Describe the structures and regulatory mechanisms essential for both quiet and he...

Science, Biology

Biology Essay al Affiliation Biology Essay Breathing appears to take place automatically. However, the process is controlled subconsciously by the respiratory center found at the base of the human brain. The process continues even during sleep or when an individual is subconscious. During quiet breathing, the predominant muscle is the diaphragm1. When it contracts, there is a drop in the pleural pressure. This lowers the alveolar pressure. The pressure gradient draws air the alveoli. Expiration during quiet breathing is a passive phenomenon. This is due to the fact that as the respiratory muscles relax, the lung and the chest wall will passively and automatically move back to their resting volumes and residual capacities.

As diaphragm contracts and moves down, the chest cavity is enlarged reducing lung pressure. Air moves in to equalize the pressure. When the diaphragm relaxes, it moves back to its original position pushing air out due to the increased pressure in the chest cavity.

In heavy breathing, many other muscles are involved. During the inspiration process, the lower ribs are raised up and out by the external intercostal muscles. The process increases lateral as well as anterposterior proportions of the thorax. Sternomastoids and the scalene muscles also aid the process by helping raise and push the sternum and the upper ribs2. This creates a pressure gradient which draws air into the alveoli. Unlike quiet expiration which is predominantly passive, heavy expiration requires the functioning of several muscles. The most important muscles here are the ones making up the abdominal wall. They include the internal and external obliques and the rectus abdominus. The transverse abdominus also plays a role in the process. These abdominal wall muscles raise the intra- abdominal pressure

by contracting3. It results in the pushing up of the diagram. The upward movement raises the pleural and alveolar pressure thus driving air out. The ribs are also pushed down and in during heavy expiration by the internal intercostals.

The breathing rate is controlled by the respiratory center in the brainstem. It is responsible for sending signals to the various respiratory muscles thus dictating when to breathe. The spinal cord is directed to maintain breathing by the medulla4. A part of the brain called the pons, located near the medulla, is key in smoothening the breathing and respiration pattern. Synchronization occurs between the involved neural centers and the muscle movement in order to ensure smooth breathing. The control occurs automatically and continuously. One does not have to think about it for it to take place. The frequency as well as the depth of breathing is very important aspects since they help in maintaining levels of oxygen, Carbon Dioxide and Hydrogen in blood. There are a number of receptors which perceive changes in the lung volume and concentration of carbon dioxide, oxygen and hydrogen ions in the blood. The receptors then give feedback to the respiratory neurons that influence the breathing depth and frequency. The reticular formation on the other hand perceives temperature and pain and gives the feedback to the respiratory centers.

Reference List

E. P. Widmaier, H. Raff, K. T. Strang, and A. J. Vander, Vanders Human Physiology: The Mechanisms of Body Function, London, Churchill Livingstone, 2011, p. 109-120.

F. Kendall, E. McCreary, P. Provance, M. Rodgers, and W. Romai, Muscles

Testing and Function with Posture and Pain, Pennsylvania, Lippincott Williams & Wilkins, 2005, p. 70.

P. R. Wheater, and B. Young, Wheaters Functional Histology: A Text and Colour Atlas, New York, McGraw Hill, 2006, p. 23-30.