UNIT 10: THE SPECIAL SENSES II

UNIT STRUCTURE

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10. 1- LEARNINNG OBJECTIVES

After going through this Unit, You will be able to

1. identify the key anatomical parts of the nose and skin
2. understand the functions of each component, how they contribute to the sense of smell and touch respectively
3. explain the structure of the nose and skin

10.2 INTRODUCTION

The nose is the primary organ of smell and functions as an important respiratory organ in the body. Besides this, it is also involved in functions such as tasting.The air that we breathe is filtered through the nasal hair. The inhaled air is warmed and humidified before it enters the lungs.The shape of the nose is due to the bones and cartilage. The nasal septum separates the nostrils and divides the nasal cavity into two.The nose is a special sense organ that is responsible for the sense of smell. It helps identify chemicals and particles in the air.

The skin is a general sense organ that provides the sense of touch, while the nose is a special sense organ that provides the sense of smell.The skin is the

largest organ in the body and is responsible for the sense of touch. It contains many receptors that detect pain, temperature, pressure, etc.

10.3 STRUCTURE AND FUNCTIONS OF SPECIAL SENSES

1. THE NOSE

STRUCTURE OF THE NOSE

Several bones and cartilages make up the bony cartilaginous framework of the nose and the internal structure.The nose is also made up of types of soft tissues such as skin, epithelia, mucous membrane, muscles, nerves, and blood vessels. In the skin, there are sebaceous glands and in the mucous membrane, there are nasal glands. The bones and cartilage provide strong protection for the internal structures of the nose. Several muscles are involved in the movements of the nose.The structure of the nose is explained as follows:

Bone: The hard bridge at the top of your nose is made of bone.

Cartilage: The upper cartilage provides support to the sides of the nose. The lower cartilage adds width and height to the nose. It provides shape to the nostrils and nose tip.

Nasal cavity: It is the hallow space through which air flows.

Hair and cilia: Hair and cilia tiny hair-like structures inside your nose trap dirt and particles. Then they move those particles toward your nostrils, where can be sneezed out or wiped away.

Septum: The septum divides the inside of the nose into two chambers. It is a thin wall made of bones and cartilage.

Mucus Membrane: The mucus membrane lines the nose, sinuses, and throat. It moistens and warms the air we breathe in. It also forms a sticky mucus that prevents dust and other small particles from the nose.

Sinuses: we have four pairs of sinuses. These air-filled pockets are connected to nasal cavities. They produce the mucus that keeps the nose moist.

Turbinates: There are three pairs of turbinates located along the sides of both nasal cavities. These folds inside the nose help warm and moisten air after we breathe it in and help with nasal drainage.

External nose

The visible part of the nose, made of bone, cartilage, and fatty tissue. The nasal root is the top part of the nose that connects to the forehead. The nasal apex is the bottom part of the nose that contains the nostrils. The nasal dorsum is the middle part of the nose

Nasal cavity

It is the airway passage that extends from the nostrils to the choana. The nasal septum divides the nasal cavity into two parts. The nasal cavity has three regions: the nasal vestibule, the respiratory region, and the olfactory region. The nasal cavity is lined with hair and mucus that trap dust and harmful particles

Paranasal sinuses

Air-containing sinuses that surround the nasal cavity. The sinuses include the frontal, ethmoid, maxillary, and sphenoid sinuses. The sinuses communicate with the nasal cavity via ducts.

