



Alayen University

Anesthesia Department

Lecture 5

Respiratory System

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Respiration occurs at multiple levels. We respire when our blood travels through our lungs and picks up oxygen and drops off carbon dioxide. We also respire when that oxygen gets delivered to our cells and carbon dioxide is carried away from those cells. Finally, we respire when our cells use that oxygen to make needed energy and

create carbon dioxide as waste. All levels of respiration are essential for life.

ANATOMY OF THE RESPIRATORY SYSTEM

The respiratory system consists of the structures used to acquire oxygen (O_2) and remove carbon dioxide (CO_2) from the blood. Oxygen is required for the body's cells to synthesize the chemical energy molecule, ATP. Carbon dioxide is a by-product of ATP production and must be removed from the blood. Otherwise, increased levels of CO_2 will lower the pH of the blood. The blood pH must be maintained within relatively narrow limits to maintain homeostasis.

There are seven structures that make up the respiratory system. They include the following:

1. **External nose.** The external nose encloses the chamber for air inspiration. Although air can be inspired through the mouth, the

mouth is part of the digestive system rather than the respiratory system.

Nasal cavity. The nasal cavity is a cleaning, warming, and humidifying chamber for inspired air. .2

Pharynx. The pharynx is commonly called the throat. It serves as a shared passageway for food and air. .3

Larynx. The larynx is frequently called the voice box. Its rigid structure helps keep the airway constantly open, or patent. .4

Trachea. The trachea is commonly known as the windpipe. It serves as an air- cleaning tube to funnel inspired air to each lung. .5

Bronchi. The bronchi are tubes that direct air into the lungs. .6

Lungs. Each lung is a labyrinth of air tubes and a complex network of air sacs, called alveoli, and capillaries. The air sacs are separated by walls of connective tissue containing both collagenous and elastic fibers. Each air sac is the site of gas exchange between the air and the blood. .7

FUNCTIONS OF THE RESPIRATORY SYSTEM

Respiration, or what we call breathing, is critical for homeostasis. There are two broad aspects of respiration:

ventilation, which is simply movement of air into and out of the lungs, and (1)

respiration, which is the diffusion of gases across cell membranes. (2)

There are two major types of respiration within the body:

A- external respiration, which is the movement of gases between atmospheric air in the lungs and the blood, and

B- internal respiration, which is the movement of gases between the blood and the body's cells.

Ventilation and respiration occur in different regions of the respiratory tract. Commonly the respiratory tract is separated into two regions:

the **upper respiratory tract**, which includes the 1 structures from the nose to the larynx, and

the **lower respiratory tract**, which includes the 2 structures from the trachea through the alveoli in the lungs.

For the respiratory system to accomplish gas exchange between the air and the blood, there are four simultaneous processes:

Ventilation. This is what we more commonly refer to as 1 breathing. Air moves into and out of the respiratory passages.

External respiration. At the terminal portion of the air 2 tubes, are tiny air sacs called alveoli. Oxygen moves out of the alveolar air and into the blood. At the same time, CO₂ diffuses out of the blood and joins the air in the alveoli.

Gas transport. Carbon dioxide and O₂ travel in the blood to 3 and from cells.

Internal respiration. Gas exchange with the tissues involves 4 the exit of O₂ from the blood into cells, while CO₂ exits cells to enter the blood.

Sometimes, it could be confusing to hear the term respiration alone because it also refers to cellular metabolism, or **cellular respiration** in fact, the two processes are related. Breathing provides the O₂ needed in cellular respiration to make ATP from glucose. Breathing also rids the body of potentially toxic CO₂, which is produced during cellular respiration.

In addition to respiration, the respiratory system performs the following functions:

- Regulation of blood pH.** The respiratory system can alter blood pH by changing blood CO₂ levels. .1
- Production of chemical mediators.** The lungs produce an enzyme called angiotensin-converting enzyme (ACE), which is an important component of blood pressure regulation. .2
- Voice production.** Air moving past the vocal folds makes sound and speech possible. .3
- Olfaction.** The sensation of smell occurs when air borne molecules are drawn into the nasal cavity. .4
- Protection.** The respiratory system provides protection against some microorganisms by preventing them from entering the body and removing them from respiratory surfaces. .5

