Nitrogen Narcosis
("Raptures of the Deep")
Compiled by Ern Campbell, MD

Nitrogen is an **inert gas** existing in largest quantity in the atmosphere, 79% in air. It is inert, meaning that it does not take part in energy transformations. It is the gas that causes nitrogen narcosis through the effect of Dalton’s law and it is the gas that causes decompression sickness on ascent from depth with reduction of pressure, (Boyle’s Law). Nitrogen is the gas that determines decompression schedules.

Nitrogen narcosis occurs when divers go **below 100 FSW**, due to the laws of partial pressures. Complex reasoning decreases 33% and manual dexterity decreases 7.3%. The condition causes loss of motor function and decision-making ability and can be more clearly defined as causing one to become "drunk", as with alcoholic beverages. The comparison to having had "three Martinis" is apt, and it has been stated that one should consider the narcotic effect of one Martini for every 50 feet of sea water.

Dalton’s Law states that the total pressure exerted by a mixture of gases is equal to the **sum of the pressure of each of the different gases making up the mixture**-each gas acting as if it alone was present and occupying the total volume. This same law causes oxygen toxicity and enhances the role of contaminant gases such as carbon monoxide and hydrocarbons.

The law is stated as:

\[ p_{\text{ATA}} = p_{\text{O}_2} + p_{\text{N}_2} + p_{\text{other gases}} \]
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thus: \( p_{N2} = f_{N2} \times ATA \)

There is a critical volume hypothesis that states there to be an increased volume of nitrogen in the membranes and this relates to solubility. This explains the pressure reversal of anesthetics. Nitrogen narcosis is potentiated by increased CO2 levels.

Certain factors increase the possibility of nitrogen narcosis:

- Cold
- Stress
- Heavy work and fatigue
- CO2 retention

Treatment of nitrogen narcosis is immediate controlled ascent to the surface, with the buddy or divemaster observing the diver for unusual behavior, administration of O2 and temporary cessation of diving. Prevention should be the best treatment, with no further diving below 100 feet.

Reference Minibox

Deep Thoughts, in Alert Diver
Download, Deep Thoughts
Scuba Diving Explained
"Fizzology"
OSHA Site
Narked, Scuba Diving Mag
eMedicine
Nitrogen Narcosis
Medline References, N2 Narcosis