

**SARASWATI INSTITUTE OF PHARMACEUTICAL SCIENCES,
DHANAP, GANDHINAGAR – 382355**



HUMAN RESPIRATORY SYSTEM

DIGITAL NOTES

MR. RAVIKUMAR R. THAKAR

ASSISTANT PROFESSOR,

DEPARTMENT OF PHARMACOLOGY & PHARMACY PRACTICE

HUMAN RESPIRATORY SYSTEM

ANATOMY & PHYSIOLOGY OF ORGANS:-

NAME OF ORGAN	ANATOMY	PHYSIOLOGY
NOSTRILS	The visible part of human nose is the protruding part of the face that bears the nostrils. The shape of the nose is determined by the ethmoid bone and the nasal septum, which consists mostly of cartilage and which separates the nostrils.	It is play important role in mediating immune responses to allergens and infectious particles which enter the nose. It helps prevent allergens and infections from invading the nasal cavity and spreading to other body structures, for example the lungs.
NASAL CAVITY	Nasal vestibule Respiratory section Olfactory region	Conchea(turbinate bones) Olfactory system Bowman's gland Surrounding structures Paranasal sinuses Nasolacrimal ducts
NASOPHARYNK	Nasopharynx is 2 to 3 cm wide and 3 to 4 cm long and situated behind nasal fossa inside the optical bone. It is the space above the soft palate at back of the nose and connect to nose and mouth.	It is a part of pharynx which comprises three separate segment .The nasopharnx oropharynx and the hypophrynx.
LARYNK	The arytenoid cartilages from the part of larynx to which the vocal ligament and vocal folgs attach. They are pyramidal in shape and have 3 surface , a base, and an apex. The cuneiform cartilage are 2 small, club-shaped cartilage that anterior to the corniculate cartilages in the aryepiglottic folds.	It is involved in breathing, production sound, and protecting the trachea against food aspiration. The larynx houses the vocal cord and manipulates pitch and volume, which is essential for phonation.

TRACHEA	The trachea is the tube linking the cricoid cartilage of the larynx to the bronchi, forming. The trachea bifurcates to form the two bronchi at the level of the 4 th -5 th intercostal space.	It part of the conducting system which transports air from the external environment to the lung.
BRONCHI	Bronchi represent the airway in the respiratory tract that conducts air into the lungs. Bronchi will branch into smaller tubes that become bronchioles	Tubes which conducted air into the lungs , and they divide into the lungs, and they divide into two lobe . bronchi for left lung and into four lobe bronchi for right lung.
BRONCHIOLES	It is passageways by which air passes through the nose or mouth the alveoli of the lungs, in which branches no longer contain cartilage or glands in their sub mucosa.	It is the alveoli of the lungs passageways by which air passes through the nose or mouth, in which branches no longer contain cartilage or glands in their sub mucosa. They are branches of the bronchi, and are part of the conducting zone of the respiratory system.
LUNGS	The lungs are a pair of spongy air-filled organs located on either of the chest. The trachea conducts inhaled air into the lungs through its tubular branches, called bronchi. divide and smaller branches ,finally becoming microscopic.	Air enter the mouth or nose travels through the windpipe, bronchi and bronchioles to the alveoli. The exchange of oxygen and carbon dioxide, which is a waste product of the body cells, passes from the blood into the alveoli and is breathed out.

MECHANICS AND MECHANISM OF RESPIRATION:-

- The respiratory muscles are the skeletal muscles and do not possess any inherent rhythmicity. Their contraction and relaxation depend on the motor impulses that are being discharged from the respiratory centers situated in the medulla-oblongata of the brain.
- There are two centers in medulla-oblongata: inspiratory centers and expiratory centers. Inspiratory centers rhythmically discharge the impulses which are carried by phrenic and intercostal nerves. They result in contraction of their respective muscles. Expiratory center inhibits inhibitory centers and thereby bring about the relaxation of the respiratory muscles.
- Lungs of the foetus before birth in the mother's womb are solid. The pleural membrane is almost attached to parietal membrane and the pressure in the cavity is zero. Immediately

