

Short-acting NO donor and decompression sickness in humans

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TO THE EDITOR: In the December issue of the *Journal of Applied Physiology*, Møllerlørkken et al. (3) describe the beneficial effect of a short-acting nitric oxide (NO) donor on the formation of venous gas bubbles after decompression in anesthetized pigs. It is accompanied by the editorial by Dr. Moon (4) discussing primarily the potential mechanisms responsible for such reduction and suggesting further direction for studies investigating this topic.

In the August issue of the journal *Medicine and Science in Sports and Exercise*, Dujic et al. (1) confirmed NO donor capability to reduce detected number of venous gas bubbles in right atrium of scuba divers in both field conditions and simulated diving in hyperbaric chamber. In the field, diving protocol consisted of 30-min dive at the depth of 30 m, with very mild exercise during bottom time and no exercise during decompression. Detection of venous gas bubbles was performed via transthoracic ultrasound 30 and 60 min after the divers surfaced to ambient pressure. As a short-acting NO donor we used nitroglycerine by oral spray (Nitrolingual, glycerol trinitrate, G. Pohl-Boskamp).

Similar to results of Møllerlørkken et al. (3), we have found significant reduction in venous gas bubbles per square centimeter (from 0.87 to 0.32 in field dive) after administration of a short-acting NO donor. Although, we cannot exclude hemodynamic effects of nitroglycerine as potential explanation, they seem unlikely because of the very short duration of such changes. We also suggest that the reduction could be due to NO-induced changes in endothelial properties (7), especially changes in endothelial NO synthase activity within small invaginations of the endothelial cell membrane rich in caveolin, cholesterol, and sphingolipids, termed caveolae (2, 6).

However, as Dr. Moon implies, it is still too early to recommend nitrates to be regularly used in diving. They should be avoided completely if someone's intention is to perform a riskier dive after ingestion of nitrates. Instead, after being tested in greater number of divers, such active compounds may be considered as therapeutic agents. Instead some nutritional modification probably could be recommended to divers in near future. For further studies, it would be of great interest to examine influence of tetrahydrobiopterine on venous gas bubble formation.

Lastly, our group has recently showed the beneficial effect of acutely administered widely used antioxidants (vitamin C and E) in improving endothelial function after diving (5).

In conclusion, we can state that diving represents a distinct human activity that is growing in number each year and that the diving population is dramatically changed in its anthropologic characteristics. It seems that in few aspects, procedures for increasing its safety will soon be adopted.

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