



# The Sensory Organs

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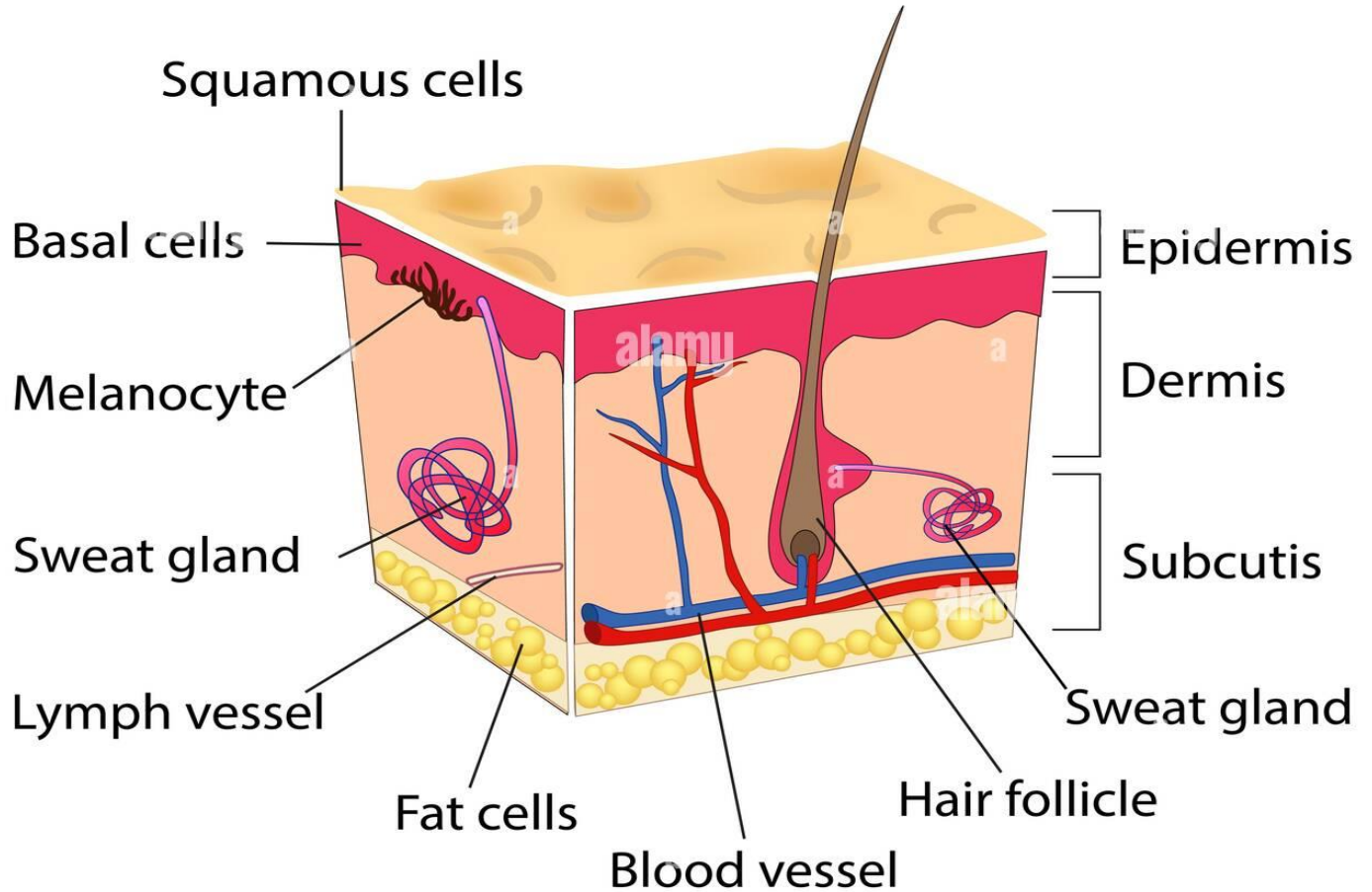
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# Skin Structure





# Functions of the skin

## Protection

- ✓ The integument or skin separates the animal from its external environment and helps to maintain a constant internal environment.
- ✓ The inflammatory cells in the skin provide defense against intruding antigens.