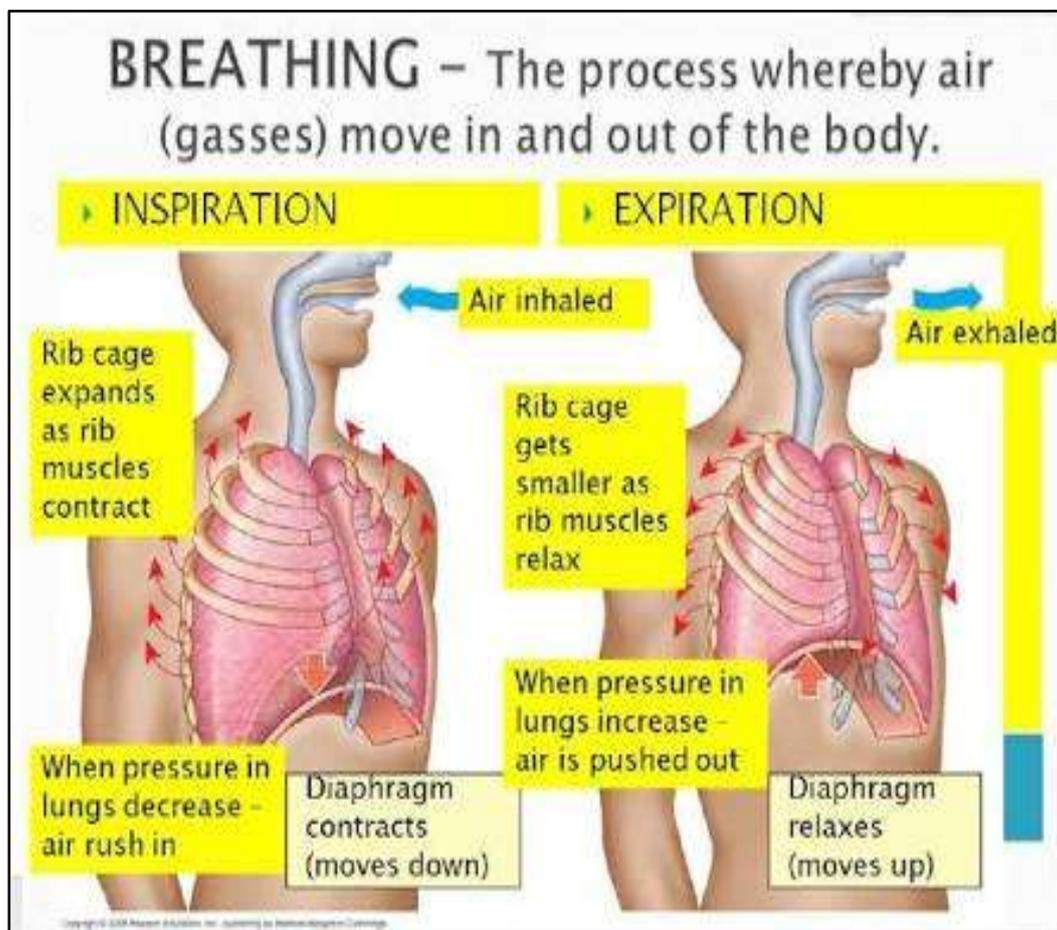
MR. RAVIKUMAR R. THAKAR

Assistant Professor

SIPS, Dhanap, Gandhinagar – 382355

after the start of parturition i.e. the moment the head of the baby comes out of the mother's womb, the change in temperature is felt in the medulla oblongata. This causes a negative pressure in the pleural cavity. Because of this negative intrapleural pressure the air is sucked through the mouth and nose and that is how the baby takes its first breath.

- Expiratory centers then act to inhibit the inhibitory center. The diaphragm and the intercostal muscles get relaxed. This brings the intrapleural pressure back to zero and the air expelled out. Normal rate of respiration in adults is 14-18 per min. in children it is higher and in infants it is still higher.
- The inspiration and expiration continue by the contraction and relaxation of respiratory muscles respectively. During normal inspiration, the pressure falls to about -2mmHg to -5mmHg. However, during forced inspiration, pressure falls to -40mmHg to -50mmHg in intrapulmonary. Because of the suction of air from the atmosphere.
- Besides respiratory muscles, in the forced inspiration sternocleidomastoid, scalenei, myslohyoid and plasma muscles also contract.
- It is the worth nothing that woman's respiration is thoracic-abdominal as the foetus has to occupy a part of the abdomen, whereas, in males respiration is abdomino-thoracic.



REGULATION OF RESPIRATION

MR. RAVIKUMAR R. THAKAR

Assistant Professor

SIPS, Dhanap, Gandhinagar – 382355

Page 4

- There are two separate neural mechanism that regulate respiration. one is responsible for voluntary control and the other for autonomic control. The autonomic to the respiratory motor neurons.
- The autonomic system in the pons and medulla oblongata is collectively described as respiratory centers. There are two groups of neurons in the respiratory centers. The dorsal group of neurons, is the source of rhythmic drive to phrenic motor neurons. The ventral respiratory groups through of both inspiratory and the expiratory cells that stimulate or inhibit dorsal respiratory group rhythmically.
- Respiratory centers as the described earlier, consist of the inspiratory and expiratory centers. respiratory center sends the impulses rhythmically and is inhibited intermittently by the expiratory centers. From lower level of the spinal cord, nervous impulses pass from the thoracic part through of the intercostal nerves to stimulate the intercostal muscles.

