

## VENTILATION DURING REST

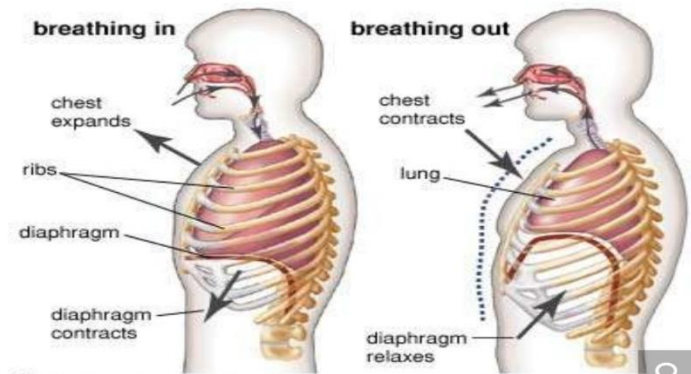
### A. Ventilation

- ❖ It can be defined as an automatic process of effortless expansion during inspiring air and voluntary contraction of chest during expiring air.
- ❖ It is a cyclic process which occurs via the organization of conducting tubes of airways but all inspired gas does not take part in gaseous exchange.
- ❖ A portion of the inspired air remains in conducting tubes of airways and does not enter in alveoli is one – third portion of inspired air at rest and this value shows more decrement in 10% due to increase size of inspired air during exercises.
- ❖ In contrast to the cyclic process of ventilation, the process of continuous flow of blood occur through lungs and participate in diffusion of gases.

### B. Ventilation pump is made up of:

- ✓ The diaphragm – expands the lower part of the rib cage and abdomen.
- ✓ The abdominal muscles - act on the abdomen and the abdominal rib cage and are expiratory.
- ✓ The muscles of rib cage (i.e. the intercostals, the parasternals, the scalene and the neck muscles), mostly act on the upper part of the rib cage (both expiratory and inspiratory)

**Note:** Ventilator pump is versatile and it has the capacity to increase its output value 25 times i.e. from the resting level of approximately 6 liters/min to 150liters/min in adults.



### C. Ventilation at rest

- ❖ During rest or sleep, metabolic rate of body is reduced and even there is a greater decline in the level of ventilation leads to the slight rise or falls in partial pressure of carbon dioxide and oxygen in arterial wall respectively.
- ❖ Effects can be detected in pattern of ventilation which may vary with resting stage.
- ❖ Minute ventilation can be calculated by multiplying the rate and tidal volume.
- ❖ Paradoxical effects (i.e. in consisted movements like inward and outward during inhaling and exhaling the gases respectively) produced as undesirable motions on at least one of the airway compartments while contraction of individual muscle group alone or the predominant contraction in comparison to other muscle groups.
- ❖ To avoid these undesired motions, two or three groups of muscles are required to work in well - coordinated manner.
- ❖ In the course of breathing at rest level, this coordinated task is accomplished by the performance of rib cage muscles (inspiratory) and diaphragm.
- ❖ At normal state, expiratory muscles and accessory muscles do not participate.

#### References:

1. The Physiology of Ventilation, Gaston Murias MD, Lluís Blanch MD PhD, and Umberto Lucangelo MD, RESPIRATORY CARE, VOL 59 NO 11, Pages 1795-1804, DOI: 10.4187/respcare.03377
2. The control of ventilation during exercise: a lesson in critical thinking, Richard. M. Bruce, Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford, United

Kingdom, *Adv Physiol Educ* 41: 539 –547, 2017; doi:10.1152/advan.00086.2017, •  
<http://advan.physiology.org>.

3. Changes in ventilation mechanics during expiratory rib cage compression in healthy males, Kyoushi Mase et al., *The Society of Physical Therapy Science*, Published by IPEC, pages 820–824, 2018, <https://creativecommons.org/licenses/by-nc-nd/4.0>.
4. The respiratory muscles during exercise, Aliverti A. et al., *Physiology master class, Breathe* 2016; 12: 165–168, DOI: 10.1183/20734735.008116,
5. *Control of Breathing*, by Rebecca Dezube, Johns Hopkins University, 2019, *Biology of the lungs and airways*.