Chapter-12 | Sense organs

Sense organs –

Anatomy and physiology of

- Eye
- Ear
- Skin
- Tongue
- Nose

Sense Organs:

- The sense organs are a group of specialized structures in the human body that are responsible for detecting and processing sensory information from the external environment.
- They include the eyes, ears, nose, tongue, and skin, which work together to help us perceive and respond to stimuli such as light, sound, smell, taste, and touch.
- Each sense organ contains specialized sensory receptors that detect specific types of stimuli, and the information they gather is then transmitted to the brain for processing and interpretation.
- Understanding how these sense organs function and interact with each other is critical for our overall sensory experience and ability to interact with the world around us.

The five main sense organs are:

1. **Eyes -** Responsible for vision
2. **Ears -** Responsible for hearing
3. **Nose -** Responsible for sense of smell
4. **Tongue -** Responsible for taste
5. **Skin** - Responsible for touch, pressure, temperature and pain sensations.

1. Eye:

- The eye is a complex organ that plays a crucial role in vision. It consists of several structures that work together to transmit light and images to the brain for interpretation.

Anatomy of the Eye:

- Cornea - the clear outer layer that covers the front of the eye and helps focus light
- Sclera - the white, protective outer layer of the eye
- Iris - the colored part of the eye that controls the size of the pupil and the amount of light entering the eye
- Pupil - the adjustable opening in the center of the iris that regulates the amount of light entering the eye
- Lens - the clear, adjustable structure behind the pupil that helps focus light onto the retina
- Retina - the inner layer of the eye that contains photoreceptor cells (rods and cones) responsible for detecting light and color
- Optic nerve - the nerve that carries signals from the retina to the brain
- Vitreous humor - the clear gel-like substance that fills the space between the lens and the retina

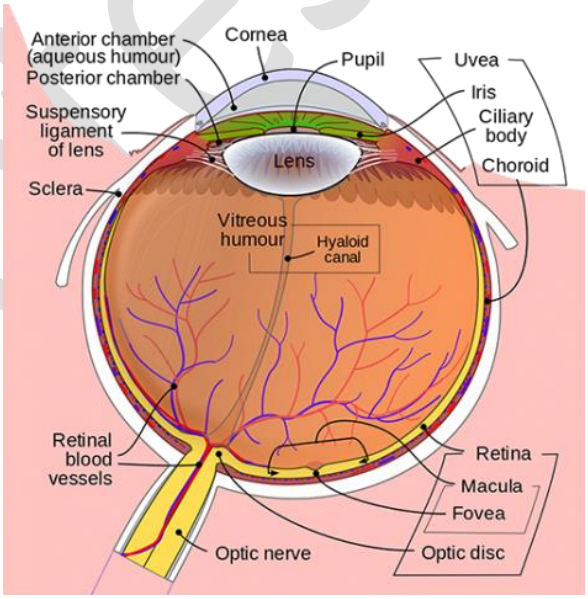

Fig: Anatomy of Eye

Physiology of the Eye:

- The cornea and lens help focus light onto the retina, where photoreceptor cells detect light and send signals to the brain.
- The iris regulates the amount of light entering the eye by controlling the size of the pupil.
- The retina contains photoreceptor cells that convert light into electrical signals that are transmitted to the brain through the optic nerve.
- The brain then interprets the signals as images.
- The muscles in the eye control eye movements and adjust the shape of the lens to maintain focus.
- The tear glands in the eye produce tears to keep the surface of the eye moist and provide protection from foreign objects.

2. Ear:

The ear is a complex organ that plays a crucial role in hearing and balance. It consists of several structures that work together to receive, transmit, and interpret sound waves.

Anatomy of the Ear:

- Outer Ear - the visible part of the ear that includes the pinna and the ear canal
- Pinna - the visible part of the ear that collects and directs sound waves into the ear canal
- Ear canal - the passage that carries sound waves from the pinna to the eardrum
- Middle Ear - the part of the ear that contains the ossicles (the malleus, incus, and stapes) and the Eustachian tube
- Eardrum - the thin membrane that separates the outer and middle ear and vibrates in response to sound waves
- Ossicles - the three small bones (malleus, incus, and stapes) in the middle ear that transmit sound waves from the eardrum to the inner ear
- Inner Ear - the part of the ear that contains the cochlea, vestibular system, and auditory nerve
- Cochlea - the spiral-shaped organ that converts sound waves into electrical signals that are sent to the brain
- Vestibular System - the part of the inner ear responsible for detecting changes in head position and movement

- Auditory Nerve - the nerve that carries signals from the inner ear to the brain

