

Medical Terminology

Lecture 4

Sensory system

Learning Objects:

- Examine the anatomy of the sensory systems
- Determine the main functions of the sensory systems
- Recognize common diseases, disorders, and procedures related to the sensory systems

Overview and Functions

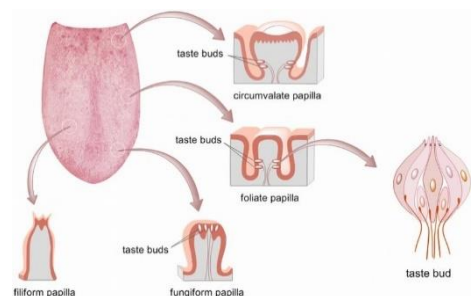
- ✓ Senses can be classified as either general or special.
- ✓ A general sense is the one that is distributed throughout the body and has receptor cells within the structures of other organs.
- ✓ **Mechanoreceptors** in the skin, muscles, or walls of blood vessels are examples of this type.
- ✓ General senses often contribute to the sense of touch, or proprioception and kinesthesia, or to a visceral sense, which is most important to autonomic functions.
- ✓ A special sense is the one that has a specific organ devoted to it, namely the eye, inner ear, tongue, or nose.

Gustation (Taste) and Olfaction (Smell)

Gustation (Taste)

Gustation is the special sense associated with the tongue. The surface of the tongue, along with the rest of the oral cavity, is lined by a stratified squamous epithelium. Raised bumps called papillae contain the structures for gustatory transduction. **There are four types of papillae, based on their appearance:**

- ❖ **circumvallate**
- ❖ **foliate**
- ❖ **filiform**
- ❖ **fungiform**



Within the structure of the papillae are taste buds that contain specialized gustatory receptor cells for the transduction of taste stimuli. These receptor cells are sensitive to the chemicals contained within foods that are ingested, and they release **neurotransmitters** based on the amount of the chemical in the food.

Neurotransmitters: Chemicals that are made by nerve cells and used to communicate with other cells, including other nerve cells and muscle cells.

Olfaction (Smell).

Like taste, **olfaction** is also responsive to chemical stimuli. The olfactory receptor neurons are located in a small region within the superior nasal cavity. The nasal epithelium, including the olfactory cells, can be harmed by airborne toxic chemicals. Scent receptor messages travel to the cerebrum, specifically to the primary olfactory cortex that is located in the inferior and medial areas of the temporal lobe, and additionally to the hypothalamus, where smells become associated with long-term memory and emotional response.

Audition (Hearing), Equilibrium (Balance), and Somatosensation (Touch)

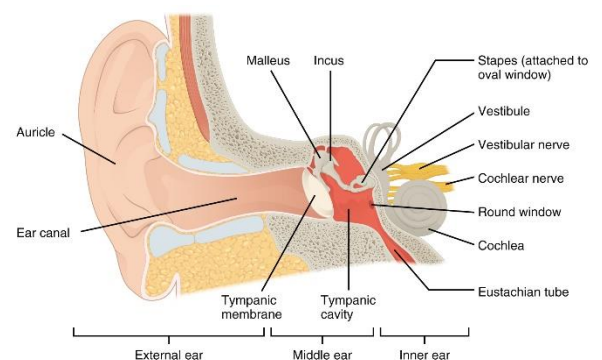
Audition (Hearing)

Hearing, or audition, is the transduction of sound waves into a neural signal that is made possible by the structures of the ear.

The external ear consists of the auricle, sometimes referred to as the pinna, ear canal, and tympanic membrane.

The middle ear consists of the ossicles, oval window, and tympanic membrane.

The inner ear is often described as a bony labyrinth, as it is composed of a series of canals embedded within the temporal bone.



Equilibrium (Balance)

Along with audition, the inner ear is responsible for encoding information about **equilibrium**. Equilibrium is the special sense associated with balance and spatial orientation. It involves the detection of head position and movement, helping maintain posture and stability.

Somatosensation (Touch)

Somatosensation is the group of sensory modalities that are associated with touch, proprioception, and interoception. These modalities include pressure, vibration, light touch, tickle, itch, temperature, pain, proprioception, and kinesthesia. This means that its receptors are not associated with a specialized organ, but are instead spread throughout the body in a variety of organs. Many of the somatosensory receptors are located in the skin, but receptors are also found in muscles, tendons, joint capsules, ligaments, and in the walls of visceral organs.

There are four main types of touch receptors:

Mechanical receptors: These receptors respond to pressure, touch, and vibration.

Thermoreceptors: These receptors respond to temperature changes.

Nociceptors: These receptors respond to pain.

