

## The Skin cells

The skin is the largest organ in the body, accounting for about 15% of the total adult body weight and it performs many important functions, including:-

- 1-Regulating body temperature.
- 2-Maintaining the balance of water and electrolytes.
- 3-The sensation of painful and pleasant stimuli.
- 4- It is also involved in the production of vitamin D.

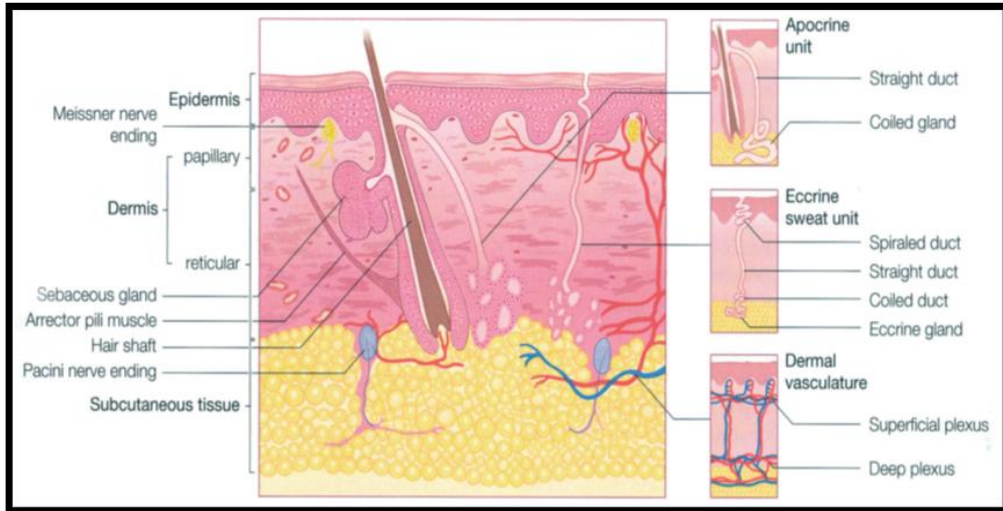
The skin stores important chemicals and nutrients within the body. At the same time, it provides a barrier that prevents hazardous substances from entering the body, and protection from the harmful effects of ultraviolet radiation emanating from the sun. In addition the color, structure, and folds of the skin help each individual become distinct from others in terms of personality traits. Anything that interferes with the functions of the skin, or causes changes in its appearance, has major effects on physical and mental health.

✚ The skin is continuous with the mucous membranes lining the body's surface and it consists of 3 layers which performs specific tasks.

1-Epidermis

2-Dermis

3-The fatty layer (also called the subcutaneous layer)



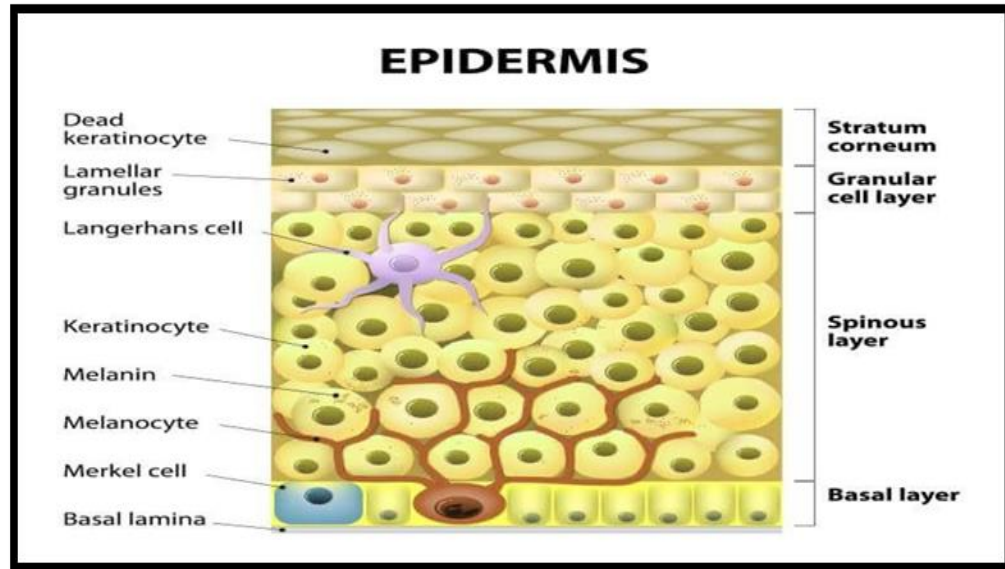
1- The Epidermis is the layer of skin that can be described as relatively thin, taut, and outer. The outer part of the epidermis is known as the **stratum corneum**, and it is relatively watertight. When intact, it prevents most bacteria, viruses, and other foreign substances from entering the body.

