An International Overlook on Diving: Excerpts from the DAN Day 2012 in Japan

Each year, DAN Japan hold discussions on safe diving, with renowned specialists coming from all over the world, sharing their experience and studies. What follows is an overview of their talks, held in Tokyo on November 2012.

Dr. Yashiro Mano, DAN Japan Founder and President

Around 800 professional diving companies exist in Japan, with about 3000 fishermen and marine harvesting divers working. There are 2000 research divers, with roughly 20,000 divers making their living from the sea. In the past, deep fishery diving with long bottom times was common in Japan, but this is being done away with and shorter dive times and shallower depths are being observed.

Types of diving being done: scuba, full-face mask and helmets, most using full-face mask. Helmet diving is being reduced and becoming more obsolete, though it continues to have its advantageous. Fishery diving usually do not exceed 60 meters, with a maximum of 80 meters. Offshore diving is usually around 30 meters. If the diving is to exceed 40 meters, trimix or heliox gas is used. The diving is mostly maintenance work and the time stress underwater is low.

Work diving has to be supported by employer and surface support as opposed to recreational diving. **Recreational diving is usually only buddy diving, buddy being a similar certified and experience level diver as yourself for proper diving. Have back up tanks and rescue divers available with life lines and communications on site. Never dive alone!** Never dive below 40 meters (divers are more accident prone at that depth) with 30 meters being the limit. Beyond that CCR, Trimix and Heliox is recommended. A stable surface gas supply line must be assured.

Whereas decompression diving should never go beyond the threshold and always within the decompression tables. Extended dive times must be supported with a chamber on site or on a stand-by basis.

Dr. Nick Bird, *DAN America CEO*

Management of diseases in remote locations requires us to do the most we can with the resources we have on hand.

DCS is a probabilistic disease: it depends on the probability of it happening based on the dives we take to what depth and time and the inert gas loading.

Most symptoms appear within the first 8 hours after surfacing, all cases appear after 24 hour upon surfacing. Meaning: any sympton diagnosis after this time period should be questionable. Neuro symptoms, the more severe ones, appear immediately and within a few hours after surfacing, while the less severe up to 10 hours after surfacing. This has implications to the treatment management of diving accidents, with severe case treatment being most important.

Treatment modalities and recommendations:

- Surface level oxygen and administration of fluids before chamber treatment
- Use of portable chamber (when available) which provide complete treatment of divers

- Evacuation – Matching the urgency of patient condition with proper diagnosis and local treatment availability prior to calling for an outside evacuation. Remember, evacuation teams put themselves at risk fetching injured patients!
- HBO therapy
- Last resort would be in-water decompression, which requires lots of air supply, support divers tending patient, planning and proper diagnosis. Weather, water temperature and evacuation time to advanced medical facilities are all vital factors when deciding on in-water decompression.

Remote location diving requires elevated safety precautions and conservative diving!

John Lippmann, OAM, Executive Director DAN Asia-Pacific

Australia hosts some of the most dangerous marine creatures in the world: the blue ring octopus, the box jelly-fish, sea-snakes... but the most dangerous creature to the diver is ourselves, mainly through lack of care and knowledge.

Starting from 1972, looking at statistics of diving fatalities we've had about 4 to 19 deaths a year but there is no real trend with no significant increase or decrease of fatalities over the years, with the diving population remaining at a steady pace and 7 deaths per million dives. For non-Australian divers, it is around 4 deaths per million dives, which does not mean Australian divers are worse divers, but that non-Australian visitors dive in a more controlled environment.

Between 1972 and 2005 I have examined 315 deaths. And 250 were scuba diving related including or CCR. 15% is attributed to equipment. Another 15 % by gas supply, 13 % by rough sea conditions in 9 % it is triggered by divers panicking. Divers get themselves in a bad situation and don't think. They don't look and they don't plan.

In my view medical fitness is a primary requisite for safe diving, then there is training, to learn more, have adequate and serviced equipment which work properly. Planning, think about where you're going, diving conditions, marine life, currents are all factors that will affect your safety. **Take your brain with you to make common sense decision. Do not relax completely by not taking responsibility for your diving.** Though there are circumstances beyond our control which may cause an accident to happen.

Dr. Alessandro Marroni, M.D., Founder and President of DAN Europe, President of the International DAN

While 40% of DCI accidents may happen through not observing the "rules", 60% DCI accidents happen while respecting the rules. Therefore a look into the "rules" was in order, which is why DAN Europe started the participatory research program in 1995. Since then, we've collected over 75,000 fully monitored dive profiles. **We have taken research to the field where the diver and diving is located, training divers not only to become technicians and collect Doppler signals but to interprete them as well.**

We monitor hydration through urine. We monitor hematic blood rates, as well as heart and lung function underwater with echograph. We also do bioimpedence, which measures the shift of fluids in your body which is important to how you hydrate or dehydrate during a dive. As diving causes you to dehydrate. So we looked at different parameters. What surprised us through hematic monitoring was that blood was denser though the fluid in the body remained the same. We looked at the same measurements during repetitive diving, monitoring the bubbles.

Another factor in play is surface tension, the force which keeps bubbles compact and together. When the

surface tension decreases the bubbles become larger. The easiest way to measure the surface tension of our body fluids, is through a sample of our urine. As surface tension is related to hydration and hydration counter-acts bubble formation. Measuring hyper-hydrated divers we found bubble reduction. **So the take-home message we leave you is, drink, drink, drink, not vodka but water, before, between and after diving**. Reduce risk factors by being fit, healthy and hydrated. Using Nitrox also helps to reduce your chance of becoming a statistic.

We also adopted procedures to reduce risks of decompression stress, by increasing our resistance through preconditioning divers before a dive, such as taking a sauna a couple hours before a dive, which helped circulating protein in the blood help fight off decompression stress. Or put a diver on a vibrating mat, which we discovered helped bubble elimination. We also found chocolate intake being an antioxidant as a help against decompression stress. Intervening through human physiology and biology through preconditioning divers increased resistance to bubble build up.

We also looked at water build up, pulmonary edema or comets in the lungs during breath hold diving. We do all this to help make diving safer.

Dr. Folke G. Lind, *M.D., Ph.D, Karolinska University Hospital*

Sweden is the size of Japan and we do a lot of diving. We dive in cold waters and therefore divers wear heavy equipment, which disposes them to accidents.

I have been a diver since 1973, teaching dive doctors for 20 years and would like to share some of my diving experiences. My chamber, the Karolinska chamber, is located in Stockholm. It has a big adjacent ICU Room. We are equipped to evacuating injured divers compressed in a mono chamber via helicopter. We do US Navy 6 Treatment which is considered the best treatment in the world. There are also a chamber in Gothenburg, one in Uddevalla and one in the south, where most of the diving is done.

All divers have to be familiar with Boyles law as well as being mindful of Henry's gas law. When making dive plans, you must take into account Murphy's law.

Stay hydrated, is the main thing. Drink a lot so you pee a lot is my recommendation as an intensive care physician. All dive tables should be buffered, you should never reach the threshold of the tables. Risk assessment has to be planned for. As a diving physician, you quickly learn that it is drowning which kills during dives. Guard against panic and hyperthermia, a big risk factor.

Watch out for stupid diving or stupid behaviour. You can be stupid, get lucky to an unsafe dive; you can also be unlucky from a safe dive and develop DCS.

Rest before diving. Plan your dive and dive your plan.