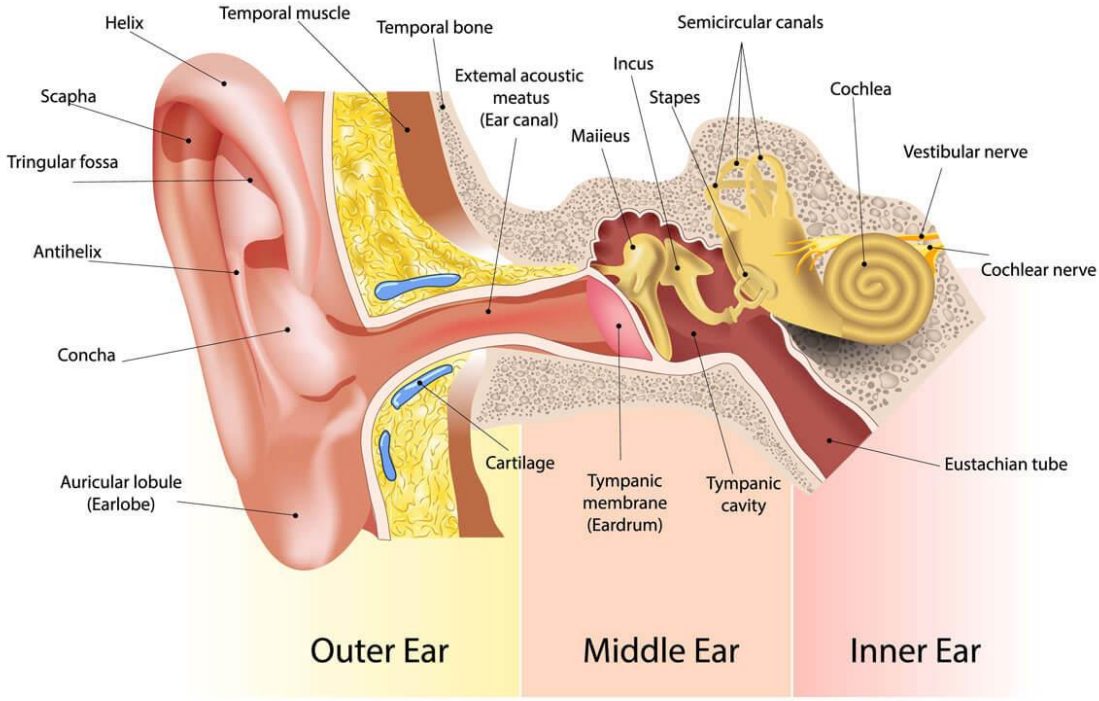

Fig: Anatomy of Ear

Physiology of the Ear:

- The outer ear collects and directs sound waves into the ear canal, where they reach the eardrum and cause it to vibrate.
- The ossicles in the middle ear transmit the vibrations from the eardrum to the inner ear.
- The cochlea in the inner ear converts the sound vibrations into electrical signals that are sent to the brain for interpretation.
- The vestibular system in the inner ear helps to maintain balance by detecting changes in head position and movement.
- The auditory nerve carries signals from the inner ear to the brain, where they are interpreted as sounds.
- The ear also helps regulate the pressure in the middle ear by equalizing the pressure between the middle ear and the environment through the Eustachian tube.

3. Skin

The skin is the largest organ in the human body and plays a vital role in protecting the body from external harm. It also serves as a sensory receptor for touch, pressure, temperature, and pain sensations.

Anatomy of the skin:

- Epidermis - the outermost layer of the skin that provides a protective barrier
- Dermis - the underlying layer of the skin that contains blood vessels, nerves, hair follicles, and sweat glands
- Subcutaneous layer (hypodermis) - the deepest layer of the skin that contains fat and connective tissue

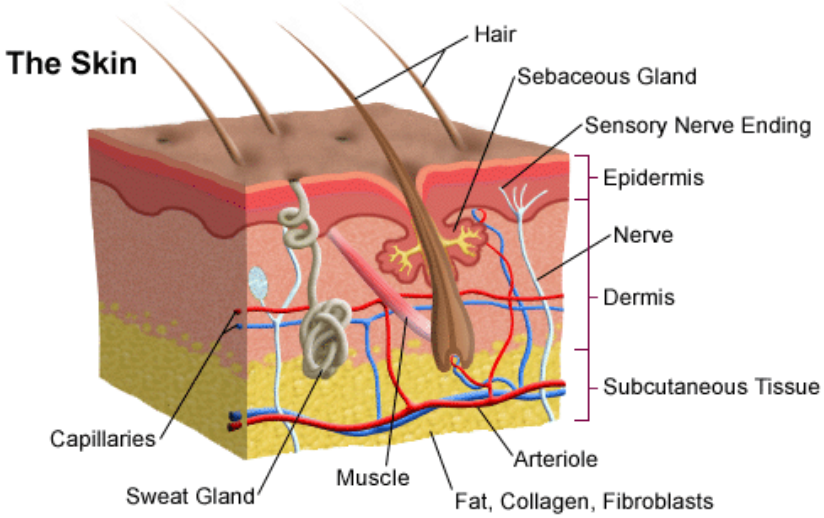

Fig: Anatomy of the skin

Physiology of the skin:

- The epidermis provides a barrier to protect against external damage and prevent water loss.
- The dermis contains sensory receptors that detect touch, pressure, temperature, and pain.
- The subcutaneous layer provides insulation and helps regulate body temperature.
- The skin also contains sweat glands that help regulate body temperature through sweating and oil glands that keep the skin moisturized.
- The skin acts as a defense against infection by producing antimicrobial peptides and housing immune cells.
- It also helps synthesize vitamin D in response to sun exposure.

