**THE RESPIRATORY SYSTEM**

**\_ FUNCTIONAL ANATOMY OF THE RESPIRATORY SYSTEM…..**

 **-the organs of the respiratory system include:**

 **\*(conducting part),, nose, pharynx, larynx, trachea ,bronchi and their small branches and the lung (respiratory part)**

**1)NASAL CAVITY:**

 **-the chamber within the nose , is divided medially by a nasal septum and separated from the oral cavity by the palate**

**- the nasal cavity is lined with a mucosa, which warms , filter and moister incoming air**

**-the mucosa also contains receptors for sense of smell**

**-paranasal sinuses and nasolacrimal ducts drain into the nasal cavity**

**2)THE PHARYNX:**

**-is a mucosa-lined muscular tube with 3 region : (nasopharynx, oropharynx, laryngopharynx)**

**-the nasopharynx functions in respiratory only**

**-the other serve both respiratory and digestive function**

**-the pharyngotympanic tube , which drain the middle ear, open into the nasopharynx ,the mucosa of these 2 regions are continuous ,so ear infection such as otitis media ,may follow a sore throat or other types of pharyngeal infection**

**-the pharynx contain ,clusters of lymphatic tissue called tonsils which act as a part of the body defense system**

**3)LARYNX (voice box):**

 **-routes air and food into the proper channel and play a role in speech**

**-it is a cartilaginous structure ,most prominent is thyroid cartilage (adam's apple)**

**-the larynx connects the pharynx with the trachea**

**-the laryngeal opening (glottis) is hooded by the epiglottis, which prevents entry of food or drink into respiratory passages when swallowing**

**-if anything other than air enters the larynx , a cough reflex is triggered to expel the substance and prevent it from continuing into the lungs**

**-parts of the mucous membrane of the larynx forms a pair of true vocal cord ,which vibrate with expelled air, this ability of the vocal folds to vibrate allows us to speak**

**4) TRACHEA:**

 **-extends from the larynx to the level of 5th thoracic vertebra**

**-the trachea is a smooth muscle tube lined with ciliated mucosa and reinforced with C-shaped cartilaginous rings**

**-the rings serve a double purpose:**

 **The open parts of the rings, allow oesophagus to expand**

**During swallowing of food:**

**It also keeps the trachea patent or open, in spite of the pressure changes that occur during breathing**

**\_MAIN BRONCHI….**

 **-right and left main (primary) bronchi result from subdivision of the trachea**

**-each plunges into the hilum of the lung on its side**

**\_LUNGS….**

 **-the lungs are large organs, they occupy the entire thoracic cavity except for the most central area (mediastinum) which houses the heart , oesphegus , bronchi ,great blood vessels**

**-the lungs are covered with pulmonary ( viscleral pleura , the thorax wall is lined with parietal pleura )**

**-the pleural membrane produce pleural fluid**

**-pleural secretion decrease friction during breathing**

**-the lungs are primarily elastic tissue and passage ways of the respiratory tree the smallest passage ways end in clusters of alveoli**

**-the conducting zone includes all respiratory passages from the nasal cavity to the terminal bronchiole, they conduct air to and from the lungs**

**-respiratory bronchiol ,alveolar ducts and sacs and alveoli ,which have thin walls through which all gas exchanges are made with pulmonary capillary blood are respiratory zone structure**

**\_THE RESPIRATORY MEMBRANE ….**

**-it construct from the alveolar and capillary walls , their fused basement membranes and occasional elastic fiber known as respiratory membrane (air-blood barrier ), which has gas (air) flowing past on one side and blood flowing past on the other**

**-the gas exchanges occur by simple diffusion through respiratory membrane**

**\_RESPIATORY PHSIOLOGY ……**

 **1) PULMONARY VENTILATION:**

**- Air must move into and out of the lungs so that the gases in the air olveoli of the lungs are continuously refreshed**