## Thermoregulation

- ✓ The average body temperature is maintained by the action of sweat glands as well as the hair on the skin of mammals.
- ✓ Evaporation of watery perspiration from the skin helps to cool and regulate body temperature in hot environments.
- ✓ For the elimination of heat, integumentary blood vessels dilate so that skin becomes a radiator whereas, for the conservation of heat, the vessels constrict.







## Excretion

- ✓ The secretion of sweat and sebaceous glands contains some amount of urea and other ions that aid in excretion. Excess vitamin B is also removed in the form of sweat.
- ✓ The skin is a minor excretory organ for some substances, especially when kidney function is impaired and aromatic substances, e.g. garlic and other spices.





## Formation of Vitamin D

- ✓ A lipid-based substance, 7-Dehydrocholesterol, in the skin is converted to vitamin D by sunlight.
- ✓ This vitamin is used in the formation and maintenance of bone, along with calcium and phosphate.

## Absorption

- ✓ Skin is capable of absorbing some substances which include some drugs, hormone replacement therapy during the menopause, and nicotine as an aid to smoking cessation in transdermal patches and some toxic chemicals like mercury.





# Sense of taste

## Physiology of taste

There are four fundamental sensations of taste.

**sweet, sour, bitter and salt.**

It is thought that all taste buds are stimulated by all 'tastes'. Taste is impaired when the mouth is dry because substances can be 'tasted' only when in solution.





**E.g.** when a person has a cold, it is common for food to taste bland and unappealing.

The sense of taste also has a protective function, e.g. when foul-tasting food is eaten, reflex gagging or vomiting may be induced.







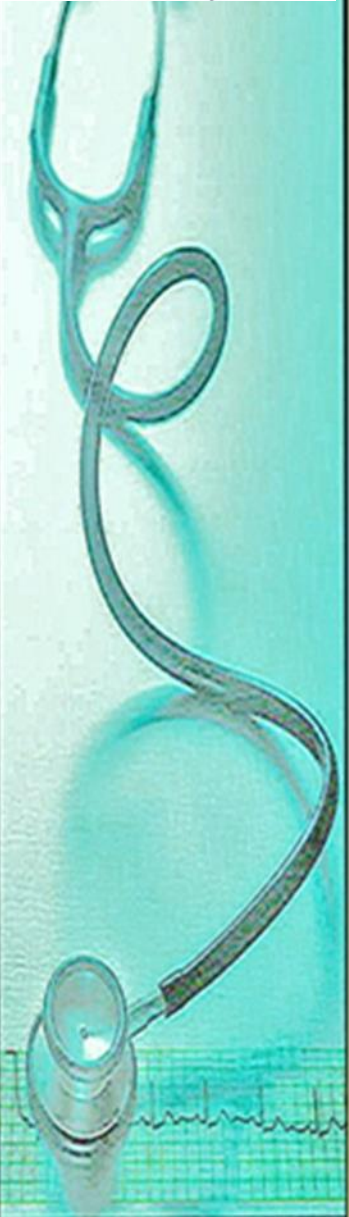
# Olfaction

## Physiology of smell

All odorous materials give off volatile molecules, which are carried into the nose with inhaled air, and even very low concentrations, when dissolved in mucus, stimulate the olfactory chemoreceptors.

The air entering the nose is warmed and convection currents carry eddies of inspired air to the roof of the nasal cavity.

'Sniffing' concentrates volatile molecules in the roof of the nose. This increases the number of olfactory receptors stimulated and thus perception of the smell.





The sense of smell may create powerful and long-lasting memories, especially for distinctive odours, e.g. hospital smells, or favourite or least-liked foods.

Inflammation of the nasal mucosa prevents odorous substances from reaching the olfactory area of the nose, causing loss of the sense of smell (anosmia). The usual cause is a cold.

## **Adaptation**

When an individual is continuously exposed to an odour, perception of it decreases and stops within a few minutes. This loss of perception affects only that specific odour.





## Hearing

The ear is the organ of hearing; it enables the perception of sound.

Hearing is the process by which the ear transforms sound vibrations in the external environment into nerve impulses that are conveyed to the brain, where they are interpreted as sounds. Sounds are produced when vibrating objects, such as the plucked string of a guitar.





The ability to hear from both the ears is known as binaural hearing, such type of hearing is essential as it helps in determining the sound source. The sound is felt in right ear first then the left ear, so the sound will be slightly louder for the right ear.