4. Tongue:

The tongue is a muscular organ in the mouth that plays a crucial role in taste perception, speech, and swallowing.

Anatomy of the Tongue:

- Dorsum - the top surface of the tongue
- Ventral surface - the bottom surface of the tongue
- Papillae - small projections on the tongue's surface that contain taste buds
- Fungiform papillae - small, mushroom-shaped projections found at the front of the tongue
- Filiform papillae - thin, pointed projections that do not contain taste buds
- Circumvallate papillae - large, dome-shaped projections found at the back of the tongue
- Bottom of the tongue's tip direct attached to the floor of mouth by the short, thick or tight band of tissue called lingual frenulum

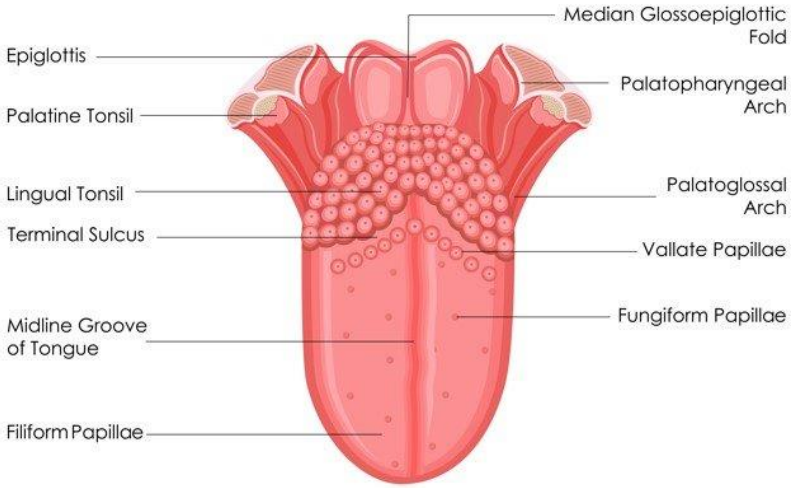

Fig: Anatomy of the Tongue

Physiology of the Tongue:

- The tongue contains thousands of taste buds that detect different tastes, such as sweet, sour, salty, and bitter.
- The tongue moves food around the mouth to help mix it with saliva, and its movements also play a role in speech.
- The tongue helps move food to the back of the throat for swallowing.
- The tongue also helps regulate oral hygiene by moving food debris and bacteria out of the mouth.

5. Nose:

The nose is a prominent organ in the face that plays a crucial role in the sense of smell and also helps to filter and moisten inhaled air.

Anatomy of the Nose:

- Nostrils - the two openings in the nose where air enters and exits
- Nasal cavity - the interior space inside the nose, divided by the septum
- Olfactory epithelium - the specialized tissue in the nose responsible for detecting odors
- Nasal conchae - curved bony plates in the nasal cavity that help increase surface area for air filtration
- Sinuses - air-filled cavities surrounding the nasal cavity

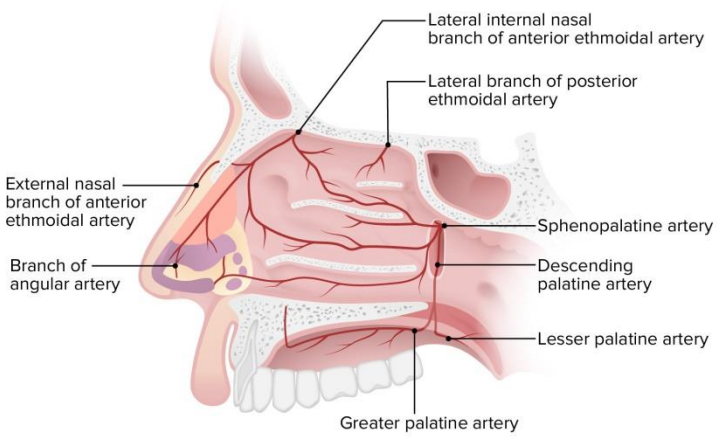

Fig: Anatomy of the Nose

Physiology of the Nose:

- The olfactory epithelium detects odors and sends signals to the brain to interpret as a specific smell.
- The nasal cavity filters, warms, and moisturizes inhaled air to protect the lungs.
- The sinuses help reduce the weight of the skull and improve resonance for speech.
- The nose also helps to improve the sense of taste by providing a moist and warm environment for taste buds in the mouth.
- Mucus in the nose traps dust, bacteria, and other particles, and the cilia in the nasal cavity move the mucus towards the throat for removal.