 **-this process of pulmonary ventilation is called breathing**

 **2) EXTERNAL RESPIRATIO-gas exchanges (o2 and CO2) between the pulmonary blood and alveoli**

**-in external respiration gas exchange are made between the blood and the body exterior**

 **3) RESIRATORY GAS TRANSPORT:**

 **-O2 and CO2 must be transported to and from the lungs and tissue cells of the body via the blood stream**

 **4) INTERNAL RESPIRATION:**

 **-in internal respiration , gas exchanges are occurring between the blood and cells inside the body**

**-(the actual use of O2 and production of CO2 by tissue cells is cellular respiration**

**\_MECHANICS OF BREATHING…..**

 **-breathing includes 2 phases (inspiration and expiration)**

 **\*INSPRATION….**

 **- Gas travels from high pressure to low-pressure area**

**-when inspiratory muscles contract (diaphragm and external inter costal) intra pulmonary volume increase, its pressure decrease air rushes in**

**\*EXPIRATION….**

 **-it is a passive process the depends more on the natural elasticity of the lungs than on muscle contraction**

**-when inspiratory muscles relax, the lungs recoil and air rushes out**

**\_RESPIRATORY VOLUMES AND CAPACITIES ….**

 **\*TIDAL VOLUME (TV)…**

 **Normal quiet breathing moves approximately 500 ml of air into and out of the lungs with each breath, this volume called T.V**

**\*INSIRATORY RESERVE VOLUME (IRV)….**

 **The amount of air that can be taken in forcibly over the tidal volume**

**\*EXPIRATORY RESERVE VOLUME (ERV)….**

 **The amount of air that can be forcibly exhaled after tidal volume**

**\*RESIDUAL VOLUME…**

**Is the amount of air left in your lungs after you breathed out as hard as you can**

**\*VITAL CAPACITY….**

**Is the maximum volume of air you can breathe out after breathing in as much as you can**

**\*DEAD SPACE VOLUME ….**

**The amount of air that remains in the conducting zone passageways and never reaches the alveoli**

 **\_EXTERNAL RESPRATION, GAS TRANSPORT AND INTERNAL RESPIATION …….**

**- External respiration \_\_ is the actual exchange of gases between the alveoli and the blood (pulmonary gas exchange)**

 **-Internal respiration \_\_is the gas exchange process that occur between capillaries and tissue cells**

 **-Cellular respiration \_\_ oxygen used to produce ATP,carbon dioxide as waste**

 **-gas exchange or gases move according to the laws of diffusion**

**-most O2 is transported bound to hemoglobin inside RBCs**

**-carbon dioxide moves from pulmonary blood into alveolar air**

**-most CO2 is transported as bicarbonate ion in plasma**

**-at body tissues, O2 moves from blood to tissues whereas CO2 moves from tissue to blood**

 **\_CONTROL OF RESPIATION…..**

 **1) NERVOUS CONTROL:**

 **-neural centers for control of respiratory rhythm are in the medulla**

 **- The medulla is the respiratory rate pacemaker**

**-reflex arcs initiated by stretch receptors in the lungs also play a role in respiration by notifying neural centers of excessive over inflation**

**2) PHYSICAL FACTOR:**

 **-increase body temperature, exercise, speech, singing**

 **And non-respiratory air movements modify both rate and depth of breathing**

**3) VOLINTION (CONSCIOUS CONTROL):**

 **-to a degree, breathing may be consciously controlled if it does not interfere with homeostasis**

**4) EMOTIIONAL FACTORS:**

 **- Some emotional stimuli can modify breathing**

**-ex: fear, anger and excitement**

**5) CHEMICAL FACTORS:**

 **-changes in blood level of CO2 are the most important stimuli affecting respiratory rhythm and depth**

**-CO2 acts directly on the medulla via its effect on reducing the PH of the blood and CSF**

**-rising levels of CO2in the blood result in faster , deep breathing falling levels lead to shallow , slow breathing**

**-changes in O2 concentration in blood are detected by peripheral chemoreceptors regions in aorta and common carotid artery**

**-these send impulses to the medulla when blood O2 levels are dropping**

 **\_DEVELOPMENT ASPECTS OF THE RESPIRATORY SYSTEM…..**

 **-in the fetus, the lungs are filled with fluid and all respiratory exchanges are made by placenta**

**-at birth, the fluid –filled pathway is drained ,and the respiratory passage ways fill with air , the alveoli in flate and begin to function in gas exchange but the lungs are not fully inflated for 2 weeks**

**-this success of this change depends on the presence of surfactant (a fatty molecule made by cuboidal cell in alveoli)**

**-it lowers the surface tension of the film at water lining each alveolar sac and the alveoli not collapse between each**