When brain interprets and compares both the sounds, it can easily distinguish that from which side the sound has originated, i.e., from the right or the left side.

Moreover, the brain has the unique property to distinguish the desired sounds from the background noises. This unique feature of brain is quite beneficial, especially in case of a crowded room where a person wants to hear any particular conversation.





Transmission of sound waves, in human ear takes place along four different mediums in the auditory system before the perception of sound.

**1) Sound Transmission through the Outer Ear:** The sound waves transmitted through air are received by the outer ear (pinna) and external auditory meatus, which further converges the sound waves in the ear canal.

**2) Sound Transmission through the Middle Ear:** The sound waves travel through air to reach the tympanum, and cause it to vibrate. The tympanum converts and transmits the sound energy from the air medium to the solid medium in the middle ear.

The ear ossicles present in the middle ear is in contact with the ear drum by malleus bone in such a way that the slightest movement of eardrum will set the ear ossicles into motion.





**3) Sound Transmission through the Inner Ear:** The ear ossicles help in the transformation of energy from the solid medium to the liquid medium in the inner ear by the stapes (attached to the fenestra ovalis).

**4) Sound Transmission to the Brain:** As the nerve impulse gets initiated, the medium of transmission changes from liquid to neural. This impulse propagates through the auditory nerve via different nuclei, till it reaches the auditory region of the brain.





## Physiology of Balance

Semi-circular canals and vestibule (including utricle and saccule) are the organs related to body balance.

This results in the nerve impulses transmitted through the vestibular nerve, which further converges with the cochlear nerve, resulting in the formation of vestibulocochlear nerve (auditory nerve).





The proprioceptors (sensory in nature), present in the joints and skeletal muscles along with the eyes, transmit nerve impulses towards the cerebellum.

Nerve impulses generated by these sources, combine together to reach the cerebrum via afferent nerves and to the skeletal muscles via efferent nerves.

This helps in the maintenance of erect body posture, proper positioning of the body, simultaneous fixation of both eyes at a specific point, and independent movement of head.

