

# Differentiation between respiration and breathing



Report: The differentiation between respiration and breathing and an explanation of the adaptation of the alveoli and their role in gas exchange.

## Introduction

This report will explore the differences between respiration and breathing by defining their structures and functions and attaching a hand drawn diagram of the respiratory tract to refer to. The author will also give an explanation of how gasses are exchanged through the alveoli by providing a table explaining the composition of inhaled and exhaled air. A description of the adaptations of the alveoli will be provided to show how they maximise the effectiveness of gas exchange. A summary will then be drawn from the findings.

## Differences between respiration and breathing

### The Respiratory System(Appendix . 1)

The respiratory system consists of tissues and also organs that help with the process of breathing. The core parts of this important system are the airways, lungs, linked blood vessels, and also the muscles that allow breathing.

### Airways

The airways are pipes that carry oxygen to the lungs. They also carry waste gas, such as carbon dioxide out of the lungs. The airways consists of; linked air passages in the nose, (called nasal cavities), the mouth, Larynx (voice box), the trachea (windpipe) and lastly tubes named bronchi or also known as bronchial tubes, and also their branches. Air moves into the body through the mouth and nose, which warms and also wets the air. (Dry cold air can

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irritate the lungs causing problems for asthma sufferers). The air then moves down the Larynx and through the trachea. The windpipe splits into two bronchial tubes, the air moves through here and then enters the lungs (Remedy Health Media, 2015).

A thin flap of tissue named the epiglottis, covers the windpipe when swallowing. This prevents both food and drink from entering the air passageways that lead to the lungs, if this failed to be successful an individual could die. With an exception of some parts of the nose and the mouth, all of the other airways have special hairs known as cilia that are coated with tacky/sticky mucus. These cilia trap foreign particles and germs that enter the airways when breathing in. These tiny, fine hairs then collect the particles up to the mouth or nose. From there, they're swallowed, sneezed or coughed out. Nose hairs and mouth saliva also trap germs and particles.

### Lungs and Blood Vessels

Remedy Health Media (2015), also suggest that linked blood vessels and also the lungs carry oxygen to the human body and also remove carbon dioxide. The lungs are situated on either side of the breastbone and fill the area of the chest cavity. The left hand lung is ever so slightly smaller than the right hand lung to allow room for the cardiac muscle (heart). In both lungs, the bronchi divide into thousands of thinner tubes known as bronchioles and these thin tubes end in bunches of tiny rounded air sacs known as alveoli. Each of the alveoli are covered with little blood vessels known as capillaries.

The capillaries connect to a complex system of veins and arteries that transport blood through the whole body.

The pulmonary artery including also its branches carry blood which is holding only carbon dioxide and no oxygen to the capillaries that surround the alveoli. Inside the alveoli, carbon dioxide transfers from the blood into the air. In conjunction with this, oxygen transfers from the air and into the blood within the capillaries. The blood which is now carrying the oxygen moves to the heart through the pulmonary vein and also its branches. The cardiac muscle pumps the blood holding the oxygen out to the body. The lungs are separated into five sections known as lobes. Some individuals have to have a diseased lung lobe removed, however they can still breathe sufficiently by using their remaining lung lobes.

### Muscles Used for Breathing

Human Kinetics (2015), state that muscles situated near to the lungs help expand (loosen) and contract, (tighten) the lungs to allow breathing. These muscles comprise of the diaphragm, intercostal muscles, abdominal muscles and muscles in the neck and also collarbone area. The diaphragm is the main muscle for breathing and is dome-shaped and located beneath the lungs. It divides the chest cavity from the abdominal cavity.

They also explain that the intercostal muscles are positioned between the ribs. They also play a huge part in helping with our breathing. Beneath the diaphragm are the abdominal muscles. They help with breathing out when we breathe fast (for example, during exercise). Muscles in the neck and also collarbone area help with inhalation when other muscles involved in

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breathing don't work as well as they should, or when lung disease impairs breathing capacity.

