebaceous and sweat glands. Subcutaneous tissue is a fatty layer located beneath the dermis. It acts to cushion muscles, bones, and internal organs from shock. Subcutaneous tissue also can also can act as an insulator and an energy source when needed.

Reference

Clark, Joe O.E. (1999). *A Visual Guide to the Human Body*. London: Barnes and Noble, Inc.

Image Reference

OpenStax College. Layers of the Skin, OpenStax-CNX CC-BY-3.0. July 3, 2013. <http://cnx.org/content/m46060/1.5/>

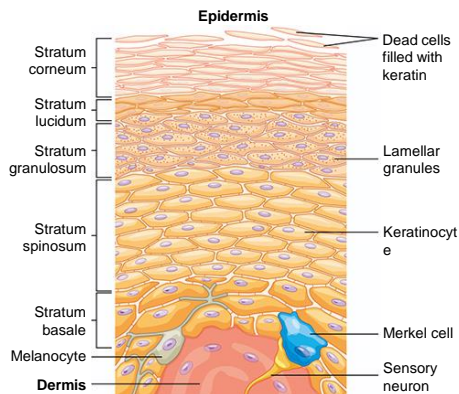
Key Words

integumentary system, skin, epidermis, dermis, hypodermis, hair, nails, subcutaneous tissue

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Epidermis

- The epidermis is the outermost layer of the skin.
- It contains a top layer of dried skin cells, which help retain moisture.
- The outer cells constantly are being sloughed off and replaced.
- Initiates vitamin D production when ultraviolet (UV) light reaches its deeper layers (stratum spinosum and stratum basale).



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Epidermis

The epidermis, the outermost layer of the skin, is comprised of three different types of cells: keratinocytes, melanocytes, and langerhans cells. Keratinocytes synthesize keratin, a protein that is essential in the formation of hair, nails and the outer skin. Melanocytes produce a dark pigment, called melanin, that protects the skin by absorbing ultraviolet radiation. Melanin also is known to account for different colors of skin, hair and eyes. Langerhans cells intercept alien material in the skin and aid the immune system.

Reference

Clark, Joe O.E. (1999). *A Visual Guide to the Human Body*. London: Barnes and Noble, Inc.

Image Reference

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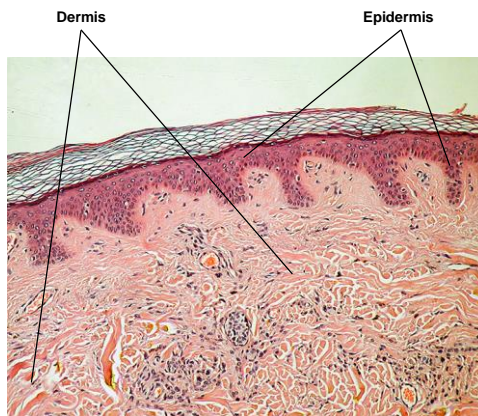
Key Words

integumentary system, skin, epidermis, keratin, keratinocyte, melanin, melanocyte, langerhans cell, pigment, melanin, immune system

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Dermis

- The dermis, the thickest layer of skin, is composed of connective tissue containing collagen and elastin.
- Within the dermis are receptors that detect pressure, temperature and pain.
- The dermis also contains blood vessels.



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Dermis

The dermis, also known as the “true skin,” lies beneath the epidermis. It is thickest in the palms of the hands and soles of the feet. Comprised mostly of collagen, the dermis also is rich in blood vessels, nerves and sweat and sebaceous glands.

Reference

Clark, Joe O.E. (1999). *A Visual Guide to the Human Body*. London: Barnes and Noble, Inc.

Image Reference

Normal epidermis and dermis with intraderman nevus 10x. Courtesy of Kilbad. Public domain.

http://commons.wikimedia.org/wiki/File:Normal_Epidermis_and_Dermis_with_Intradermal_Nevus_10x.JPG

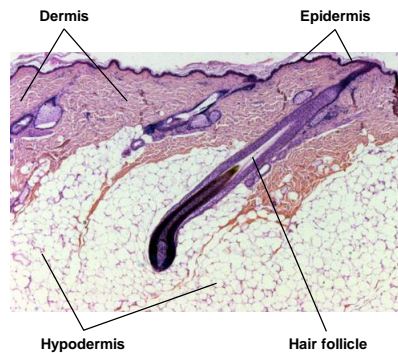
Key Words

integumentary system, skin, dermis, epidermis, collagen, elastin, sensory nerves, nerve cells

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Hypodermis (Subcutis)

- The hypodermis, or subcutis, is a level of fat at the base of the skin, which connects the skin to fibrous tissue of bones and muscles.
- It can function as insulation, a fuel reserve or cushioning.



Micrograph © Dr. Thomas Caceci, Virginia-Maryland Regional College of Veterinary Medicine. Used with permission.

Hypodermis

The subcutis is joined to the bottom of the dermis and is the deepest layer of skin. Lipocytes located within the subcutis make lipids for the subcutaneous tissue. The subcutis functions as a cushion for muscles, bones, and internal organs and can also act as an insulator or energy source when needed.