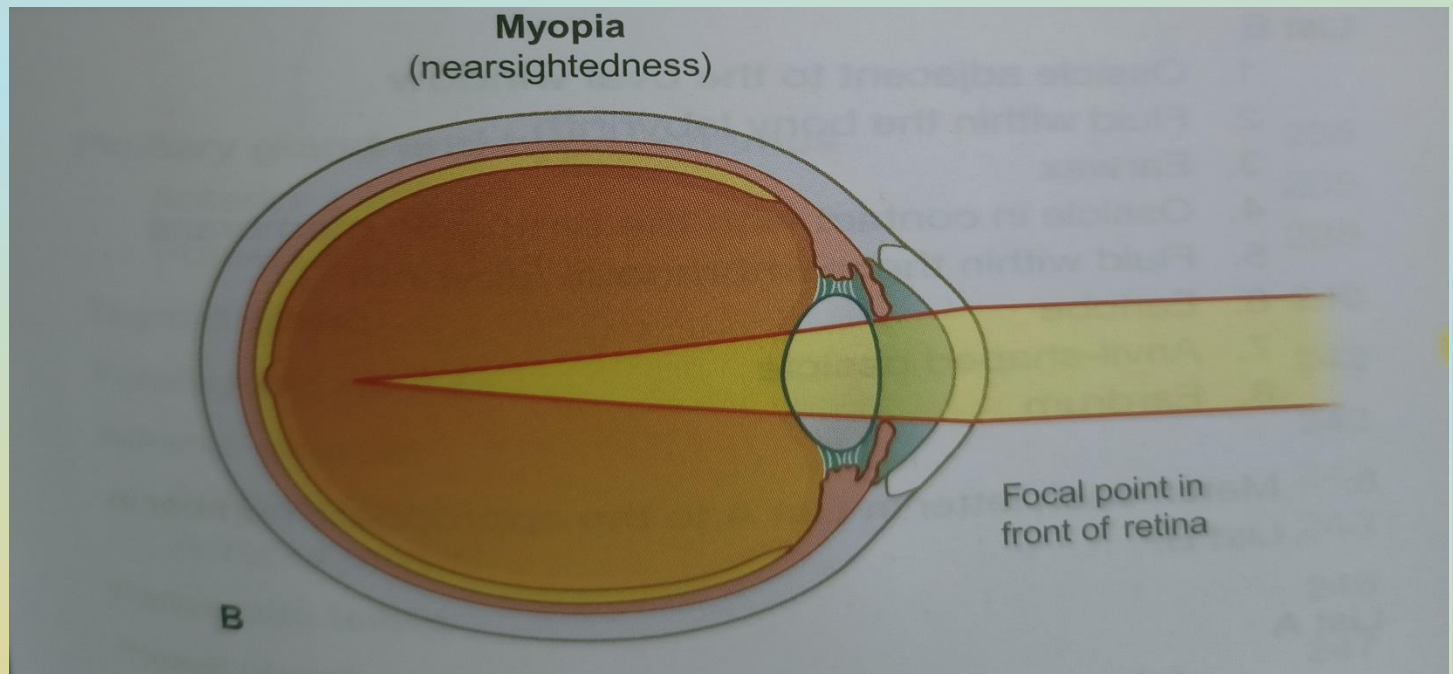




# Refractive errors of the eye

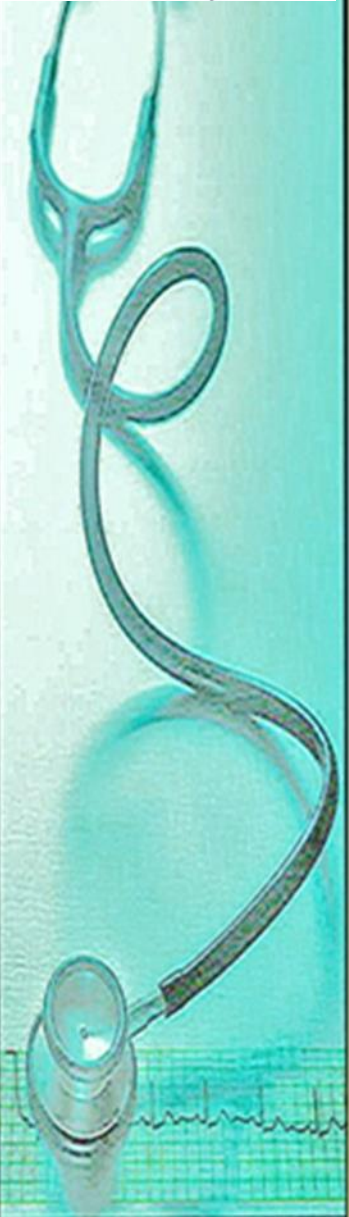
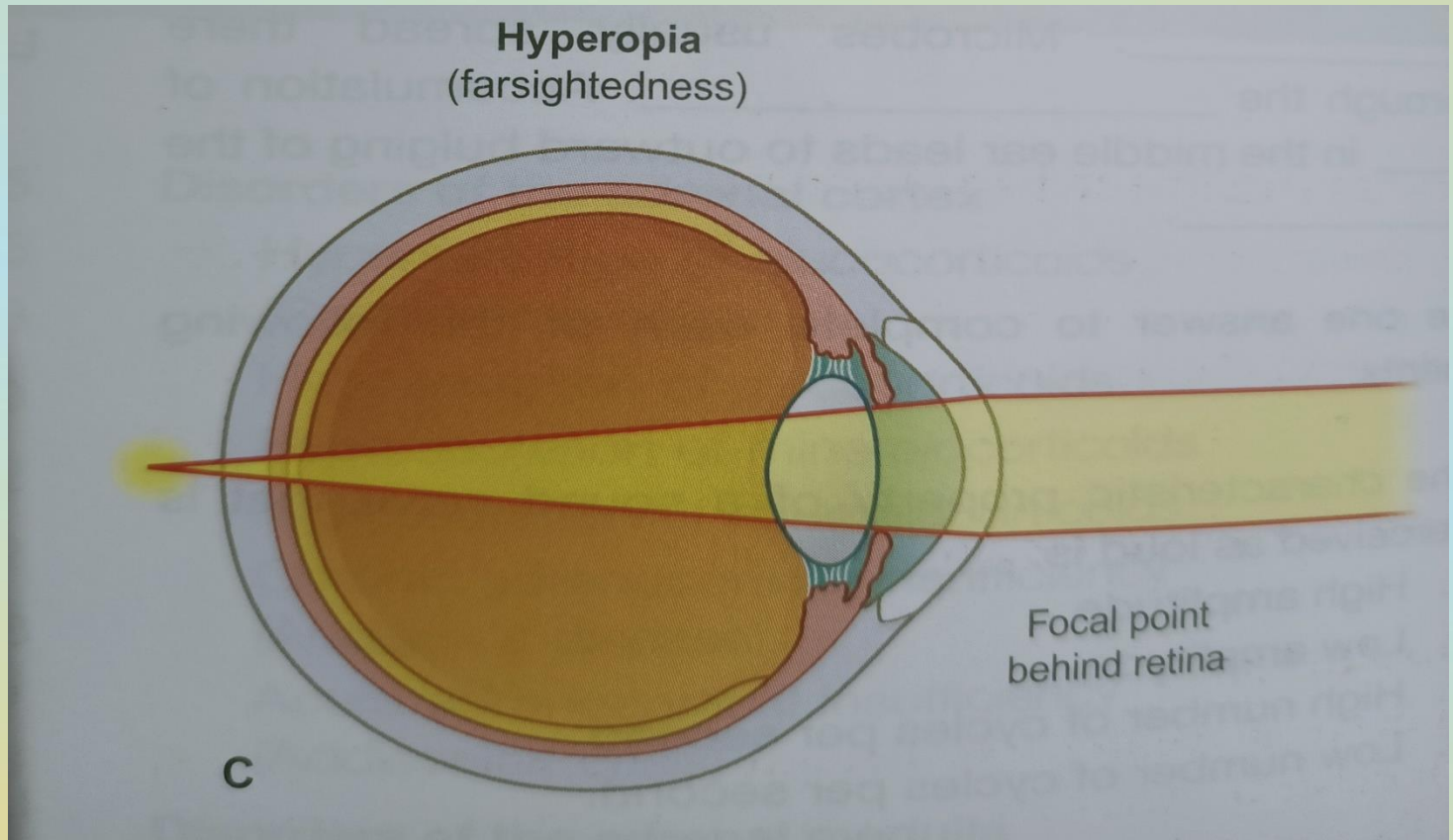
## Myopia