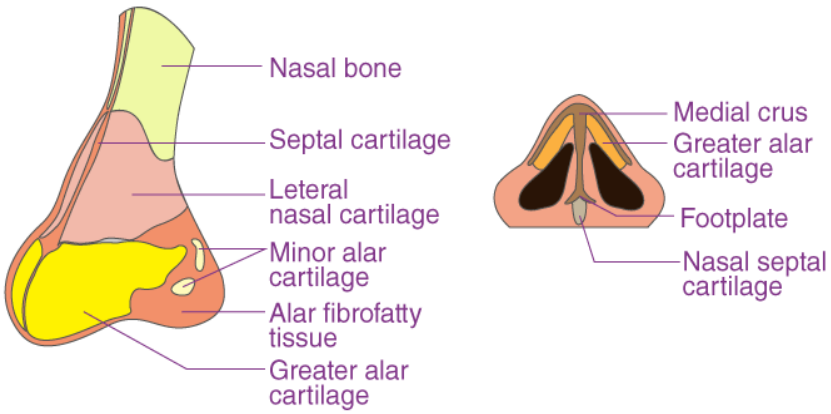


Figure 1 STRUCTURE OF NOSE

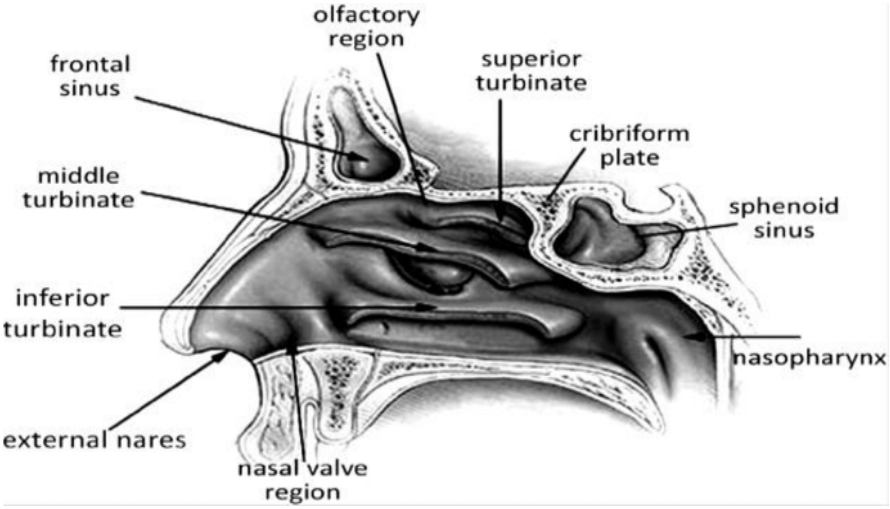


Figure 2 Structure of nose

FUNCTIONS OF THE NOSE:

Following are the important functions of the nose:

Sense of smell:

The inhaled air comes in contact with the olfactory epithelium and the nerve fibers extending from the olfactory receptors accumulate the molecules containing the odour to send the signals to the olfactory bulbs through the receptors. These signals are carried to the olfactory region of the brain and are decoded so that the smell is identified.

Sense of taste:

While chewing, the food releases certain chemicals that travel up to the nose and activate the olfactory receptors inside the nose. They work in coordination with the taste buds to identify the actual flavour of the food.

Helps in Inhalation:

In the respiratory system, the human nose is the very first organ of the upper respiratory tract. Its primary respiratory purpose is to provide and clean inhaled air by heating, moisturizing, and removing particulates. Large particles are caught in the nostrils by nasal fur, which prevents them from entering the lungs.

Speech:

The lungs' pressure is used to generate speech. Nasalization, or the process of adjusting airflow via the human body nose, may help with this. While enabling gasses to pass from both the nose and the mouth, the soft palate is lowered to create nasal vowels and consonants. Nasal airflow is sometimes used to obtain click consonants, which are a set of nasal clicks.

Purification of inhaled air:

The walls of the nasal cavity are covered with hair or cilia that trap the dust and harmful particles and purify the inhaled air. The back-and-forth movement of cilia helps in moving the dust particles to the throat where they are swallowed or are excreted through the nasal cavity.

MECHANISM OF OLFACTION

The sense of smell, or olfaction, occurs when odorant molecules activate olfactory receptors in the nose. This activates a series of biochemical reactions that ultimately result in the brain perceiving a smell.

Steps of olfaction

1. Inhaled odorant molecules enter the nasal cavity
2. The molecules bind to olfactory receptors in the olfactory epithelium
3. The binding causes the receptor membrane to change shape
4. This change generates an electrical signal in the sensory cell
5. The signal travels through the olfactory nerve to the brain's olfactory bulb
6. The olfactory bulb sends signals to the piriform cortex
7. The piriform cortex sends signals to other brain regions
8. The brain interprets the signals as a specific odor

2. THE SKIN - STRUCTURE AND FUNCTION

The skin is the largest organ of the body. It has three main layers, the epidermis, the dermis and the subcutaneous layer.

THE EPIDERMIS

The epidermis is an elastic layer on the outside that is continually being regenerated. It includes the following:

Keratinocytes - The main cells of the epidermis formed by cell division at its base. New cells continually move towards the surface. As they move, they gradually die and become flattened.

Corneocytes - The flattened dead keratinocytes that together make up the very outer layer of the epidermis is called the stratum corneum or horny layer. This protective layer is continually worn away or shed.

Melanocytes – Produce the pigment melanin that protects against UV radiation and gives skin its Colour.

THE DERMIS

The dermis is the inner layer that includes the following:

Sweat glands – Produce sweat that travels via sweat ducts to openings in the epidermis called pores. They play a role in temperature regulation.

Hair follicles – Are pits in which hairs grow. Hairs also play a role in temperature regulation.

