

Difference Between Oxygenation and Ventilation

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Key Difference - Oxygenation vs Ventilation

The oxygenation and [ventilation](#) are two different [physiological processes](#). In respiratory physiology, the process of the exchange of gases between [lungs](#) and ambient air is known as ventilation. Thus, ventilation is the act of inhaling and exhaling. Ventilation is further divided into alveolar ventilation and pulmonary ventilation. Alveoli ventilation is the process of exchanging gases between alveoli and the external environment. Pulmonary ventilation is the natural process of breathing which is called as inhaling and exhaling. The addition of oxygen to any system including human body is described as oxygenation in medicine. The oxygenation may also refer to the treatment of a patient with oxygen input or combining of medication and other substance with oxygen. The **key difference** between oxygenation and ventilation is, **oxygenation is an artificial process of providing oxygen when organs or tissues of a patient that are under [hypoxia](#) state or blood in hypoxemia state (low oxygen in the blood) while ventilation refers to the natural process of flowing air into and out of the lungs.**

What is Oxygenation?

The oxygenation is the act of addition of oxygen to human system artificially. Thus, it is not termed as a natural process. Oxygenation or oxygen therapy supplements the body with the required amount of oxygen in medicine. The oxygen is needed for normal cell [metabolism](#). The cost of home oxygen is around 4000 USD per month in the United States. Oxygenation is extremely important as not enough oxygen may cause cardiac arrest and brain failures. Oxygenation is further categorized into several types based on the patient's condition.

Extracorporeal membrane oxygenation: it is a technique of providing respiratory support. The blood is sent through artificial lung which consists of two compartments, separating from the gas permeable membrane, with the blood on one side and ventilating gas on the other side. This is used prominently in newborns. **Hyperbaric oxygenation:** it is the situation of the increased amount of oxygen in an [organ](#) or tissue by the external administration. **Pulsed Oxygenation:** it is a technique from which oxygen is delivered to a patient via only inhalation rather than through the respiratory cycle. **Transtracheal oxygenation:** from this oxygen is delivered to a patient through a catheter at low pressure flow passing directly into the trachea. Oxygenation is extremely important in conditions like hypoxia (low level of oxygen in organs or tissues) and hypoxemia (low level of oxygen in the blood). Insufficient oxygenation is also termed as hypoxemia (partial oxygen tension). Hypoxemia is the condition that lacks required oxygen level in a biological environment of blood thus, it is needed to supply the required level of oxygen through oxygenation process.



Figure 01: Oxygenation using pulse oximeter

The hyperbaric oxygenation is the situation of the increased amount of oxygen in an organ or tissue due to the external administration of oxygen to a person in a compression chamber at an ambient pressure that is greater than the normal atmospheric pressure. The pulse oximeter is the principle instrument measuring the adequate oxygenation in a patient. So, oxygenation is considered as an artificial phenomenon that keeps a patient healthy.

What is Ventilation?

The ventilation is the process of inflow and outflow of atmospheric air between the [alveoli](#) of lungs and atmospheric environment. It is mainly divided into two processes; pulmonary ventilation and alveoli ventilation. Pulmonary ventilation refers to the total exchange of air (inspiration and expiration). And alveoli ventilation is described as the ventilation of alveoli where the gas exchange with the blood.

Pulmonary ventilation is commonly known as [breathing](#). Breathing in is referred to as “inspiration” and breathing out is referred to as “expiration.” The air enters into the mouth and nasal cavity, passing through the [pharynx](#), then the larynx and finally into the [trachea](#) in the chest cavity. In the chest cavity, the trachea is divided into two smaller tubes known as “[bronchi](#).” Bronchi are further divided and form bronchioles. The alveoli can be found connected to the ends of bronchioles. The external air is flown through this route and reaches till the tiny structures known as “alveoli” where gas exchange takes place. In breathing out the air follows the same route in the opposite direction hence completes expiration process.

During inspiration process, the [diaphragm](#) is contracted. Hence, it increases the internal height (volume) of the thoracic cavity and its internal pressure. The rib cage moves up and out, and the [diaphragm](#) flattens to increase the internal space. This activity causes the outside air to enter into the lungs. In the expiration process, the intercostals muscles and diaphragm are relaxed,

returning to their original position. This decreases the internal space and increases the internal pressure. This activity further decreases the size of the thoracic cavity. Hence, the lungs force the air out.