- Most of the cells in the epidermis are **keratinocytes** which function to synthesize keratin (a long threadlike protein with a protective role) and they arise from cells in the deepest layer of the epidermis, which is called the **basal layer**. The basal cells of the epidermis undergo proliferation cycles that provide for the renewal of the outer epidermis, “New keratinocytes move upward slowly toward the surface of the epidermis. When these cells reach the surface of the skin, they gradually begin to shed, and are replaced by new cells that pour out from below”.

- There are cells scattered throughout the basal layer of the skin called **melanocytes** which produce the pigment melanin, which mainly contributes to skin color. However, the main function of melanin remains to filter ultraviolet rays emanating from sunlight Which causes damage to genetic DNA, and leads to a number of harmful effects, including skin cancer.



- The epidermis also contains **Langerhans cells**, which are part of the skin's immune system. **These cells help detect foreign substances, defend the body against infection, and play a role in the occurrence of skin allergies.**
- The other cells found in the Epidermis are **Merkel cells** which are oval-shaped, slow-adapting, located in sites of high tactile sensitivity that are attached to basal keratinocytes. Merkel cells are found in the digits, lips, regions of the oral cavity, and outer root sheath of the hair follicle and are sometimes assembled into specialized structures known as tactile discs or touch domes.

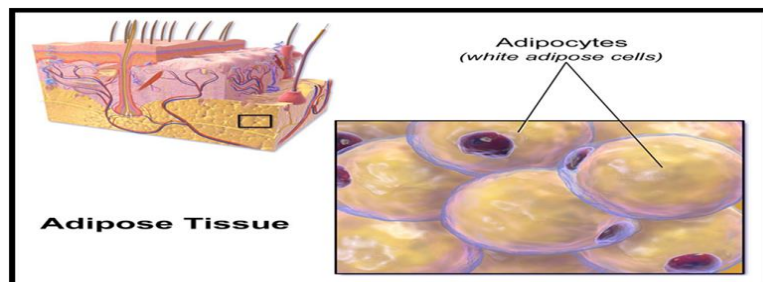


- Epidermis also protects (along with other layers of skin) internal organs, muscles, nerves, and blood vessels from injury. For areas of the body that need more protection, such as the palms of the hands and the soles of the feet, this layer is thicker.

2- The Dermis is the second layer of the skin. It is a thick layer of fibrous and elastic tissue, and it consists mostly of collagen with a small but important component called elastin, which gives the skin its elasticity and strength. The dermis **contains** nerve endings, sweat glands, sebaceous glands , hair follicles, and Blood vessels.

- Nerve endings sense pain, touch, pressure, and temperature. Some areas of the skin contain more nerve endings than others; for example, the tips of the fingers and toes contain many nerves and are very sensitive to touch.
- Sweat glands produce sweat in response to heat and stress. Sweat is made up of water, salt, and other chemicals. Sweat helps cool the body when it evaporates from the skin.
- The blood vessels of the dermis provide nutrients to the skin and help regulate body temperature. Heat makes the blood vessels swell , allowing large amounts of blood to circulate near the surface of the skin, where heat can be released, cold makes the blood vessels constrict, keeping the body temperature.

3- The fat layer located under the dermis and it helps in insulate the body from heat and cold. It acts like a padding or protective cushion and an area for storing energy. Fat is found in living cells called **adipocytes**, where fibrous tissue keeps them connected to each other. The thickness of the fat layer varies from one area to another in the body, it does not exceed a fraction of an inch on the eyelids, and reaches several inches on the abdomen and buttocks in some people.



