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# HYPERVENTILATION

## Overview

## Definition

Hyperventilation is **rapid or deep breathing** that can occur with anxiety or panic. Results in a abnormal loss of carbon dioxide (CO<sub>2</sub>) from the blood.

As for example when the respiratory rate increases from a required 12 per minute to an excessive 15 per minute and remains elevated for a prolonged time.

## Carbon Dioxide

## The Important of CO<sub>2</sub>

- This waste product is involved in the transportation of oxygen from the blood, to the cells of the body.
- Reduced carbon dioxide levels result in reduced oxygen in the body tissues and vital organs, resulting in various health issues.
- CO<sub>2</sub> helps dilate the smooth muscle tissues and helps regulate the cardiovascular system.

## The Important of CO<sub>2</sub> (cont'd)

- CO<sub>2</sub> gets converted to carbonic acid, thereby becoming a primary regulator of the alkaline/acid balance of the body.
- Carbon dioxide, the most potent stimulus to respiration, is blown off in excessive amounts. The PACO<sub>2</sub> falls and respiratory alkalosis develops.
- Moreover, CO<sub>2</sub> plays a role in the proper functioning of the digestive system.

## Effects of reducing CO<sub>2</sub>

- Since CO<sub>2</sub> increases the acidity in the blood, a low CO<sub>2</sub> level leads to increased alkalinity in the blood.
- Leads to the constriction of blood vessels that supply blood to the brain.
- Transport of essential electrolytes for the functioning of the nervous system is also reduced.
- Low level of CO<sub>2</sub> in the bloodstream, can cause cerebral vasoconstriction, thereby resulting in cerebral hypoxia.

## Causes

- Excessive breathing leads to low levels of carbon dioxide in your blood.
- Hyperventilation syndrome is triggered by emotions of stress, anxiety, depression, or anger.
- Occasionally hyperventilation from panic is generally related to a specific fear or phobia, such as a fear of heights, dying, or closed-in spaces (claustrophobia).

- Anxiety and nervousness
- Bleeding
- Cardiac disease, such as congestive heart failure or heart attack
- Drugs (such as an aspirin overdose)
- Infection such as pneumonia or sepsis
- Lung disease such as asthma,
- Panic attack
- Pregnancy
- Severe pain
- Stress

## Effects

- The cerebral vessels become constricted and subjectively the pilot often notices a feeling of dizziness, a coldness and tingling around the lips and a feeling as though there was a band around the head.
- Nausea may be present.
- If hyperventilation continues the subject may become unconscious.
- With the breath held the carbon dioxide levels build up once more and the symptoms disappear in reverse order

## Symptoms

The symptoms and signs of this are:

- Visual disturbances
- Anxiety
- Transient dizziness in the person
- Muscle cramps
- Blackouts

If you have hyperventilation syndrome, you might not be aware you are breathing fast. However, you will be aware of having many of the other symptoms, including:

- Belching
- Chest pain
- Confusion
- Dizziness
- Dry mouth
- Light-headedness
- Muscle spasms in hands and feet
- Numbness and tingling in the arms or around the mouth
- Palpitations
- Shortness of breath
- Sleep disturbances
- Weakness

## Treatment

The goal is to raise the carbon dioxide level in your blood. There are several ways to do this:

- You need to take in less oxygen. Breathe through pursed lips or you can cover your mouth and one nostril, and breathe through the other nostril.
- Breathe into a bag
- Talk aloud
- As it is imperative in the air that no mistake be made, the treatment for both is to breathe 100% oxygen and to reduce the rate and depth of respiration.

## Pressurization & Depressurization

## Cabin Pressurization

- Although it is usually in military pilots that problems arise with hypoxia at levels above 30,000 ft., it must be remembered that more and more commercial aircraft are now cruising at extreme altitudes and flight above 40,000 ft. is common.
- The Concorde, for example, cruises above 60,000 ft.

- Cabin pressurization in these aircraft ensures that the partial pressure of oxygen is adequate and it is rare for the cabin pressure to be above 7,000 ft.
- However, it is wise to remember that passengers with chronic lung diseases or serious anemia, particularly those who are smokers, may be significantly hypoxic even at this altitude.

## Cabin Depressurization

- More dangerous however is the situation which develops when cabin pressure suddenly fails, usually due to the loss of a window or door.
- The result is rapid decompression with a sudden increase in the cabin altitude to match the ambient altitude.
- The immediate effect of decompression is a loud noise, condensation of water vapour causing a mist and a shower of dust and small particles.

- The temperature falls dramatically.
- The resultant cabin pressure may actually fall below that of the ambient pressure due to "aerodynamic suction".

## Effects of Cabin Depressurization

- If the final cabin altitude is high, the time of useful consciousness may be very short.
- This causes reversal of the oxygen diffusion gradient across the alveolar membrane and oxygen passes back into the lung from the blood.

## Times of Useful Consciousness

Altitude	Conscious time
20000	5 – 12 minutes
25000	2 – 3 minutes
30000	45 – 75 seconds
35000	30 – 60 seconds
40000	10 – 30 seconds
45000	12 – 15 seconds
50000+	12 or less seconds