

# Hyperbaric Oxygen Therapy

Treatment by hyperbaric oxygen therapy (HBOT) happens when close to 100 percent oxygen is administered at an increased pressure (typically two to three times that of atmospheric pressure) at sea level inside an enclosed pressure vessel, better known as a hyperbaric chamber. Typically, HBOT can be performed in a monoplace, or one-person chamber, or via a larger, multiplace chamber capable of supporting two or more patients and inside attendants at any given time. The effects of hyperbaric oxygen are mainly due to the increased oxygen tension and content in the blood; this in turn affects body tissues. Hyperbaric oxygen is used to treat many diseases.

Under normal atmospheric conditions, after all oxygen most oxygen being transported is bound to receptor sites on hemoglobin have been bound with oxygen, only a small amount of oxygen will dissolve into the remaining fluid component of the blood. By increasing the pressure inside a hyperbaric chamber while breathing 100 percent oxygen, the inspired (inhaled) partial pressure of oxygen increases proportionally. For each additional atmosphere (14.7 pounds per square inch, 33 feet of water, or 10 meters of water) of pressure added over sea level, an additional atmosphere of oxygen may be inspired — the equivalent of 200 percent oxygen. In addition to the beneficial effects of the oxygen, there is also the effect of the hydrostatic pressure as it squeezes the nitrogen bubbles, reducing their size and helping to alleviate symptoms.

## Why have HBOT?

Hyperbaric oxygen therapy is a useful primary or adjunct treatment for a variety of medical conditions and injuries. HBOT is approved for the following 13 ailments (called 'indications') by the international organization the Undersea and Hyperbaric Medical Society (UHMS), based in the United States ( European Editorial Note: in Europe the indications are slightly different and may vary from Country to Country. For more information also see "<http://www.echm.org/>"[www.echm.org](http://www.echm.org/) ).

- Air or gas embolism (AGE);
- Carbon monoxide (CO) poisoning and CO poisoning complicated by cyanide poisoning;
- Clostridial myositis and myonecrosis (gas gangrene);
- Crush injuries, compartment syndromes, and other acute traumatic peripheral ischemias;
- Decompression sickness;
- Enhancement of healing in selected problem wounds;
- Exceptional blood loss anemia;
- Intracranial abscess;
- Necrotizing soft tissue infections;
- Osteomyelitis (refractory);
- Delayed radiation injury (soft tissue and bony necrosis);
- Skin grafts and flaps (compromised);
- Thermal burns.

## How is HBOT Given?

HBOT treatments can consist of one recompression only for acute conditions, or may include 20 to 40 or more treatments for more chronic medical conditions. Each treatment usually lasts one to two hours; the number of treatments depends on the progress of the patient and the alleviation of symptoms. For each treatment, the chamber pressure and duration are set according to the diagnosis and the treatment policy and procedures of a given facility. To enter the hyperbaric chamber, patients and attending personnel

must wear special hospital clothing. Petroleum-based flammable material, including patient dressings and spark-generating products, are not allowed in the chamber.

### **Treatment Consideration**

Because HBOT involves the contraction and expansion of air spaces within the body, illnesses or disorders that may interfere with this process and cause tissue damage require individual consideration. Any condition that might impair the oxygenation of blood or the flow of blood into the body tissues reduces the effectiveness of hyperbaric oxygen therapy. Examples of such disorders include dysfunction of the Eustachian tube(s) (i.e., ear clearing problems) and bullous lung disease.

Auditory tube dysfunction precludes equalization of the middle ear with the ambient pressures. This may require making a temporary opening in the eardrum (tympanostomy or myringotomy, an opening or tube placement in the eardrum, or tympanic membrane, respectively) before treatment. Bullous lung disease (air-filled cysts in the lung) is also considered a relative contraindication to HBOT, as it could predispose to pneumothorax or arterial gas embolism. In addition, hyperbaric oxygen therapy is not recommended for pregnant patients, except for the treatment of acute illness in which the risk of withholding treatment exceeds the potential risk of exposure of the fetus to hyperbaric treatment.

Drs. Reza Gorji and Enrico Camporesi, have noted that in pregnancy there is redistribution of body and tissue fluid concentrates in the peripheral tissues, away from the central circulation. This could predispose the pregnant diver to nitrogen retention there and a consequent increase in risk of DCS. The effects of the uptake of nitrogen and the risk of DCS in the fetus are less clear. The fetal lung does not function in gas exchange and is thus unable to filter any microbubbles that may be present in its circulation: the mother could pass on such bubbles to the fetus from the placenta, or they may occur spontaneously in the fetus. As in decompression illness (DCI), any bubbles formed in the fetus could have detrimental effects.

These could hinder organ development and function, and cause congenital malformation or even spontaneous abortion. In addition, diving can change the physiology of other substances in the body. For example, some researchers have found that a change in the blood cells called platelets (caused by intravascular bubble formation) can cause bodily states responsible for DCS.