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Basma Bashar

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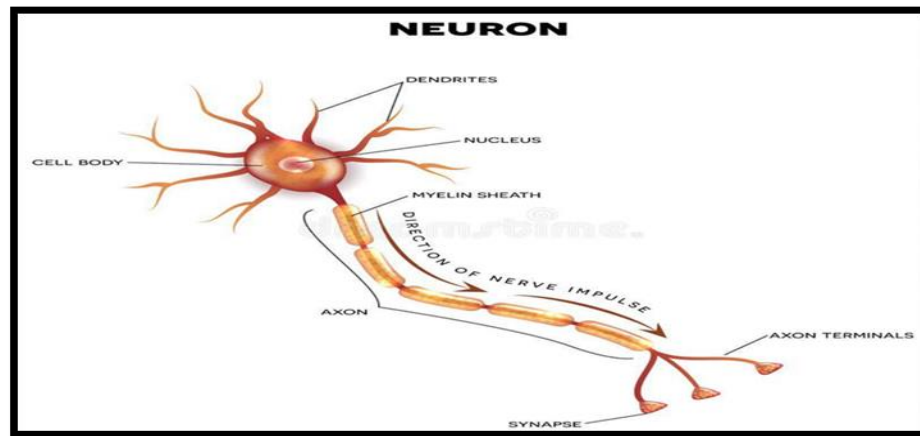
### Nerve cell (neurons)

Human nervous system is the most complex system in the human body it consists of

1-Nerve cells

2-Glial cells

3-Nerve fibers



Nerve cell (neuron) : is defined as the structural and functional unite of the nervous system , it is like any other cell in the body having nucleus and all the organelles in the cytoplasm . However , it is different from other cells by two ways:-

- 1- Neuron has branches called axon and dendrites.
- 2- Neuron doesn't have centrosome; so it cannot undergo division.

More than 100 billion of neurons form a network for communication. Each neuron has an average at least a thousand interconnections with other neurons, forming a very complex system for communication. Neurons are responsible for **reception, transmission and processing of stimuli**. Neurons are sensitive to stimuli convert stimuli into nerve impulse and conduct nerve impulses.

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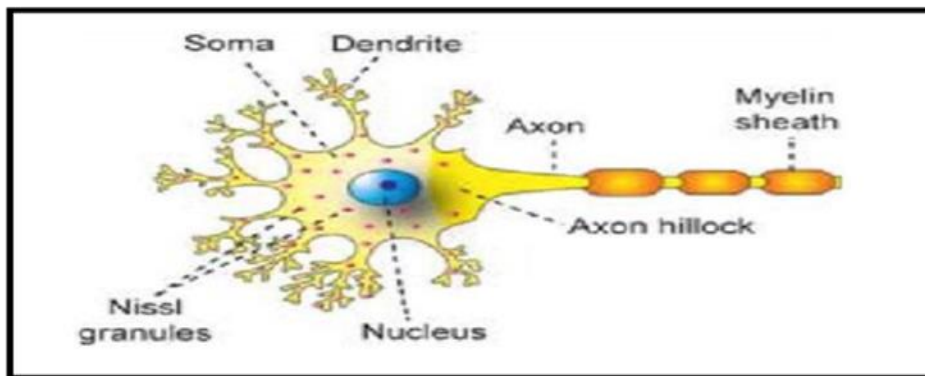
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### Structure of Neuro:-

Each neuron consist of 3 parts:

- 1- Cell body ; has ability to generate impulse.
- 2- Dendrites ; which are multiple elongated cytoplasmic processes have ability to receive stimuli from the environment and transport them to the cell body of the neuron.
- 3- Axon ; which is a single process has ability to transport the nerve impulses to other cells.



- Nerve Cell Body known as **soma or perikaryon**. It is irregular in shape and, it is constituted by a mass of cytoplasm called **neuroplasm** which is covered by a cell membrane and contains a large nucleus, Nissl bodies, neurofibrils, mitochondria and Golgi apparatus.

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Nucleus: Each neuron has one nucleus which is centrally placed in the nerve cell body and it has one or two prominent nucleoli. The nucleus does not contain **centrosome** So; **the nerve cell cannot multiply like the other cells (why?)**. Nissl bodies are small basophilic granules found in cytoplasm of neurons, these bodies are present in the soma except in axon hillock. Nissl bodies are called tigroid substances since these bodies are responsible for the tigroid or spotted appearance of soma after suitable staining. The Nissl bodies flow into the dendrites from soma, but not into axon. So, **the dendrites are distinguished from axons by the presence of Nissl bodies under microscope.**

- Neurofibrils: are thread like structures present in the form of network in the soma and the nerve processes. Presence of neurofibrils is another characteristic feature of the neurons.
  - Mitochondria: are present in the soma and in axon. As other cells, **the mitochondria form the powerhouse of the nerve cell**, where ATP is produced.
  - Golgi apparatus: of the nerve cell body is similar to that of other cells. It is concerned with processing and packaging of proteins into granule.
- Dendrite: The dendrite is the branched process of the neuron and it is branched repeatedly and it may be present or absent. If present, it may be one or many in number. The dendrite has Nissl bodies and neurofibrils, It transmits impulses towards the nerve cell body.

