

Let's Talk Dive Physiology

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Exclusively for NAUI Instructors

Your Body Under Pressure

The increased pressure underwater has many effects on your body. This handout reviews some possible negative effects of pressure, how to reduce your risk, and how to give first aid if an accident occurs.

To learn more about how to prevent diving accidents, and how to manage an emergency, we recommend you continue your dive education by becoming a certified Rescue Diver.

Diving can never be a risk-free activity, but you can greatly reduce your chances of getting injured by planning ahead and following safe diving practices.

Depth, Time, and Ascent Rate Limits Must be Followed to Reduce Risk. Always Make a Safety Stop.

Contributing Factors:

Certain factors can make a diver more likely to get DCS, AGE, or Nitrogen Narcosis. Every individual has a different natural susceptibility to each condition.

Factors contributing to DCS include obesity, age, fatigue, smoking, alcohol before a dive, impaired circulation, dehydration, cold water, and hard work during a dive.

A diver doing work at depth breathes more nitrogen and therefore will be more susceptible to both nitrogen narcosis and DCS than a non-working diver.

Alcohol consumption, hangovers, fatigue, anxiety, cold, and medications can increase susceptibility to nitrogen narcosis.

Be in good physical and mental condition for each dive. Cancel the dive if you don't feel well or if you're uncomfortable with the dive conditions.

Treat any suspected pressure-related diving injury with 100% oxygen. Call DAN for help at: **(919) 684-4DAN.**

Decompression Sickness

DCS results from the uncontrolled release of nitrogen into the bloodstream and tissues as bubbles. DCS is usually caused by exceeding depth and time limits or ascending too quickly from a dive, but can hit any diver with significant time below 30 feet.

Prevention: Reduce your risk by never approaching or exceeding the depth and time limits of the tables or your computer. Make a safety stop at the end of each dive and always ascend slowly, especially after your safety stop.

DCS Type 1: Type 1 is the milder form.

Signs & Symptoms: Pain in the joints or limbs not relieved by rubbing; increasing pain intensity or mobile pain that moves along a limb. Skin burning or itching, rash-like appearance on the skin of the back, torso, or arms. Symptoms may pass quickly, and may start anytime from shortly after surfacing to 24 hours later.

Treatment: DCS 1 may quickly progress to the more serious DCS 2. Treat with 100% oxygen and get evaluated by a dive physician. Recompression in a

chamber may be required.

DCS Type 2: This form includes serious functional impairment or respiratory distress.

Signs & Symptoms: May come and go in bizarre fashion, and may be similar to those of AGE, except DCS 2 usually affects both sides of the body. Others include two-sided weakness and paralysis of the upper or lower body, areas of numbness, difficulty walking or balancing, unconsciousness, severe respiratory distress, loss of bladder/bowel control, mottled skin that rapidly changes appearance, chest, head and neck pain, dizziness, nausea, visual disturbances, ringing in the ears, changes in the senses, joint pain.

Treatment: This is a life-threatening condition that may result in death or permanent disability. Treat with 100% oxygen and chamber recompression as soon as possible.

Lung Overexpansion Injuries

Lung overexpansion injuries can result from deliberate or accidental breath-holding while ascending as little as 5 feet, or by lung diseases that block air from exiting the lungs.

Prevention: Reduce your risk by ascending slowly, never holding your breath, and never "skip breathing." Always breathe continuously on scuba. Do not dive with a chest cold or other conditions that could block airflow out of your lungs.

Arterial Gas Embolism (AGE): AGE is caused by any amount of air escaping from torn lung tissue into the bloodstream. As bubbles coalesce and expand on

ascent, they can block arteries carrying oxygen-rich blood to the brain, with the same effect as a stroke. **Signs & Symptoms:** Very similar to those of a stroke, usually confined to one side of the body. Difficulty walking or speaking, sudden unconsciousness underwater or immediately after surfacing, partial or complete blindness, nausea, severe headaches, numbness, weakness, lack of muscular control. Victim will probably also show symptoms of other lung overexpansion injuries.

Treatment: Provide life support and 100% oxygen. Without prompt chamber recompression, permanent disability or death is likely.

Pneumothorax (Collapsed Lung): Lungs can collapse when air escapes from ruptured alveoli and expands into the space between the lungs and their surrounding pleural membrane.

Signs & Symptoms: Wheezing, choking, coughing, shortness of breath (underwater or at the surface) which may result in blueness of the skin, lips, and nail beds. Painful breathing, bloody sputum in the mouth.

Treatment: This condition is immediately life-threatening. Provide 100% oxygen and medical evacuation.

Nitrogen Narcosis

Breathing nitrogen at high partial pressures can induce signs & symptoms of anesthesia or narcosis (intoxication). The threshold pressure is highly variable from diver to diver and dive to dive. Most serious impairment is experienced deeper than 100 fsw, yet some divers show little effect and others are affected at shallower depths.

Prevention: Do not dive deeper than 60 ft without further training

or practice in basic and emergency skills.

Signs & Symptoms: Symptoms are similar to alcoholic intoxication, but that is never a laughing matter on scuba. Symptoms include impaired thought, judgment, and ability to perform tasks requiring mental or motor skills. A diver may feel light-headed, increased self-confidence, and loss of fine discrimination.

Treatment: Nitrogen narcosis is easily treated by merely ascending to a shallower depth. The symptoms will pass quickly; the diver can continue diving at a shallower profile.

Oxygen Toxicity

At high enough partial pressures, oxygen has a toxic effect on the body. Oxygen toxicity symptoms usually start with twitching and lead to full-blown convulsions, resulting in drowning. This is not a concern when diving with air within the recreational dive limit (130 ft), but is a major consideration and can be FATAL when diving with Nitrox (EANx or oxygen-enriched air). Depending on the "mix" of Nitrox, it could become toxic around 100 feet.

Prevention: Do not use Nitrox without proper training. Do not use Nitrox for deep dives. When using air, do not dive deeper than 130 feet without advanced training.

What's What?

Depth & Time Related Injuries:
Decompression Sickness
Types 1 and 2 (DCS 1 and DCS 2)

Ascent Injuries: Arterial Gas Embolism and Collapsed Lung

Depth Related Symptoms:
Nitrogen Narcosis, Oxygen Toxicity