

# The Queen of Gases

## *Breathing Oxygen at Safety Stops and Surface Intervals May Increase Your Safety Margin*

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Oxygen has been called the "princess of gases" by dive physicians. Because it is essential for life, it might better be called the "queen." Human beings have evolved in an air atmosphere at 14.7 pounds / 6.6 kilograms per square inch (1 atmosphere) with a mixture of 21 percent oxygen and 79 percent nitrogen. Thus, 21 percent oxygen is our optimum concentration for life. The human body does not fare well when exposed to pressures much higher or lower than 1 atm: hypoxia occurs at altitude, and oxygen toxicity is a danger at increased pressures. What a paradox that the very gas so vital for life can also kill us!

Virtually all dive boats now carry oxygen as a first aid measure. Should a diver have signs or symptoms of decompression illness (DCI), it is oxygen that can help resolve these pressure-related injuries. Injured divers should receive 100 percent oxygen, hopefully, with a DAN oxygen unit and by a diver or aquatics enthusiast trained in a DAN oxygen course. When inhaled, life-saving oxygen travels to tissues damaged by bubbles and assists in the removal of the nitrogen bubbles responsible for the injuries.

Divers requiring recompression therapy will most likely receive 100 percent oxygen during a U.S. Navy Treatment Table 6 (TT6), the most frequently used treatment table. The TT6 requires 285 minutes in the chamber with 20-minute exposures to 100 percent oxygen. These oxygen sessions are followed by five-minute air breaks at 60 feet / 18 meters and 30 feet / 9 meters to prevent oxygen toxicity.

During deep commercial and technical diving, the last stages of decompression usually require that the divers breathe 100 percent oxygen - at depths shallow enough to avoid the convulsions of oxygen toxicity but which will accelerate nitrogen desaturation and help reduce the likelihood of DCI. This has proved to be a useful technique, and DCI is comparatively rare today in commercial divers.

Nitrox has become a popular mixture for recreational scuba divers, the philosophy being that raising oxygen levels and thereby reducing nitrogen concentration will provide longer bottom times and, possibly, greater safety. There are reports of some resorts now hanging nitrox tanks at the 15-20 foot / 4.5-6 meter stop for the divers to breathe during air dives in order to decrease the risk of DCI. As nitrogen desaturation is the goal, would not 100 percent oxygen be better?

I was a technical adviser to the 1989 movie "The Abyss," directed by James Cameron. On the set in South Carolina was a 60-foot / 18-meter deep concrete hemisphere used for the underwater scenes. Filled with water, it was a super-deep pool. There was a problem, however: the movie stars were underwater for only a short time, but the cameramen and crew were underwater a great deal longer. They all used dive computers to keep track of their nitrogen exposure, but there was still concern about DCI. As a safety factor, I suggested that at day's end they breathe 100 percent oxygen for 30 minutes on the surface. They did, and no decompression illness occurred.

As most readers of *Alert Diver* know, I believe our ascent rates are too fast, perhaps even at 30 feet / 9 meters per minute. Slowing rates further, however, is technically very difficult unless we institute another three- to five-minute safety stop at, say, 40-50 feet / 12-15 meters from a 100-foot / 30 meter dive. If we cannot slow ascent rates further, should we, too, be using oxygen to help our ascent?

When diving with nitrox, we can build in extra safety by using air tables. Or when diving with air, we can breathe a hyperoxic mix at the safety stop, during the surface interval, or after the dive. There are, of course, many practical and logistic issues in instituting such practices for recreational divers.

However, the incidence of decompression sickness has hardly changed over the past 10-15 years, even with the advent of dive computers and slowing ascent rates.

Could oxygen be scuba divers' queen, too? Can it provide the solution to greater safety? At the very least, it may require a closer look.

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