## Are We Killing Recovered Divers?

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I read many times a year about divers who have drowned or otherwise met a tragic fate and are then recovered by search and rescue teams. In some cases for poorly trained teams I find the recovery consists of attaching a lift bag and allowing the body to rocket to the surface while the SAR team does their leisurely (comparatively) ascent following good decompression rules.

Now the pause for thought kicks in, what if the divers weren't as dead as was thought? The mammalian diving reflex is a powerful, instinctual response, quoting everything.com:

"This reflex optimizes mammals' respiration to stay underwater for a long time. It's exhibited strongly in aquatic mammals (seals, otters, dolphins, etc.), but exists in a weaker version in other mammals, humans included. Diving birds, such as penguins, have a similar diving reflex. Every animal's diving reflex is triggered specifically by cold water contacting the face -- water that's warmer than 70°F won't cause the reflex, and neither will submersion of body parts other than the face. Also, the reflex is always exhibited more dramatically, and thus can grant longer survival, in young people and animals.

Upon initiation of the reflex, three changes happen to the body, in this order: Bradycardia is the first response to submersion. Immediately upon facial contact with cold water, the human heart slows down ten to twenty-five percent. In the seal the changes are even more dramatic, going from about 125 beats per minute to as low as 10 on an extended dive. Slowing the heart rate lessens its need for bloodstream oxygen, leaving more to be used by other organs.

Next, peripheral vasoconstriction sets in. When under high pressure induced by deep diving, capillaries in the extremities start closing off, stopping blood circulation to those areas. Note that vasoconstriction usually applies to arterioles, but in this case is completely an effect of the capillaries. Toes and fingers close off first, then hands and feet, and ultimately arms and legs stop allowing blood circulation, leaving more blood for use by the heart and brain. Human musculature accounts for only 12% of the body's total oxygen storage, and our muscles tend to cramp up during this phase. Aquatic mammals have as much as 25 to 30% of their oxygen storage in muscle, and thus they can keep working long after capillary blood supply is stopped.

Finally, and most interesting, is the blood shift that occurs only during very deep dives. When this happens, organ and circulatory walls allow plasma/water to pass freely throughout the thoracic cavity, so its pressure stays constant and the organs aren't crushed. In this stage, the lungs' alveoli fill up with blood plasma, which is reabsorbed when the animal leaves the pressurized environment. This stage of the diving reflex does not occur in humans." Humans have been successfully resuscitated after over an hour of submersion in cold water, this response only happens in very cold water, tropical temperatures of 70 degrees don't do it. However, if the body is below a thermocline and the resulting water temperature is in the range that causes the combination of hypothermia and mammalian diving reflex to occur then resuscitation may also be possible even in tropical waters.

Even at times when the person appeared dead, they were cold, blue, non-responsive, had fixed, dilated pupils, the whole bit, they were successfully resuscitated when the mammalian diving reflex perhaps combined with hypothermia, was in affect.

So what exactly am I getting at here? I propose that a study be performed where SAR teams when retrieving bodies in cold water, don't just shoot them to the surface. Instead, where the body has been submerged for less than 2 hours, rather than just rocketing the body to the surface causing DCI and other trauma caused by rapid bubble formation and air expansion, attempt, only if it is safe to do so, to bring the body up as if the diver was alive (follow decompression profile to mitigate bubble formation) perhaps even going as far as insertion of an airway with a one-way valve to allow escape of air trapped in the lungs on ascent. Of course this would not apply to bodies that had been submerged for several hours or days, but if the body had been submerged for less than 2 hours then there may be a faint chance of resuscitation, unless the tissues are so damaged by DCI as to make that impossible.

Now, I am not a Doctor, Nurse, Paramedic, Biologist or life sciences expert of any kind, but it just seems to me that in the situation I described, when the diver is lost in cold water and has been submerged less than 2 hours when recovered, that they may still able to be resuscitated. Given that this could even remotely be true, SAR teams should take the utmost care to properly decompress bodies recovered under these conditions.