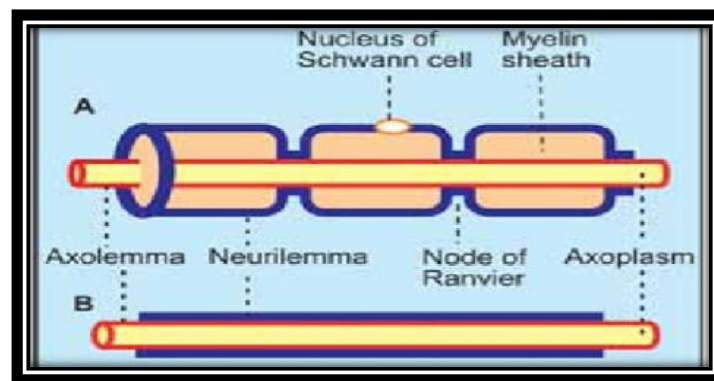


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- Axon: The axon is longer than dendrite. Each neuron has only one axon. The axon arises from axon hillock of the nerve cell body and it extends for a long distance away from the nerve cell body. The length of the longest axon is about one meter.



A. Myelinated nerve fiber

B. Non-myelinated nerve fiber

The nerve fiber described above is the Myelinated nerve fiber which are insulated by myelin sheath and the other one non myelinated nerve fiber which is not covered by myelin sheath .

- The dendrites are short and the axons are long and both of them form the processes of neuron. The dendrites and axons are usually called **nerve fibers**.

### CLASSIFICATION OF NEURON

A- Depending on the shape .

B- Depending on function

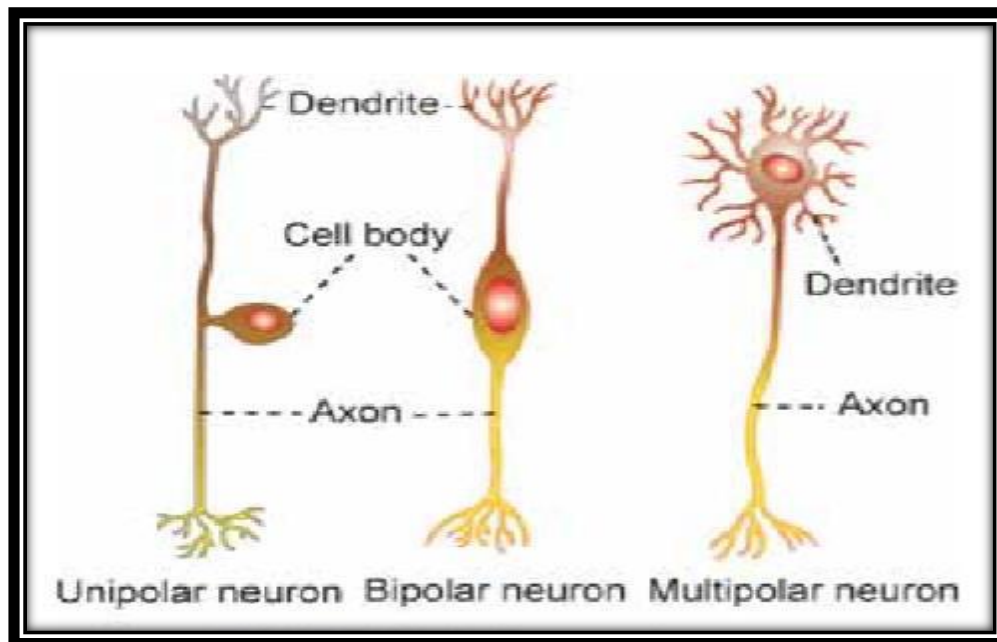
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**Depending on The shape** which based on the number of poles from which the nerve fibers arise (dendrites and axons), neurons are divided into several types:

- 1- Unipolar neurons that have only one pole from which, both the axon and dendrite arise
- 2- Bipolar neurons which have two poles, axon arises from one pole and dendrites arise from the other pole.
- 3- Multipolar neurons which have many poles, one of the poles gives rise to the axon and all the other poles give rise to dendrites.



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**Depending on Function** : the nerve cells are classified into 3 types:

- 1- Sensory neurons : which carry the sensory impulses from periphery to the central nervous system.
- 2- Interneurons establish relationships among other neurons forming complex functional networks.
- 3- Motor neurons: which carry the motor impulses from central nervous system to the peripheral effector organs like muscles, glands, blood vessels, etc.