This abnormality is also called nearsightedness or shortsightedness. Because the eyeball is too long, distant objects are focused in front of the retina. Close objects are focused normally but distant vision is blurred. Correction is achieved using a biconcave lens.



# Hyperopia

This abnormality is also called farsightedness or longsightedness. It causes a near image to be focused behind the retina because the eyeball is too short. Distant objects are focused normally but close vision is blurred. A convex lens corrects this.





# Hearing loss

Hearing impairment can be classified in two main categories: conductive and sensorineural.

## 1. Conductive hearing impairment

This occurs when an abnormality of the outer or middle ear.

### Otosclerosis

This is a common cause of progressive conductive hearing loss in young adults, which may affect one ear but is more commonly bilateral. It is usually hereditary.





## Serous otitis media

Also known as 'glue ear', or secretory otitis media, this is a collection of fluid (effusion) in the middle ear cavity.

### Causes include:

- ✓ Obstruction of the auditory tube by, for example, pharyngeal swelling, enlarged adenoids or tumour
- ✓ Untreated acute otitis media.







## Sensorineural hearing impairment

This is the more prevalent form of hearing impairment and is the result of a disorder of the nerves of the inner ear or the central nervous system.

Noise-induced hearing loss is one cause of sensorineural hearing impairment, which may arise as a consequence of:

- ✓ Employment, e.g. construction work, manufacturing or the music industry
- ✓ Social activities, e.g. listening to loud music on personal equipment or at nightclubs.





## Meniere's disease

is a disorder of the inner ear that can lead to dizzy spells (vertigo) and hearing loss.

The cause is not known. Ménière's disease is associated with recurrent episodes of incapacitating dizziness (vertigo), nausea and vomiting lasting for several hours.



# Ear infection

## External otitis

Infection by *Staphylococcus aureus* is the usual cause of localised inflammation (boils) in the auditory canal. More generalised inflammation may be caused by prolonged exposure to bacteria or fungi or by an allergic reaction to, for example, soaps, hair sprays or hair dyes.







## Acute otitis media

This is inflammation of the middle ear cavity, usually caused by upward spread of microbes from an upper respiratory tract infection via the auditory tube. It is very common in children.