Proprioceptors: These receptors of position and movement of the body.

Vision (Sight)

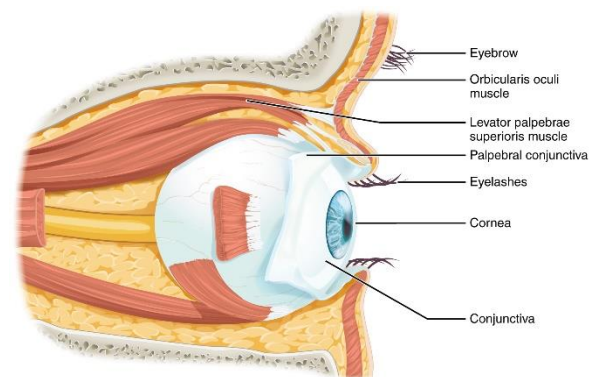
Vision is the special sense of sight that is based on the transduction of light stimuli received through the eyes. The eyes are located within either orbit in the skull. The bony orbits surround the eyeballs, protecting them and anchoring the soft tissues of the eye. The eyelids, with lashes at their leading edges, help to protect the eye from abrasions by blocking particles that may land on the surface of the eye.

The eye itself is a hollow sphere composed of three layers of tissue:

The outermost layer is the fibrous tunic, which includes the white **sclera** and clear **cornea**. The sclera accounts for five-sixths of the surface of the eye, most of which is not visible.

The middle layer of the eye is the vascular tunic, which is mostly composed of the choroid, ciliary body, and iris.

The innermost layer of the eye is the neural tunic, or retina, which contains the nervous tissue responsible for photoreception.



The *retina* is composed of several layers and contains specialized cells for the initial processing of visual stimuli.

Diseases and Disorders of the Sensory Systems

Olfactory Diseases and Disorders

Anosmia: A complete loss of the sense of smell. It can be caused by nasal infections, head trauma, and certain medications.

Rhinitis: Rhinitis is inflammation of the nasal cavity mucosal lining which can lead to congestion and rhinorrhea. Potential causes include allergy, bacterial or viral infection, and exposure to chemicals.

Ears, Nose, and Throat Diseases and Disorders

Otitis Media: Otitis Media is known as inflammation of the middle ear canal that involves the eardrum. It is commonly seen in younger children due to bacterial and viral infections. Signs and symptoms include fever, cough and cold symptoms, hearing loss, irritability, and otalgia (pain in the ear).

Otitis Externa: Otitis Externa is inflammation of the external ear canal. It is known as swimmer's ear because it is associated with its exposure to water. Its clinical presentation and management are the same as otitis media.

Conductive Hearing Loss: Conductive hearing loss occurs when something disrupts sound through the mid and outer ear, such as physical damage to the eardrum (perforation).

Sensorineural Hearing Loss: Sensorineural hearing loss results from damage to the neural structures. This type of hearing loss is usually permanent.

Otosclerosis: Otosclerosis is the hardening of the ear due to new bone formation of the inner ear ossicles. Its etiology may be related to prior measles infection, stress fractures to the tissue surrounding the inner ear, or immune disorders.

Eye Diseases and Disorders

Blindness: The term "blindness" may cover a broad spectrum of visual disability, from limited visibility to total blindness.

Cataract: A cataract is a clouding of the normally clear lens of your eye. For people who have cataracts, it is like seeing through cloudy lenses or windows. Age-related cataracts are the most common type, although cataracts can develop as a result of a congenital condition or due to trauma.

Conjunctivitis

Conjunctivitis is a condition involving inflammation of the conjunctiva. Common causes include allergens and bacterial and viral pathogens. The cause of conjunctivitis determines if it is transmissible from one individual to another; conjunctivitis caused by the adenovirus, for example, is highly contagious, whereas conjunctivitis caused by pollen is not.

Diabetic Retinopathy: Diabetic retinopathy is a disease of the retina caused by diabetes mellitus. The retinal veins dilate, leading to swelling as fluid leaks from blood vessels into the retina. It is estimated that 77% of patients with type 1 diabetes and 25% of patients with type 2 diabetes have diabetic retinopathy.

Glaucoma: Glaucoma is a condition in which increased pressure in the eye leads to progressive vision loss. It is the second most common cause of permanent blindness.

Taste Diseases and Disorders

Ageusia: A complete loss of the sense of taste. It is rare and can be caused by nerve damage, medications, and zinc deficiency.

Gustatory rhinitis: A condition that causes a temporary loss of smell and taste. It is most common during a cold or the flu.

Dysgeusia: A distortion or impairment of the sense of taste. It can be caused by zinc deficiency, medications, and nerve damage.