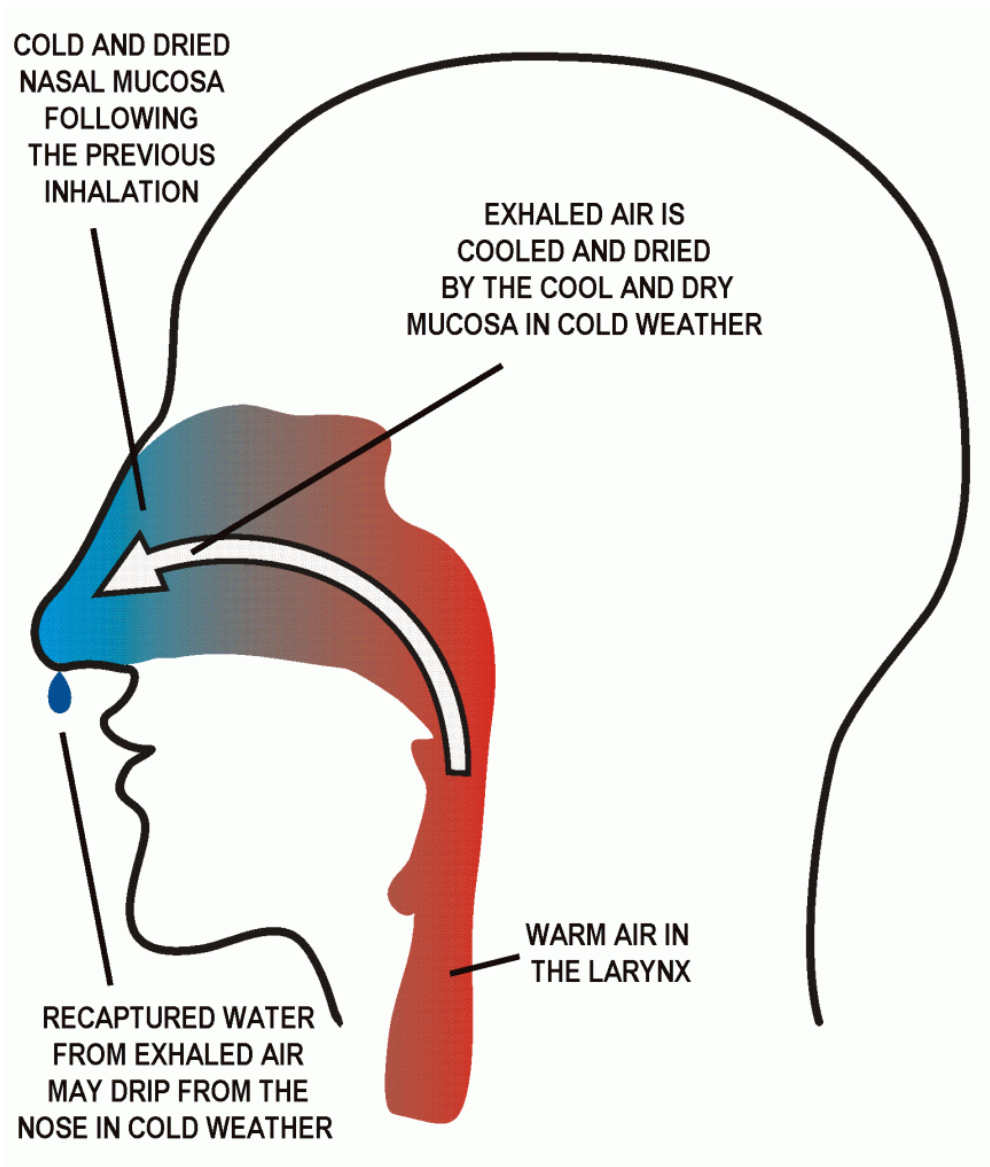


Figure 02: Ventilation

The alveoli ventilation is defined as the bringing of atmospheric oxygen into the lungs and expelling of carbon dioxide out of the body which is brought to the lungs through mixed venous blood. It is also technically defined as the volume of atmospheric fresh air that reaches alveoli per minute and also the similar amount of air leaving the body per minute. The alveoli ventilation depends on a person's lung volume. The [lung volume](#) changes from person to person based on age, sex and body size.

What are the Similarities Between Oxygenation and Ventilation?

- In both cases, the oxygen is delivered to the respiratory system.
- The both of these are highly important for human survival.
- Lungs are involved in both instances.
- The both of these help in maintaining blood oxygen level.

What is the Difference Between Oxygenation and Ventilation?

Oxygenation vs Ventilation	
Oxygenation is the addition of oxygen to any system including human body externally and artificially.	Ventilation is the process of exchanging gas between lungs and ambient air or inflow of atmospheric air into the lungs and outflow of the air out of the body.
Type	
Oxygenation is an artificial process that is provided by the external administration.	Ventilation is a natural process.
Duration	
Oxygenation is only possible in time with patients show hypoxemia conditions (low level of oxygen in the blood) or Hypoxia (low level of organs or tissue oxygen).	Ventilation takes place naturally in all the time.
Pulse Oximeter	
In oxygenation, the pulse oximeter is important to measure how much oxygen needed to be administrated externally.	In ventilation, the pulse oximeter is not needed or essential.
Categorization	
Oxygenation consists of several types: Extracorporeal membrane oxygenation, Hyperbaric oxygenation, Pulsed Oxygenation, and Transtracheal oxygenation.	Ventilation consists of two types: Pulmonary ventilation and Alveoli ventilation.

Summary - Oxygenation vs Ventilation

The oxygenation and ventilation are two different physiological processes. The oxygenation refers to the treatment of a patient with oxygen input or combining of medication and other substance with oxygen. It is an artificial process that is administrated externally. In respiratory physiology, the process of exchanging gases between lungs and ambient air is known as ventilation. Thus, it is a natural process. Ventilation is further divided into alveolar ventilation and pulmonary ventilation. The difference between oxygenation and ventilation is, oxygenation is an artificial process of providing oxygen when organs or tissues of a patient under hypoxia state or blood in hypoxemia state (low oxygen in the blood) on the contrary, ventilation refers to a natural process of flowing air into and out of the lungs.

Reference:

1. Oxygenation and mechanisms of hypoxemia. [Available here](#)
2. SEER Training: Mechanics of Ventilation. [Available here](#)

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How to Cite this Article?

APA: Difference Between Oxygenation and Ventilation.(2017 November 13). Retrieved (date), from <http://differencebetween.com/difference-between-oxygenation-and-vs-ventilation/>

MLA: "Difference Between Oxygenation and Ventilation" Difference Between.Com. 13 November 2017. Web.

Chicago: "Difference Between Oxygenation and Ventilation." Difference Between.Com. <http://differencebetween.com/difference-between-oxygenation-and-vs-ventilation/> accessed (accessed [date]).



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