Reference

1. Clark, Joe O.E. (1999). *A Visual Guide to the Human Body*. London: Barnes and Noble, Inc.
2. OpenStax College. Layers of the Skin, OpenStax-CNX CC-BY-3.0. July 3, 2013. <http://cnx.org/content/m46060/1.5/>

Image Reference

Micrograph 1205 © Thomas Caceci, PhD, Virginia-Maryland Regional College of Veterinary Medicine. Used with permission.
<http://www.vetmed.vt.edu/education/curriculum/vm8054/Labs/Lab14/lab14.htm>

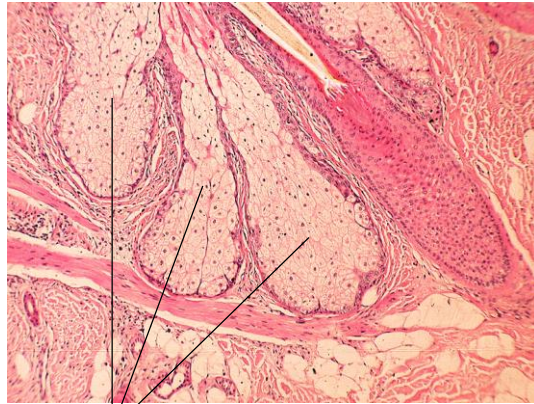
Key Words

integumentary system, skin, hypodermis, subcutis, subcutaneous, fat cells, fatty tissues, adipocyte, lipocyte

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Sebaceous Glands

- Sebaceous glands within the dermis produce oil, or sebum, which keeps the hair and skin soft and flexible.
- Fatty acids in sebum oil are antibacterial and help retain water in skin.



Sebaceous glands



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Sebaceous Glands

Sebaceous glands are connected to adjacent hair follicles by a short duct. They provide oil for the hair and outer skin by producing sebum, a mixture of waxes, fatty acids, cholesterol and debris of dead cells. Sebum retains moisture, keeping hair glossy and skin pliable. Sebum also can kill certain forms of harmful bacteria.

Reference

1. Clark, Joe O.E. (1999). *A Visual Guide to the Human Body*. London: Barnes and Noble, Inc.
2. OpenStax College. Accessory Structures of the Skin, OpenStax-CNX CC-BY-3.0. June 3, 2013. <http://cnx.org/content/m46062/1.3/>

Image Reference

Micrograph courtesy of Kilbad. Public domain.

http://en.wikipedia.org/wiki/File:Base_of_Pilosebaceous_Unit_10x.JPG

Key Words

skin, sebaceous gland, hair follicle, dermis

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Sweat Glands

- Eccrine sweat glands are found in almost every area on the skin's surface. These glands emit droplets of perspiration (mostly water) that cool the body as the sweat evaporates.
- Apocrine sweat gland secretions interact with hair follicles, and are associated with bacteria-related odors.

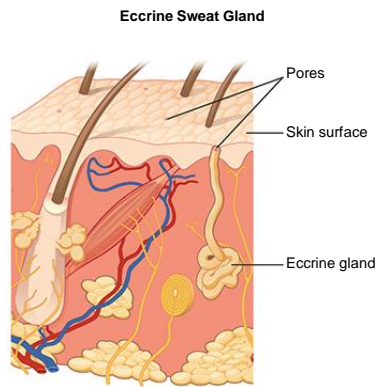


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Sweat Glands

Sweat glands are found around the body. Eccrine glands act as a thermo-regulators by moistening the skin. They secrete more sweat than do apocrine glands. Apocrine glands become active during adolescence.

Reference

1. Clark, Joe O.E. (1999). *A Visual Guide to the Human Body*. London: Barnes and Noble, Inc.
2. OpenStax College. Accessory Structures of the Skin, OpenStax-CNX CC-BY-3.0. June 3, 2013. <http://cnx.org/content/m46062/1.3/>

Image Reference

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Key Words

integumentary system, skin, eccrine gland, apocrine gland, sweat, sweat gland, homeostasis

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Pigmentation

- The skin's pigment is mostly determined by the presence of melanin.
- Eumelanin which is brown/black, is the most common biological form of melanin.
- Pheomelanin is red.
- Melanin controls the amount of ultraviolet (UV) radiation from the sun that penetrates the skin.

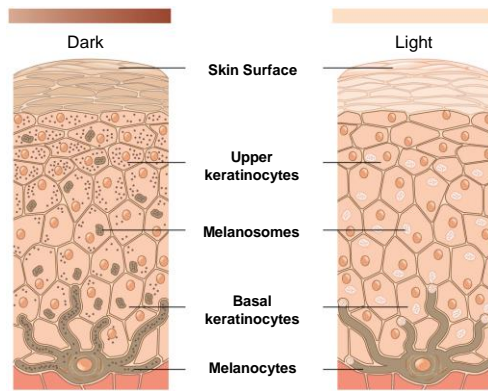


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Pigmentation

Effects of the sun's rays or a tanning salon results with the manufacture of melanin, and built up as keratinocytes. The higher the number of keratinocytes results in a tan, or darker color of skin, and aids in the breakdown of folic acid. Increased amounts of melanin protects the skin from UV radiation. However, too little can lesson production of vitamin D and impair calcium absorption in the body.

