

BREATHING AND EXCHANGE OF GASES

REGULATION OF RESPIRATION

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- ❖ Human beings have a significant ability to maintain and moderate the respiratory rhythm to suit the demand of the body tissues. This is done by neural system.
- ❖ The respiratory rhythm centre in the Medulla is primarily responsible for this regulation.

Following respiratory groups regulate respiration :-

1. The **dorsal respiratory group (DRG)** is present in the dorsal portion of medulla oblongata. The signals from these neurons generate the basic respiratory rhythm. The nervous signal released from this group is transmitted to the diaphragm & EICM.
2. The **ventral respiratory group (VRG)** of neurons are located anterolateral to the dorsal respiratory group. During normal respiration, this remains inactive. In the enhanced respiratory drive, the respiratory signal of this group contributes to fulfil the demand by regulating both inspiration and expiration. Few of the neurons of this group control inspiration, while few other control expiration, thus regulating both.
3. The **pneumotaxic centre** is located on pons. It is called switch off point of inspiration. Neural signal from this centre can reduce the duration of inspiration and thereby alter the respiratory rate. When this center send strong signal then lungs are filled partially.

❖ **Hering Breuer reflex arch :**

In the walls of terminal bronchioles and atria stretch receptors are present, which are normally inactive but they become active when alveoli are filled with maximum air. The Hering Breuer reflex arch now becomes activated and sends inhibitory signals to the inspiratory centre to switch off inspiration. This prevents the alveoli from over stretching and bursting. Thus Hering Breuer reflex arch is a protective reflex which works only when normal mechanism of switch off of inspiration does not work timely due to any reason.

- ❖ A chemosensitive area is situated adjacent to the rhythm centre which is highly sensitive to CO_2 and hydrogen ions. Increase in these substances can activate this centre which in turn can signal the rhythm centre and increase breathing rate. The role of oxygen in the regulation of respiratory rhythm is quite insignificant.
- ❖ Aortic body and carotid body are chemoreceptors associated with aortic arch and carotid artery. They also can recognise changes in CO_2 and H^{+} concentration.
- ❖ The activity of respiratory centre is also affected by body temperature and blood pressure. Whenever body temperature is increased or blood pressure goes high, respiratory centre becomes more activated and this increases the respiration rate.

Functions of areas in the respiratory centre:

1. The medullary rhythmicity area contains two regions—The inspiratory area and expiratory area.
2. Nerve impulses arising in the inspiratory area establish the basic rhythm of respiration.
3. Neurons in the expiratory area are inactive during quiet respiration but cause contraction of the internal intercostal and abdominal muscles during forceful expiration.
4. The pneumotaxic area sends inhibitory impulses to the inspiratory area to limit inspiration and brings about expiration.
5. The apneustic area sends stimulatory impulses to the inspiratory area to prolong inspiration when the pneumotaxic area is inactive.