APNEUSTIC AND PNEUMOTAXIC CENTERS:

- The rhythmic discharge of the neurons in the respiratory center is spontaneous, but it is modified by centers in the pons and afferent impulses coming from lungs through vagus nerve. They are carried out by the vagus nerves to the respiratory centers in medulla oblongata. Besides these important factors, coughing, sneezing, swallowing and skin stimulation also reflex affect respiration.
- Pons in the brain consists of the two more centers: apneustic centers and the pneumotaxic center. stimulation of the apneustic center stimulates respiratory centers and results in arrest of respiration in inspiration. apneustic centers also cause deep and prolonged inspiration.
- Chemical control: It is the main factor in regulating the rate and depth of respiration. The pneumotaxic center in the pons is affected by the reaction of the blood. Carbon dioxide also stimulates the respiratory center directly. The pneumotaxic centers receive information about the changes in CO₂ through chemoreceptors present in the arch of aorta and the carotid body.
- Apneustic center also gets its inhibitory impulses from the vagus nerve. these impulses come from stretch receptor of the lungs and chemoreceptors of aortic and carotid bodies. Thus, apneustic center ceases to activate medullary centers and as a result the inspiratory center stops discharging and the expiration follows passively.
- By regulating respiratory depth and rate through above mentioned centers, respiratory system performs the following functions:
 1. Supply of the adequate amount of oxygen removal of carbon dioxide.
 2. Regulation of H⁺ ion concentration and hence pH of blood.
 3. Maintenance of body temperature

RESPIRATORY REFLEXES:

Pulmonary Irritant Reflexes:

MR. RAVIKUMAR R. THAKAR

Assistant Professor

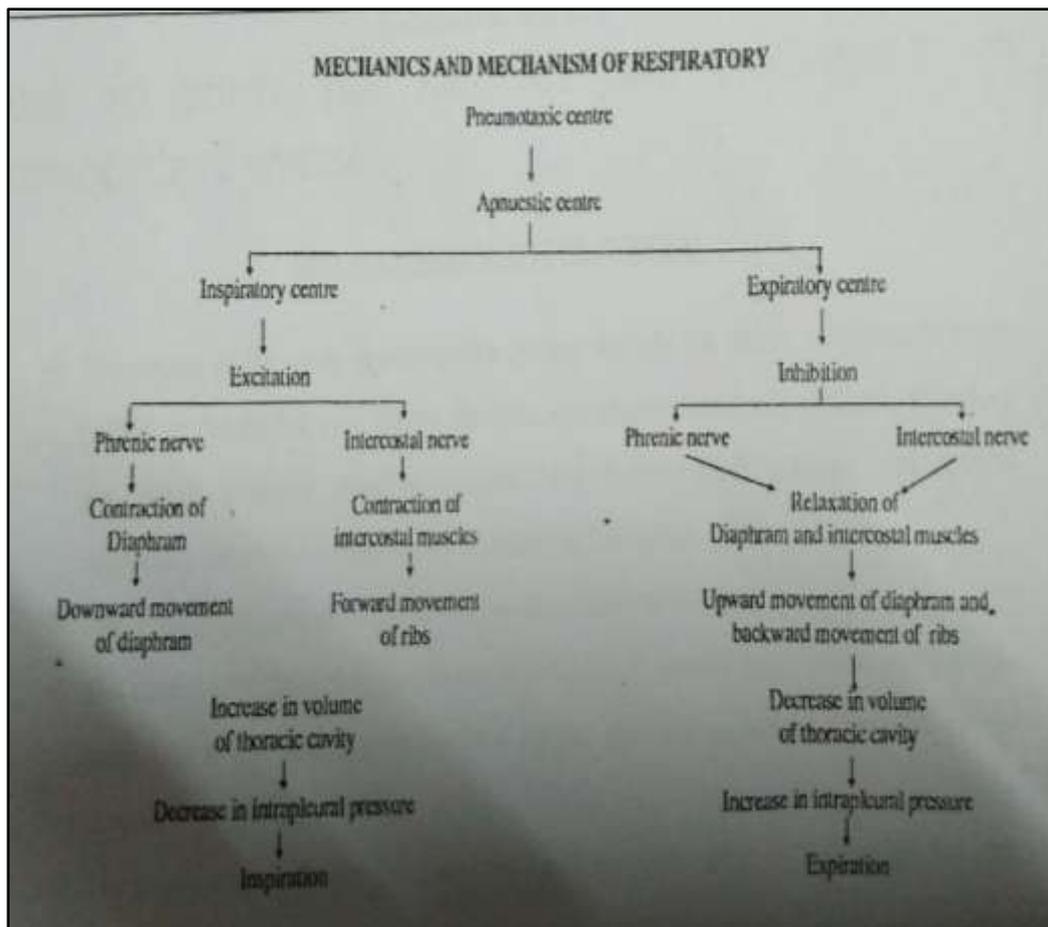
SIPS, Dhanap, Gandhinagar – 382355

Page 5

The lungs are sensitive to wide range of chemicals, dust, limit, smoke etc. On sensitization they communicate with respiratory centers via vagal nerves. These promote reflex constriction of air-passages, coughing & sneezing.

The Hering-Breuer Reflexes:

The conducting passages and visceral pleural contains stretch receptors which get stimulated when lungs are also over inflated. The impulses from these receptors are sent to medullary centers and result in termination and allow expiration. This reflex is mainly for preventing lung damage and is thus protective.



Mechanics & Mechanism of Respiratory