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Hypoxia and Hypoxemia (Low Blood Oxygen)

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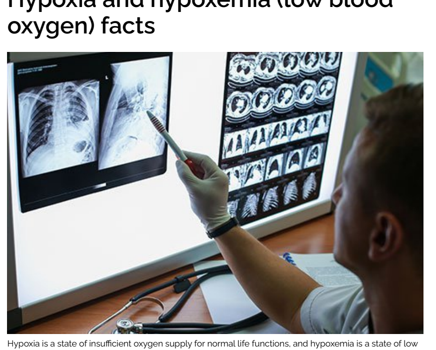
Hypoxia and hypoxemia (low blood oxygen) facts


Hypoxia is a state of insufficient oxygen supply for normal life functions, and hypoxemia is a state of low arterial oxygen supply.

- Hypoxia is a condition or state in which the supply of oxygen is insufficient for normal life functions; hypoxemia is a condition or state where there is a low arterial oxygen supply -- in some publications these terms are used interchangeably.
- There are a variety of causes and potential causes of any type of hypoxia.
- Symptoms of hypoxia and/or hypoxemia may be acute or chronic and vary in intensity from mild to severe. Common acute symptoms are:
  - shortness of breath,
  - rapid breathing, and
  - a fast heart rate.
- Severe symptoms include:
  - The inability to communicate
  - Confusion
  - Possible coma or death
  - Other associated symptoms also may be present.
- Hypoxia or hypoxemia symptoms in children may be mouth breathing and drooling.
- In general, hypoxia and/or hypoxemia is diagnosed by physical examination and by using oxygen monitors (pulse oximeters), determining, oxygen level in a blood gas sample and may include pulmonary function tests.
- Treatment for hypoxia and/or hypoxemia is to give additional oxygen to the patient and into the environment or the body (blood) as quickly as possible. Techniques vary widely according to the patient's condition, but may include oxygen by face mask or nasal cannula, mechanical ventilation (intubation), hyperbaric chamber, or other devices or medicines to open airways.
- Hypoxia and/or hypoxemia may be prevented in some individuals by avoiding circumstances that reduce oxygen concentration in the environments or by providing oxygen before symptoms develop. People with asthma can prevent hypoxia/hypoxemia symptoms by taking certain medications on a regular basis as prescribed by their doctor.

What is hypoxia and hypoxemia (low blood oxygen)?

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- Hypoxia is a condition or state in which the supply of oxygen is insufficient for normal life functions.
- Hypoxemia is a condition or state in which there is a low arterial oxygen supply.
- Hypoxia is sometimes used to describe both states (hypoxia and hypoxemia).
- Within the body, hypoxemia can lead to hypoxia (tissue hypoxia) in various tissues and organs with the most severe being cerebral hypoxia that can rapidly result in brain damage or death.
- Conversely, if a person experiences environmental hypoxia (low or absent oxygen in the environment from high altitudes or drowning, for example), the person can develop hypoxemia.

Hypoxia and Hypoxemia Symptoms

Cyanosis or Turning Blue

Cyanosis is a bluish color of the skin and mucous membranes due to insufficient oxygen in the blood. Symptoms and causes of cyanosis include:

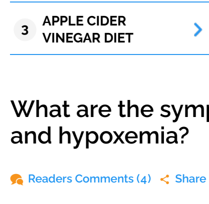
- The person's lips or fingernail beds may appear blue
- Certain lung conditions in which lung function is compromised as asthma, COPD, and bronchitis
- Abnormal forms of hemoglobin or other abnormalities in the blood cells

Read about more symptoms and causes of cyanosis »

What causes hypoxia and hypoxemia?