Sebaceous glands – Produce sebum (an oil) to keep hairs free from dust and bacteria. Sebum and sweat make up the 'surface film'.

THE SUBCUTANEOUS

The subcutaneous layer under the dermis is made up of connective tissue and fat (a good insulator).

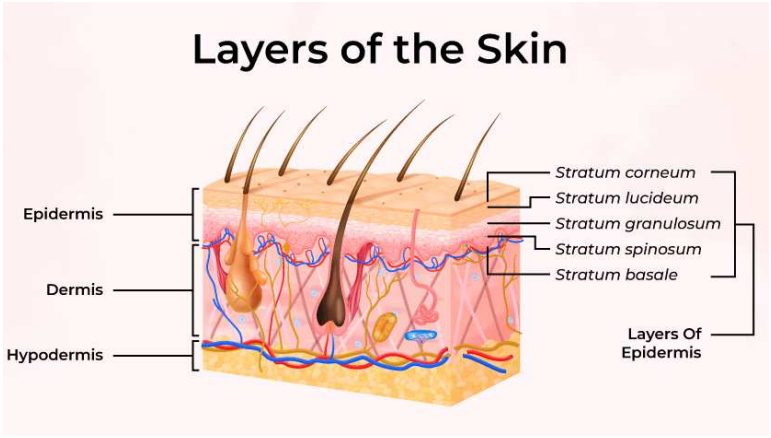


Figure 3 Skin (Somatosensory System)

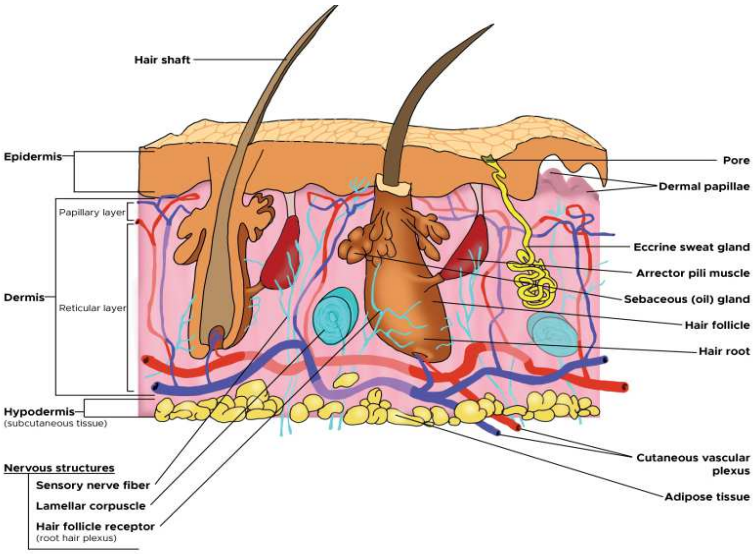


Figure 4 Cross Section, Layers of the Skin

FUNCTIONS OF THE SKIN

- Provides a protective barrier against mechanical, thermal and physical injury and hazardous substances.
- Prevents loss of moisture.
- An immune organ to detect infections etc.

- Storing lipids (fats) and water.
- Controlling water loss by preventing water from escaping by evaporation.
- Providing water resistance by preventing nutrients from being washed from the skin
- Protection against microorganisms, dehydration, ultraviolet light, and mechanical damage; the skin is the first physical barrier that the human body has against the external environment.Reduces harmful effects of UV radiation.
- Sensation of pain, temperature, touch, and deep pressure starts with the skin.Creating sensation through nerve endings that detect temperature, pressure, vibration, touch, and injury.
- Mobility**:** The skin allows smooth movement of the body.
- Endocrine activity: The skin initiates the biochemical processes involved in Vitamin D production, which is essential for calcium absorption and normal bone metabolism.
- Exocrine activity: This occurs by the release of water, urea, and ammonia. Skin secretes products like sebum, sweat, and pheromones and exerts important immunologic functions by secreting bioactive substances such as cytokines.
- Immunity development against pathogens. Protecting against pathogens. Langerhans cells in the skin are part of the immune system
- Regulation of Temperature: Skin participates in thermal regulation by conserving or releasing heat and helps maintain the body's water and homeostatic balance. Helps regulate temperature.
- Acts as a sensory organ (touch, detects temperature).
- Helping with thermoregulation by producing sweat and dilating blood vessels, which helps keep the body cool. "Goosebumps" and blood vessel constriction help people retain heat.