## Chronic otitis media

In this condition there is permanent perforation of the membrane following acute otitis media (especially when recurrent, persistent or untreated) and mechanical or blast injuries





## Disorders of the eye

### Inflammatory conditions

#### Stye

Also known as hordeolum, this is an acute and painful bacterial infection of sebaceous or tarsal glands of the eyelid margin. The most common cause is *Staphylococcus aureus*.



## Blepharitis

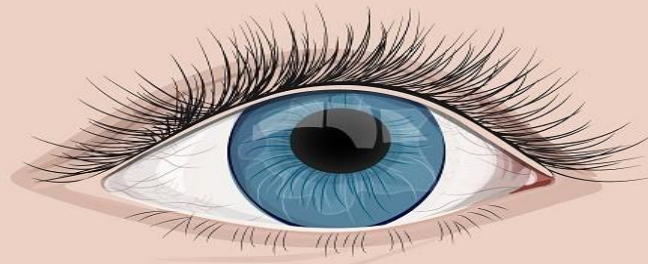
This is chronic inflammation of the eyelid margins, usually caused by bacterial infection or allergy, eg staphylococcal infection or seborrhoea (excessive sebaceous gland secretion).



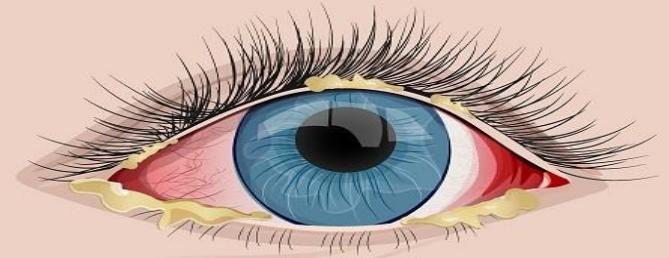


# Conjunctivitis

Inflammation of the conjunctiva may be caused by irritants, such as smoke, dust, wind, cold or dry air, microbes or antigens, and may be acute or chronic.



Healthy eye



Bacterial conjunctivitis



Viral conjunctivitis



Allergic conjunctivitis



# Aging changes

## Introduction

Aging changes the method in which our senses (hearing, vision, taste, smell, and touch) provide information about the world.

Sensory changes may affect an individual's lifestyle as it may cause difficulty in communication, enjoying activities, and being in contact with other people, and may lead to isolation. Senses collect information in the form of sound, light, smells, tastes, and touch from the environment.







Declined capability to identify vibration, touch, and pressure, increases the possibility of injuries, including pressure ulcers (skin sores developed when pressure inhibits blood supply to the area).

After the age of 50, the sensitivity to pain decreases in several people.

For example, when an individual is hurt, he/she may not be aware of how severe the injury is as the pain does not cause any inconvenience.





The aged people may have difficulty in walking because of decreased capability to identify whether or not the body is in contact to the floor.

Thus, the risk of falling increases in older people.

Aged people are more sensitive to light touches due to their thinner skin.

If changes in touch and pain, or difficulties in standing or walking arise, they should communicate to healthcare worker as there might be techniques to cope up the symptoms.





## Vision

Vision takes place as soon as the light is focussed on the eye and recited by the brain Light is passed through the cornea (transparent eye surface) and moves through the pupil (opening to the inner portion of the eye).

Aging alters all the eye structures. The sensitivity of cornea reduces, thus eye injuries remain unnoticed. After the age of 60, the size of pupils may reduce to about  $\frac{1}{3}$  of the original size fat the age of 20).





Aging slowly diminishes the sharpness of vision (visual acuity).

The most common disorder is difficulty in focusing the eyes on nearby objects; this condition is called presbyopia.

Wearing reading glasses, bifocal glasses, or contact lenses may aid to correct this problem.







## Hearing

The two important functions of ears are hearing and maintaining balance. When sound vibrations cross the eardrum to reach the inner ear, the hearing sensation is produced. The vibrations are converted into nerve signals in the inner ear and are carried by the auditory nerve to the brain for interpretation.

**For example,** the ability to receive sounds declines and the aged individual may find it difficult to maintain balance while sitting, standing, and walking.





## Taste and Smell

The taste and smell senses function collectively as many tastes are associated with smells. The sense of smell originates at the nerve endings on the upper lining of the nose. There are about 10,000 taste buds.

Aging decreases the number of taste buds; also, the left over taste buds start shrinking. After the age of 60, sensitivity to the five tastes reduces. Less saliva is produced in older people, causing dry mouth and affecting the sense of taste.