The causes of both environmental and tissue hypoxia often result in the intermediate state of hypoxemia; thus the causes of any type of hypoxia are also potential causes of hypoxemia. Some of the many causes of hypoxia are the following:

- Chemical or gas poisoning (for example cyanide, carbon monoxide)
- Low or absent concentration of oxygen (for example, high altitudes reached without supplemental oxygen as seen in mountain climbing, and aviation, drowning, or fires)
- Lung problems, for example:
  - Chronic obstructive pulmonary disease (COPD)
  - Emphysema
  - Bronchitis
  - Pulmonary edema
  - Lung cancer
  - Pneumonia
  - Sleep apnea (nocturnal hypoxemia)
  - Pneumothorax
  - Asthma
- Any medications that reduce or stop the effort for breathing (for example, fentanyl and other narcotics)
- Heart problems (for example, severe bradycardia, and ventricular fibrillation)
- Anemia and/or conditions that destroy red blood cells
- Reducing or stopping arterial blood flow to any tissue for organ (for example, arterial blockage by a clot or by injury like a gunshot)



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What are the symptoms of hypoxia and hypoxemia?

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The symptoms of hypoxia and/or hypoxemia may be acute or chronic.

Acute symptoms can come on rapidly and usually consist of:

- shortness of breath,
- rapid breathing, and
- a fast heart rate.

Other **associated symptoms** that can occur in both acute and chronic hypoxia and hypoxemia include:

- Wheezing
- Sweating
- Coughing

The affected individual may be mildly confused initially and appear weak or may experience rapid changes in the color of his or her skin ranging from blue to cherry red (depending on the causes).

Severe symptoms seen with cerebral hypoxia include:

- confusion,
- inability to communicate,
- coma, and
- may result in death.

The symptoms in pediatric patients can be similar to the above and may include the following:

- Lethargy
- Irritableness
- Anxiousness
- Inattentiveness
- Sitting up and leaning forward to improve diaphragmatic breathing
- Children with epiglottitis and airway restriction may drool and mainly breathe by mouth.

How is hypoxia and/or hypoxemia diagnosed?

In general, an individual patient's hypoxemia is usually diagnosed by oxygen monitors placed on fingers or ears (pulse oximeter) and/or by determining the oxygen level in a blood gas sample (a sample of blood taken from an artery). Normal readings are about 94% to 99% oxygen saturation levels; generally, oxygen is supplied if the level is about 92% or below.

Other tests may be ordered to determine if other potential problems such as carbon monoxide poisoning are responsible for the hypoxia.

Pulmonary function tests may also be ordered along with other studies to help determine the cause of unexplained low oxygen saturation.

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What is the treatment for hypoxia and/or hypoxemia?

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The treatment for hypoxia and/or hypoxemia is to give additional oxygen to the patient and into the body (blood) as quickly as possible, especially if cerebral hypoxia is suspected, or to treat the underlying cause of the hypoxia.

Many patients will respond to additional oxygen supplied by a nasal cannula. The quicker the oxygen level reaches normal, the better the prognosis is for the patient. However, the timing is very important, because cerebral hypoxia can occur within a few minutes and, in many patients, may not be reversible.

Some patients may be treated in a hyperbaric chamber that increases oxygen concentrations in the blood (used in carbon monoxide poisoning), while others may require mechanical ventilation (intubation) with oxygen supplied at higher than normal atmospheric concentrations.

Others, such as mountain climbers or airline passengers, may need only additional oxygen provided by oxygen masks until they reach lower levels where oxygen concentrations are closer to the normal levels (about 21%) in the atmosphere.

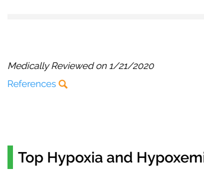
However, care must be used when giving oxygen, as it can be toxic to tissues if it is used excessively (hyperoxia). Hyperoxia may cause:

- vertigo,
- behavior changes, and
- other central nervous system changes such as seizures and/or tissue damage that may result in pneumonia IQ, eye changes like cataracts, and other organ pathology.

Hyperoxia may occur in patients undergoing hyperbaric therapy or in long-term ICU patients.

Can hypoxia and/or hypoxemia be prevented?

Hypoxia and/or hypoxemia may be prevented in some individuals by avoiding circumstances that reduce the oxygen concentration in the environment or by providing oxygen via nasal cannula or oxygen masks before hypoxia and/or hypoxemia develop. This can be done by recognizing those individuals who have a tendency to develop hypoxia and/or hypoxemia and provide them with oxygen if they develop any of the early symptoms. Moreover, there are medications that can provide prevention and/or relief from hypoxia/hypoxemia symptoms that are due to certain medical conditions like asthma IQ.



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