10.4 EFFECT OF YOGIC PRACTICES ON SKIN AND NOSE

EFFECT OF YOGIC PRACTICES ON SKIN AND NOSE

Yoga poses and facial exercises can help improve the appearance of skin and nose.Someyoga poses which can be beneficial for skin and nose special senses are-

Matsyasana (Fish Pose):

A backbend that stretches the face and neck muscles, which may reduce wrinkles.

Bhujangasana (Cobra pose):

A pose that involves lying on the stomach with the palms on the floor

Adhomukhashvanasana (Downward-facing dog):

A pose that may tighten loose skin

Sarvangasana (shoulder stand pose)

A pose that may tighten loose skin

FACIAL EXERCISES

Fish face: Suck in your cheeks as if making a fish face, then hold for a few seconds

Eyelid stretch: Look up and raise your eyebrows, then gently close your eyelids while still looking up

Smiling and nose push: Smile, then push the tip of your nose up with your index finger

Breathing exercises

Deep breathing: Deep breathing exercises, such as abdominal breathing and alternate nostril breathing, can help restore balance.

Benefits

- Yoga can help tighten loose skin and prevent aging.
- Yoga can help improve the appearance of wrinkles and fine lines.
- Yoga can help improve your complexion.
- Face yoga can help lift and firm the muscles under the skin.

Yoga causes vasodilatation (the enlargement of the blood vessels), which leads to increased blood flow to the skin.This allows for more oxygen and nutrients to come to the skin's surface, creating a cutaneous flushing or glow.

Tadasana (Mountain Pose)

With its focus on deep, rhythmic breathing, this simple standing pose helps alleviate stress and improve oxygen flow.Tadasana increases oxygen through controlled breathing helps the body to release harmful toxins and keep the skin healthy and glowing.By enhancing blood circulation, Tadasana improves lymphatic drainage, which brightens the complexion and reduces puffiness around the eye area

Uttanasana (Standing Forward Fold)

Inversions are one of the best exercises to bring blood flow to the face and increase oxygen supply to skin cells.

ParivrttaSukhasana (Simple Seated Twist)

A healthy gut is essential for healthy skin.Parivrttasukhasana is a gentle, seated twist that assists in digestion and toxin removal by increasing circulation and energy to the stomach, small intestine, large intestine and liver.

Matsyasana (Fish Pose)

Another yoga pose for better skin is Matsyasana, or fish pose.By gently stretching the throat muscles, fish pose helps flush your thyroid and parathyroid glands, thereby keeping hormones in check. Additionally, Matsyasana has great anti-aging benefits. This pose gives a good stretch to the muscles of the face and throat which makes it one of the beneficial exercises to reduce the appearance of a double chin."

Bhujangasana (Cobra)

Stress is one of the worst offenders for skin health. Emotional stress takes a huge toll on the hormones and skin. Cobra pose helps reduce tension, stress and fatigue by opening your lungs and energizing your body. This pose, and others in yoga, help your wellness by lowering cortisol (the "stress hormone")

and reducing oxidative stress.This also minimizes and prevents the visible signs of skin aging brought on by dehydration and loss of elasticity.

MEDITATION

Meditating for just a few minutes a day can relieve stress in our daily lives, which in turn can help our skin. If we look at severe skin issues and cases of psoriasis, one study tested the hypothesis that stress reduction methods based on mindfulness meditation can positively influence the rate at which psoriasis clears in patients. Meditation and Mantra recitation improves the microcirculation which reduces the stress. Stress free mind is important for the healthy body and soul.

PRANAYAMA

Nadi Shodhana

Also known as alternate nostril breathing, this is a breathing exercise that involves inhaling and exhaling through one nostril while keeping the other closed.

It's a calming technique that can help with stress and anxiety. It can also help regulate the nervous system, lower blood pressure, and strengthen lung muscles. To practice, sit quietly and slowly breathe in and out through one nostril while keeping the other closed. Then switch nostrils.

SHATKARMA

Jala neti is the procedure of nasal irrigation by lukewarm saline water, which removes the dried mucous from the nose, cleanses sinuses and helps in restoring the flow of air.Neti reduces excessive stress from the mind and relaxes the mind. It also helps to activate the healthy skin by increasing more blood circulation to the nasal area.

Kapalbhati is of prime importance as it is the best exercise for cleaning respiratory blockages, improving mental functioning and refreshing the head region

Kunjal Kriya helps in expulsion of phlegm and mucous deposited in the body.

10. 5- LET US SUM UP

The nose is the prominent structure between the eyes that serves as the entrance to the respiratory tract and contains the olfactory function. It provides air for respiration and serves the sense of smell. It cleans itself of foreign debris extracted from inhalation. Several bones and cartilages make up the bony cartilaginous framework of the nose and the internal structure. The nose is also made up of types of soft tissues such as skin, epithelia, mucous membrane, muscles, nerves and blood vessels.

