

Does Nitrox Reduce Narcosis?

Until very recently it was commonly accepted that the use of Nitrox would reduce narcosis. On the face of it this seems to make sense. If an increased partial pressure of nitrogen causes narcosis then if we replace some of the nitrogen in the breathing mix with oxygen we will reduce the partial pressure of nitrogen at a given depth. The majority of nitrox courses taught exactly this reasoning until quite recently. However, it is now believed that it's not just nitrogen that causes narcosis but that different gases result in varying levels of narcosis. Nitrogen has a high level of narcosis but is not the only narcotic gas.

As there is no definitive explanation for the causes of narcosis it is difficult to prove which gases have more or less potential to cause narcosis. The best estimate for the levels of narcosis is derived from a theory that says the level of narcosis caused by an individual gas is related to the solubility of that gas in a fatty substance. This is known as the Meyer-Overton hypothesis. Using this measure oxygen should be more narcotic than nitrogen. If this is the case then Nitrox will not reduce our levels of narcosis as we are just replacing one narcotic gas with another.

It would be nice if we could prove this argument one way or the other by comparing the narcotic effects of air and Nitrox. Unfortunately it's not that easy. In order to ensure that we had a measurable level of narcosis we would need to be at a significant depth. At these depths the risks of CNS oxygen toxicity mean that we would have to reduce the amount the oxygen in the breathing mixture to the point where it would be too small to be able to distinguish between the effects of air and nitrox.

The result is that the question of whether Oxygen is more or less narcotic than nitrogen can generate some interesting discussions but is effectively irrelevant for recreational nitrox divers.

Trimix

As we dive deeper the effects of narcosis become more and more significant. We have seen that using Nitrox does not help in reducing narcosis. Furthermore the increased levels of oxygen limit the depth that we can dive using Nitrox without risking CNS oxygen toxicity. So for deep diving we must look at another solution.

We know that different gasses have different narcotic properties and so the best solution is to find a gas that is considerably less narcotic than either nitrogen or oxygen and use this to replace some of the nitrogen in the breathing mix. Helium and Neon both have properties that predict that they would be considerably less narcotic than nitrogen and experiments have shown this to be the case. Neon is prohibitively expensive and so Helium, though still expensive, has been used as the gas of choice for deeper diving.

Helium is considerably less narcotic than nitrogen and so as we replace some of the nitrogen with helium we are reducing the overall narcotic effect of the combined gas. As we increase the amount of helium in the mixture, and so further reduce the amount of nitrogen present, we further reduce the narcotic level of the overall gas.

Commercial and military divers often replace all of the nitrogen in their breathing mixture and just use a mixture of helium and oxygen. This is known as Heliox. This produces virtually no narcosis but due to the cost of helium is a very expensive option. Recreational technical divers tend to use a mixture of Helium, Oxygen and Nitrogen, known as Trimix. By adjusting the level of the three gases the diver can select a mixture that has the desired level of narcosis.

A trimix diver can perform a dive to 80m but can choose his breathing mixture so that they experience a level of narcosis that is the same as if they were breathing air at 35m. On a subsequent, deeper dive to 90m they may be 10m deeper but can choose a breathing mix that still gives the same level of narcosis. This is known as the Equivalent Narcotic Depth (END). In this case a Trimix diver at 90m may be experiencing less narcosis than a recreational diver at 40m on air.

The reduction in narcosis introduces a number of advantages. A clearer head allows the diver to enjoy the dive and actually remember what they see down there. There is little point in exploring a wreck if you don't remember the experience after.

In addition the reduction in narcosis removes the lack of judgement, loss of coordination and inability to resolve problems. This can give the technical diver a huge safety advantage. As they go deeper, and the risks increase, they can help to reduce those risks by reducing their level of narcosis.

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