The pleasure of safety

North Ari Atoll, Maldives (4°13'N – 72°46'E), 7-14th November 2011

Here we are again in this patch of land surrounded by the ocean, to continue the research we began on our last trip, just a year ago. At the first rendezvous in Gangehi, we had underlined the importance of pre- and post-dive tests, of donating diving profiles to research, and that of relaxation techniques borrowed from free diving.

This time, there are some important novelties. We will accompany all the divers staying at the Gangehi Village Island Resort (Best Tours) for the whole week, suggesting an experimental programme for them: themed evenings with medical-scientific presentations, practical advice and a new protocol which applies diver preconditioning techniques for the reduction of decompression risks.

We have called this pilot programme **Wellness Diving**. It is a way of associating entertainment with practicality, combining scientific rigour with pure pleasure. In some research camps organised by DAN Europe DSL, some tests diver pre-conditioning tests have already been carried out. These have given surprising results on post-dive bubbles.
Hydration, relaxation, total body vibration, dark chocolate, saunas and infra-red light: these are some of the things we tried on divers pre-dive.

Wellness applied to divers was something Prof. Alessandro Marroni spoke about back in 2008:

"*Even though it may seem strange and just a fad, the concept is not so far from truth: the data which is emerging shows that some pre-immersion procedures, totally non-invasive and even rather pleasant, have a significant preventive or protective effect against decompression stress and that from diving in general. Furthermore, it has become well-known and it is scientifically proved that a good "aerobic fitness" condition is associated with a reduction in decompression risks. All this could very well be framed in the context of "pre-diving wellness", and why not? Seeing as that these are simple procedures to enact and which require no particularly complex or costly equipment, one could envisage pre-dive "wellness areas" in future diving centres and even on dedicate diving cruise vessels."*

Three years later, this is exactly what DSL is proposing to the Gangehi divers.
What more appropriate place could there be than a small Maldives island to test the project?

Organization and logistics are fundamental in these phases. Alberto Bonotti, responsible for the Albatros Top Diving centre of Gangehi, has already organised everything so that the day after our arrival all the procedures can be carried out quickly and precisely. The protocol lays out that 12 divers, divided in groups of 3, will carry out basic tests before exposure, then undergoing their assigned pre-conditionings.
The 4 groups are: Vibration, Chocolate, Control Group, Guides. Our divers will be "vibrated" before the beginning of the series of dives and will have dark chocolate (75% cocoa) every day, to stimulate protective mechanisms. Total body pre-immersion **vibration** (see analysis) leads to a depletion of gaseous micronuclei and their significant reduction after diving, as compared to profiles without pre-vibration (preliminary reduction of gaseous nuclei to optimise decompression).

Chocolate on the other hand produces NO (Nitric oxide), which acts as a vasodilator and protector of endothelial integrity (the endothelium is the tissue which lines the inside of our blood vessels). If blood vessels dilate, it is harder for bubbles to get trapped. The preventive action of NO also hinders the sticking of the bubbles to the endothelial wall. **Dawn of 7 November 2011. Here we are, finally on the**

island, welcomed by a small shark swimming in the lagoon. We are in a truly magical place, where anything can happen and any encounter can leave emotional traces. The first day of work is carried out in complete serenity. Control procedures foresee the use of a **thermal camera**, which will help understand interaction with the warm Maldives waters in the dives.

We will also use **cardiac echography** for the visualization of post-dive gaseous bubbles. We have decided to also include the guides' group in the diving test, so that we may see the effects on subjects who are exposed to the hyperbaric condition for longer and who dive repetitively. The first checks generally showed a normal production of bubbles, which we expected. This stayed within security limits, varying between grades 0.5 and 1.5 – known in jargon as LBG (Low Bubble Grade). Only in two cases do we find values between 2 and 3 – HBG (High Bubble Grade).

Monitoring was to be carried out for the whole week and at the end of each day's diving, so to have a daily evaluation of the bubble rate. We asked the guides to perform an extra evaluation task on their work, using a scale of 0 to 5, where zero is the greatest degree of relaxation and serenity during the dive, bearing in mind two factors: emotional (stress) and physical (underwater work load). The themed week included two evening presentations of DAN and its DSL (Diving Safety Laboratory) projects. This information was also appreciated by the non-diving guests of the village. Particular curiosity was generated by the PFO (patent foramen ovale), perhaps due to recent news which involved a famous soccer player. To know its effects on diving was even more interesting.

DAN has been studying this phenomenon for several years, providing appropriate guidelines. The audience's interest then concentrated on the tight bond between research and health, like that highlighted by studies on free-divers with changes to their haemoglobin after diving and flying.

Speaking of this project, we showed how heavy air is!
Starting from Italy with Dr. Cialoni, we had the idea of taking a bottle of water, drinking 2/3 of the content and then leaving it subject to the pressure variations of the cabin for the whole flight. Obviously, the bottle became compressed, but not completely, as the liquid and compressible part offered some resistance. A banal example which shows how important the pressure variations during flight can be, especially for a diver returning home by plane after several days of diving. DAN has thus established some simple rules: 12 hours of interval after a curved dive profile, 24 hours after repetitive dives or ones outside the curve. Another small suggestion to take on your travels.

Dr. Cialoni's presentation was another intense moment in the soirées. Danilo provided guests with a free-diving simulation and a video of Umberto Pelizzari setting the world record at 80 metres. Spectators were asked to hold their breath whilst they watched the video with the best techniques they knew. But is free-diving just about holding your breath? Obviously not! It is probably the search for a sensation of well-being which, with the appropriate techniques, motivates the need to breathe to the limits, without going beyond them… Now the video is still playing, the viewers have to hold their breath a little longer and Pelizzari perhaps only feels like giving in once he has reached the surface… what a sensation! Danilo, you took us on a marvellous dive!

Still on the theme of breath-holding, one of the highlights of the week is the session dedicated to **relaxation and breathing techniques** held on a narrow stretch of sand. Divers and others took part. It's an almost mystical moment. We are taken to an oasis of relaxation, listening to the gurgle of the small waves breaking on the sand. The hustle and bustle of everyday life is far away: each one of us establishes a connection with our inside part and listens to him/herself breathe…

Right at the end of the relaxation session, a beautiful turtle surfaces onto the sandy stretch, bringing us

back to reality.
A heartfelt thanks goes to Best Tours, which helped us manage the mobile research laboratory and provided the Gangehi island venue. Thanks also to Albatros Top Diving.

Analysis

Total body vibration for depletion of gaseous micronuclei Effect: reduction of gaseous nuclei to optimise decompression. How to do it: divers are vibrated on purpose-built beds for a set time, 30 minutes before immersion. It seems that the vibrations significantly reduce the number of bubbles found in divers after immersion. The study began after interesting reports from divers on the Côte d'Azur who noticed far less decompression problems after adopting a peculiar strategy: they would race their dinghies at full speed so as to "shake" the bubbles before diving, then returning slowly so as not to shake them afterwards.

Scientific references

Pre-dive Vibration (abstract)
Pre-dive Sauna
Pre-dive Hydration

Wellness Diving
DAN Europe Research has always been committed in research projects to make diving even safer. The results obtained so far thanks to its scientists have become a point of reference for the medicaldiving community. Wellness Diving is an experimental pilot programme which applies diver preconditioning techniques for the reduction of decompression risks in the field.

Take care of yourself before diving:

- total body vibration
- infra-red sauna
- dark chocolate

These are some of the pre-dive activities which conjugate well-being and greater diving safety.