

Stick to Your Maximum Operating Depth

Question: On a recent dive trip, my buddies and I dived using 30 percent nitrox. Beyond our maximum operating depth was a big turtle that my buddies wanted to photograph. They decided to take deep breaths and hold them to prevent breathing in oxygen at the deeper depth. Besides the obvious concerns regarding breath-holding and exceeding maximum operating depth, I thought the oxygen in a diver's system would be compressed to ambient pressure regardless of whether or not he breathed. Can you please clarify?

Answer: As you surmise, the logic employed by the other divers was not valid. The gas in their lungs would be compressed as they descend, whether or not they breath-hold. Descent produces an increase in the gradient that drives oxygen into the blood, and the volume of gas in the lungs is substantial enough that constant breathing is not required for the effect to be meaningful.

The risk of oxygen toxicity also increases with increasing exercise intensity and carbon dioxide (CO₂) levels. Thus, not only did these divers fail to eliminate the elevated oxygen exposure, but also the breath-hold would have created rising CO₂ levels to further increase the risk of toxicity if sustained for a substantial period of time.

The question of what is an appropriate maximum partial pressure of oxygen (PO₂) has evolved recently. The old limit of 1.6 ATA has largely been replaced with 1.4 ATA, particularly for depths where the complication of a seizure would be much more difficult to survive. One of the most challenging realities to understand in diving physiology is that getting away with something once, twice or 10 times is not a guarantee of future safety. Respecting maximum operating depths to limit PO₂ to no more than 1.4 ATA and keeping exercise intensity at depth as low as possible should be the baseline for safe practice. Creative alternatives may be enticing right up to the point where they fail. The best way to prioritize safety is to adopt more conservative limits wherever feasible, and bear in mind, in real time, that the worst possible outcomes really can happen. Our diving fatality databases make this unhappy truth very clear.