**16. Ears, nose and eyes**

The cell is the basis of all living things. To understand the structure and function of the body, we need to understand the structure and function of its smallest living part - the cell.

A cell is the smallest unit of matter that can live independently and reproduce itself. Cells exist in all shapes and sizes - elongated, square, star-shaped and oval - and have many different functions. A group of cells form tissue.

**TOPIC 1: THE EAR**

The ears provide hearing and maintain body balance. The ear structure has three parts - the outer ear, the middle ear and the inner ear.

**THE OUTER EAR**

The outer ear is the visible part of the ear. It protects the inner structures from damage. The External auditory meatus (auditory canal) is lined with ceruminous glands and hairs, which filter out dust and foreign particles. The outer ear is also the passage for sound waves. The tympanic membrane (eardrum) separates the auditory canal from the middle ear.

**THE MIDDLE EAR**

The middle ear is found within a cavity in the temporal bone. It has minute bones known as auditory ossicles that transmit sounds from the tympanic membrane to the inner ear.

**THE INNER EAR**

The inner ear is responsible for hearing and balance. Within the inner ear structures, the vibrations of sound waves are translated into nerve impulses. Structures within the inner ear, the semicircular canals and vestibule, help to maintain posture and balance.

**THE EUSTACHIAN TUBE**

The Eustachian tube connects the middle ear to the throat. It maintains the atmospheric pressure of air within the ear, enabling the eardrum to vibrate as the sound waves reach it. This is vital for hearing.

The ears are complex, sensitive organs and are susceptible to damage in many ways. Loud noise or trauma many damage the sensitive receptors in the ears, causing hearing loss. Viral or bacterial infections may cuase disorders such as Otitis media. Problems with the inner ear can cause conditions such as Menieres disease, tinnitus, vertigo or labrynthitis, which affect the balance and health of the client.

**TOPIC 2: THE NOSE**

**STRUCTURE**

Most of the nose is concerned with breathing: inhaling air into the body and exhaling it from the body (see p.158). However, it is also the organ of smell. At the top of the nose there are two areas of pigmented tissue known as olfactory membranes. They contain the olfactory, or smell-sensing cells, which have fine hair-like protrusions called cilia. The olfactory cells connect to nerves in an area known as the olfactory plexus. Once triggered, these nerves send messages along the olfactory nerves to the brain, particularly the limbic system. This area of the brain deals with memory, emotions, our basic instincts and mechanical functions.

**FUNCTION**

When odor molecules pass over the olfactory cells, it is thought that these cells trigger receptor areas which send an impulse via the olfactory plexus and nerves to the brain. Here the information is processed and interpreted (i.e. is it a new smell, a nice smell, a smell with positive or negative associations?). Depending on the interpretation, the brain sends messages to other parts of the body to elicit a response.

**TOPIC 3: THE EYE**

**THE EYES**

The eyes are the organs of sight. They are positioned separately, but function generally as a pair, assisting in the maintenance of balance.

The eyelids are layers of tissue above and below the front of the eye. They protect the eyes through blinking (20-30 times per minute) and the eyelashes that line the edges of the eyelids filter and trap substances such as dust. Sebaceous and mucous secretions lubricate the eyelids. Lacrimal glands secrete a fluid that keeps the surface of the eye moist and prevents the cornea from drying out. If a foreign body enters the eye, extra fluid is produced to wash away the particle. Parasympathetic stimulation of these glands causes crying, when large amounts of fluid are produced.

The eyes have a fibrous outer layer known as the sclera or white of eye. At the front of the eye this is covered by a thin mucous membrane, the conjunctiva. The conjunctiva also lines the inside of the eyelids and helps prevents damage and drying of the eye through mucous secretions.

The eye is divided into two sections, or chambers, each one filled with fluids that maintain the internal pressure and shape of the eyeball. The anterior chamber sits between the cornea and the lens and contains the aqueous humour. The vitreous chamber is the cavity behind the lens and is filled with the vitreous humour.

Light enters the eye through a transparent dome, the cornea, and it is focused onto the retina at the back of the eye. It passes through the cornea, the pupil and the iris. The iris is the coloured disc in the centre of the eye, and it controls the amount of light entering through dilation or contraction of the pupil, which appears as a black dot in the middle. The pupil dilates when the light is low and contracts when the light is bright, permitting or restricting the passage of light through the opening. The lens of the eye sits behind the pupil and refracts (bends) light reflected by objects. The ciliary muscles control the thickness of the lens, refracting light and allowing the eyes to focus. The lens becomes thicker to focus on objects nearby and thinner to focus on objects in the distance.

The retina forms the inner layer of the eye wall. It contains light sensitive cells (photoreceptors). Near the centre of the retina is the macula, which is highly sensitive and contains millions of photoreceptors called rods and cones. The photoreceptors permit the conversion of light rays into nerve impulses. In the centre of the macula is a small dimple, the fovea, which provides sharpest vision and is the location of most colour perception At the nasal side of the macula, the nerve fibres gather to form the optic nerve, one of the cranial nerves. This nerve leaves the eye through an area known as the blind spot, where there are no light-sensitive cells.

**TOPIC 4: DISEASES AND DISORDERS (PATHOLOGIES)**

**THE EAR**

**Deafness -** Partial or complete loss of hearing.

**Labrynthitis -** Is an inflammation of the inner ear which can cause balance disorders.

**Meniere's disease -** Is a disorder of the inner ear that can affect hearing and balance. It is characterized by episodes of dizziness and tinnitus and progressive hearing loss, usually in one ear.

**Motion sickness -** Is the state of being dizzy or nauseated because of the motions that occur while travelling in or on a moving vehicle.

**Otitis media -** Is an acute or chronic inflammation of the middle ear.

**Tinnitus -** Is a ringing or booming sensation in one or both ears; a symptom of an ear infection.

**Vertigo -** Is dizziness: a reeling sensation; a feeling that you are about to fall.

**THE EYE**

**Blepharitis -** Inflammation of the eyelids characterized by redness, swelling and dried crusts.

**Cataracts -** An eye disease that involves the clouding or opacification of the natural lens of the eye.

**Conjunctivitis -** An inflammation of the eye's outer membrane, which causes redness, swelling, itching and watering in one or both eyes and is contagious.

**Corneal ulcer -** Is an inflammatory or, more seriously, infective condition of the cornea, involving disruption of its epithelial layer with involvement of the corneal stroma.

**Glaucoma -** An eye disease that damages the optic nerve and impairs vision (sometimes progressing to blindness). Cells make tissue. There are four types of tissue: epithelial, connective, nervous and muscular.