## Breathing

### Inhalation

Hyper physics (2012), explain that during inhalation, the diaphragm contracts (tightens) and moves down which maximises the space in the chest, allowing room for the lungs to expand. The intercostal muscles situated in between the ribs also help to enlarge the chest. They contract to move the rib cage both up and out when inhaling. As the lungs capacity increases, air is drawn in through the mouth and nose. The air makes its way through the windpipe and enters the lungs. After making its way through the bronchial tubes, the air finally reaches and moves into the alveoli.

Through the extremely thin walls of the alveoli, oxygen taken from the air moves to the capillaries. Haemoglobin, a red blood cell protein aids the movement of oxygen from the alveoli to the blood. In conjunction with this, carbon dioxide travels from the capillaries into the alveoli. The gas has travelled in the bloodstream from the right side of the heart through the pulmonary artery. Blood carrying oxygen from the lungs is carried through the capillaries to the pulmonary vein which delivers the oxygenated blood to the left side of the heart. The left side of the heart pumps the blood to the rest of the body. There, the oxygen in the blood moves from blood vessels into surrounding tissues (Hyper physics, 2012).

### Exhalation

During the act of exhalation, the diaphragm relaxes and moves up and into the chest cavity. The intercostal muscles which sit between the ribs also relax to decrease the space available within the chest cavity. As this available space in the chest cavity reduces, air rich in carbon dioxide is forced out of the lungs and then windpipe, and lastly out of the mouth or nose (Boundless Biology, 2015).

Exhalation requires no effort unless lung disease is apparent or physical activity is taking place. During physical activity, the stomach muscles contract and force the diaphragm against the lungs more than usual which rapidly pushes air out of the lungs (Boundless Biology, 2015).

#### The adaptations of the alveoli and their role in gas exchange

##### Gas exchange

An exchange of gases takes place within the alveoli, between the gases inside the alveoli and the blood. Blood that arrives in the alveoli has a greater carbon dioxide concentration which is produced during respiration by the body's cells. However, the air in the alveoli has a much smaller concentration of carbon dioxide, resulting in a concentration gradient which allows carbon dioxide to diffuse out of the blood and into the alveolar air (Intel, 2014).

Also according to Intel (2014), blood arriving in the alveoli has a lower oxygen concentration (as it has been used for respiration by the body's cells), while the air in the alveoli has a higher oxygen concentration.

Therefore, oxygen moves into the blood by diffusion and combines with the haemoglobin in red blood cells to form the combined oxyhaemoglobin.

*This table taken from BBC (2014), shows the differences (estimated figures) in the composition of inhaled and exhaled air.*

Gas	% of inhaled air	% of exhaled air
Oxygen	21	16
Carbon dioxide	0.04	4
Nitrogen	79	79

### Adaptations of the alveoli

According to ABPI (2015), to maximise the effectiveness of gas exchange, the alveoli have numerous adaptations such as, they are folded, providing a much greater surface area for gas exchange to occur. Also the walls of the alveoli are only one cell thick which makes the exchange surface very thin – shortening the diffusion distance across which gases have to move.

Each alveolus is surrounded by blood capillaries which ensure a good blood supply. This is important as the blood is constantly taking oxygen away and

bringing in more carbon dioxide, which helps to maintain the maximum concentration gradient between the blood and the air in the alveoli. Lastly each alveolus is ventilated, removing waste carbon dioxide and replenishing oxygen levels in the alveolar air. This also helps to maintain the maximum concentration gradient between the blood and the air in the alveoli (ABPI, 2015).

## Summary

This report has explored the differences between respiration and breathing by defining their structures and functions. The author has also give an explanation of how gasses are exchanged through the alveoli by providing a table explaining the composition of inhaled and exhaled air. A description of the adaptations of the alveoli has been provided to show how they maximise the effectiveness of gas exchange.

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