Medical Specialties Related to the Sensory Systems

An optometrist is an eye specialist that examines and evaluates for ocular pathology and prescribes corrective lenses.

An ophthalmologist evaluates and manages eye pathology as well as performs surgery.

An otorhinolaryngologist (ENT) is a physician that specializes in ears, nose, and throat treatment and conditions.

An audiologist evaluates and manages individuals with hearing loss.

Combining Form of Sensory system

audi/o (hearing)

aur/o (ear)

aur/i (ear)

blephar/o (eyelid)

cochle/o (cochlea)

conjunctiv/o (conjunctiva)

cor/o (pupil)

corne/o (cornea)

core/o (pupil)

cry/o (cold)

dacry/o (tear, tear duct)

dipl/o (two, double)

ir/o (iris)

irid/o (iris)

is/o (equal)

kerat/o (cornea)

labyrinth/o (labyrinth, inner ear)

lacrim/o (tear, tear duct)

mastoid/o (mastoid bone)

myring/o (tympanic membrane, eardrum)

ocul/o (eye)

ophthalm/o (eye)

opt/o (vision)

ot/o (ear)

phac/o (lens)

phak/o (lens)

phot/o (light)

pupill/o (pupil)

retin/o (retina)

scler/o (sclera)

staped/o (stapes, middle ear)

ton/o (tension, pressure)

tympan/o (tympanic membrane, middle ear)

vestibul/o (vestibule)

Sensory Systems Vocabulary

Acoustic neuroma : A benign tumor of the vestibular nerve in the internal auditory canal.

Anisocoria: Condition of unequal pupil size.

Anosmia: Loss of the sense of smell.

Audiologist: Specialist who studies, diagnoses, and treats hearing-related issues.

Audiology: Medical specialty that studies hearing and hearing impairment.

Audiometry: The testing of the acuity of the sense of hearing.

Cataract: A condition in which the lens of the eye becomes cloudy

Conjunctiva: Mucous membrane that lines the eyelids and outer surface of the eyeball

Conjunctivitis: Inflammation or infection of the conjunctiva; also called pinkeye.

Cornea: Transparent outer covering of the anterior portion of the eye

Dacryocystitis: Inflammation of the tear (lacrima) sac.

Dacryocystorhinostomy: Creation of an artificial opening between the lacrimal sac and the nose (to restore drainage).

Diplopia: Double vision.

Endophthalmitis: Inflammation within the eye.

Iritis: Inflammation of the iris.

Keratitis: Inflammation of the cornea.

Keratomalacia: Degeneration of the cornea.

Labyrinthitis: Inflammation of the inner ear (labyrinth).

Mastoidectomy: Excision of the mastoid bone.

Mastoiditis: Inflammation of the mastoid bone.

Myringoplasty: Surgical repair of the tympanic membrane.

Nasopharyngeal: Pertaining to the nose and pharynx (throat).

Nociceptors: Sensory neurons that respond to pain.

Ophthalmologist: A doctor who has special training in diagnosing and treating eye problems.

Ophthalmology: A surgical specialty focused on the structure, function, and surgery of the eye.

Ophthalmopathy: Disease of the eye.

Ophthalmoplegia: Paralysis of one or more eye muscles.

Ophthalmoscope: Instrument used to view the inside of the eye.

Optometrist: A specialist who diagnoses, treats, and manages diseases and disorders of the eye.

Optometry: The professional practice of eye and vision care that involves measuring vision.

Otalgia: Pain in the ear.

Otorhinolaryngologist: A doctor who has special training in diagnosing and treating diseases of the ear, nose, and throat.

Otomycosis: Fungal infection of the external ear.

Otosclerosis: Hardening of the ear.

Otoscope: Instrument used to view the ear.

Otoscopy: Process of viewing the ear canal and eardrum.

Pharyngitis: Inflammation of the pharynx.

Retinoblastoma: Cancer that forms in the tissues of the retina.

Retinopathy: Disease of the retina.

Retinoscopy: Process of determining the refractive state of the eye.

Rhinitis: Inflammation of the mucous membranes of the nose.

Rhinorrhea: Excess nasal drainage; also called a “runny nose.”

Sclera: The white of the eye.

Sinusitis: Inflammation of the sinuses.

Stapedectomy: Excision of the stapes.

Thermoreceptors: Specialized neurons that respond to changes in temperature.

Tonometer: Instrument used to measure pressure (within the eye).

Tonometry: Process of measuring pressure (within the eye).

Tonsillitis: Inflammation of the tonsils.

Tympanoplasty: Surgical repair of the tympanic membrane.

Visual acuity: Sharpness of vision.

Xerophthalmia: Condition of dry eye.