The skin is a large, complex organ with range of vital roles, from protecting people from pathogens to helping maintain the right body temperature.

Yoga therapy has become important part of life to rejuvenate the body for a better harmony in the mind, body and soul. It helps to maintain health, prevention from various diseases. Yoga includes the Asanas, breathing and relaxation exercises to control the mind and emotions and making body more relaxed.

10.6 FURTHER READING

Text Books:

1. Ross and Wilson - Anatomy and physiology
2. Pearce, Evlyn C. - Anatomy and physiology for Nurses (Jaypee Brothers)
3. Tortora - Anatomy and Physiology

Reference Books:

1. Gray, H., *Anatomy of Human Body*, Lea &Febiger, Philadelphia
2. Guyton, Arthur C. *Textbook of Medical Physiology*, W.B.Saunders Co. Philadelphia
4. Gupta, A.K., *Sharir Rachana v kriya Vigyan*
5. Gore, M. M., *Anatomy & Physiology of Yogic Practices*, New Age Books, N.D.
6. Chaurasiya- *Human Anatomy*
7. Shirley Teles- *A glimpse of Human Body*

8. American Academy of Ophthalmology. Eye Anatomy: Parts of the eye and how we see (https//www.aao.org/eye-health/anatomy/parts-of eye)4/29/2023

✓ 10.7 ANSWER TO CHECK YOUR PROGRESS

Q1. What is the structure of the nose and what are its primary functions?

Answer: The nose is primarily composed of bone and cartilage, forming a framework that houses the nasal cavity, which is lined with mucous membranes and tiny hairs called cilia; its primary functions are to filter, warm, and humidify inhaled air while also providing the sense of smell through olfactory receptors located within the nasal cavity.

Q2.What are the sinuses?

Answer: There are four types of sinuses- Maxillary sinus, Frontal sinus, Ethmoid sinus, Sphenoid sinus

Q3. How many layers are in the nose?

Answer: The nasal envelop consists of five layers. Skin, superficial fatty layer, fibro-muscular layer, and periosteum or perichondrium are among them.

Q4. What are the four structures associated with the nose?

Answer: Structure associated with sinuses of the nose include the maxillary, frontal, and sphenoid and the ethmoidal cells.

Q5. How the nose helps you smell?

Answer: Olfactory receptors are located in the upper part of the nasal cavity; these nerve cells detect chemicals in the air. Olfactory bulb is located in the forebrain; this is where the nerve impulses from the olfactory receptors are received. Olfactory nerves carry the impulses from the olfactory bulb to the brain. The brain interprets the impulses as smells.

Q6. Mention the functions of nose?

Answer: The functions of nose include-

- **Breathing**: The nose allows air to enter and oxygenate your body.
- **Speech**: The nose contributes to how you sound when you speak.

- **Air filtration**: The nose filters and cleans air to remove germs and allergens.
- **Air warming and moistening**: The nose warms and moistens air so it can move comfortably into your respiratory system.

Q7. Define skin?

Answer: Skin is the outermost protective covering of the body, stretched all over the body in the form of a layer.

Q8. List the functions of skin?

Ans.- Functions of skin - (i) Protection (ii) Temperature regulation (iii) Perceive changes in the surroundings (iv) Synthesize vitamin D (v) Helps in excretion

Q9. List the four ways in which the skin serves as a protective body covering.

Answer- (i) It protects the underlying tissues from mechanical injury. (ii) It protects the body from harmful ultraviolet rays (present in sunlight). (iii) It protects the entry of harmful germs into the body. (iv) It prevents desiccation i.e., loss of water from the body surface by evaporation.

Q10. Name the pigment which imparts skin its Color.

Ans.- Melanin.

⍰ 10.8 MODEL QUESTION

A.Objectives Question

Q1. Define skin?

Q2. Name the pigment which imparts skin its Colour?

Q3. What are the name of sinuses present in the nose?

Q4. Which nerve is responsible for the smell?

Q5.The three regions of skin epidermis are _____, _____ and _____.

B. Very short question (Words Limit 150-200)

Q1. Draw the structure of nose? And explain it?

Q2. Explain the layers of the skin?

Q3. Explain the function of skin?

C. Long Essay (Words Limit 300-500)

Q1. Elaborate the structure and function of the nose and explain the mechanism of olfaction?

Q2. Explain in detail about the structure and function of skin and suggest the possible yogic
practices for the skin health?

Q3. Write in brief about the following: (i) Epidermis (ii) Dermis (iii) hypodermis

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