Reference

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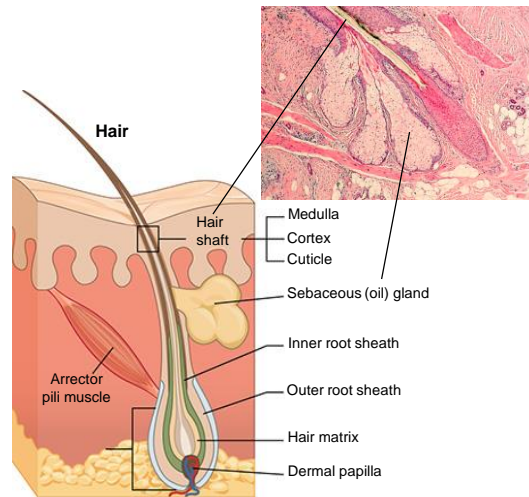
Key Words

skin, integumentary system, skin color, melanin, eumelanin, pheomelanin

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Hair Follicles

- Hair follicles are found on most parts of the human body.
- Hair follicles channel sebum (oil) to the skin surface, where it softens skin and hair.



Hair Follicles

Hair follicles are located deep within the dermis. They are located, to varying degrees, on every part of the body except the lips, palms of the hands and soles of the feet. Each hair root grows inside a bulblike follicle which tunnels through the surface of the skin. The hair shaft grows out of the skin. Its color is determined by the combination of black, brown and yellow pigments it contains.

Reference

1. Clark, Joe O.E. (1999). *A Visual Guide to the Human Body*. London: Barnes and Noble, Inc.
2. OpenStax College. Accessory Structures of the Skin, OpenStax-CNX CC-BY-3.0. June 3, 2013. <http://cnx.org/content/m46062/1.3/>

Image Reference

1. Modification of micrograph (10x) by Kilbad. Public domain. http://en.wikipedia.org/wiki/File:Base_of_Pilosebaceous_Unit_10x.JPG/

<http://cnx.org/content/m46062/1.3/>

2. OpenStax College. Accessory Structures of the Skin, OpenStax-CNX CC-BY-3.0. June 3, 2013. <http://cnx.org/content/m46062/1.3/>

Key Words

skin, hair follicle, dermis, pigment

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Nails

- Nails protect the farthest extremities of the body: fingers and toes.
- A nail root contains cells that enable it to keep growing.
- The nail body is made up of a dense layer of dead keratinocytes (cells filled with the structural protein, keratin).
- The pink area on a nail is a result of many blood vessels lying underneath the nail body.

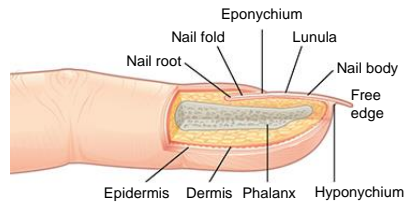


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Nails

Nails are accessory structures of the integumentary system. The nail root lies under the nail fold. It contains cells which enable it to keep growing. The lateral nail fold overlaps the nail root, and forms the cuticle where it meets the end of the nail body.

Keratinocytes are cells in the epidermis which serve as barriers against pathogens, heat, UV radiation and water loss. Keratinization is when the keratinocytes produce more and more keratin and die, with the outermost layer shed off and replaced by newer cells.

References

1. Keratinocyte. Wikipedia CC-BY-SA 3.0. <http://en.wikipedia.org/wiki/Keratinocyte>
2. OpenStax College. Accessory Structures of the Skin, OpenStax-CNX CC-BY-3.0. June 3, 2013. <http://cnx.org/content/m46062/1.3/>

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Key Words

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Functions of the System

- Serve as a living boundary that separates the internal body from the external world.
- Help regulate body temperature.
- Acts as the first line of defense against disease-causing invaders.
- Regulates the movement of substances across the boundary into the body.



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Functions of the System

The skin is a living boundary that separates the inside of the body from the external world. Because it is permeable to water and heat, skin helps to control body temperature.

Skin also contains a large community of bacteria that is acquired at birth. These resident bacteria act as a line of defense to ward off harmful microorganisms. Daily skin loss prevents potential colonists from inhabiting the skin. In addition, the skin supplies acidic products to deter certain types of bacteria. Skin's dryness acts as a natural resistance to bacteria which thrive in moist environments.

To help maintain a stable internal environment, the skin also regulates the movement of substances across the epidermis.

Reference

Clark, Joe O.E. (1999). *A Visual Guide to the Human Body*. London: Barnes

and Noble, Inc.

Key Words

skin, integumentary system, protection, functions

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