

Letters to the Editor

Comment regarding: Han K-H, Hyun G-S, Jee Y-S, Park J-M. Effect of water amount intake before scuba diving on the risk of decompression sickness. *Int J Environ Res Publ Health*. 2021;18:7601

This letter aims to correct the literature record in respect of serious flaws in a human study of water intake and decompression stress. Our letter was submitted as a Letter to the Editor to the journal publishing the original manuscript, but was not accepted for publication. We submit it here since the topic is within the primary scope of interest of *Diving and Hyperbaric Medicine*.

There are significant concerns with a recent report describing an effort to investigate the influence of pre-hydration on circulating bubble formation.¹ The research topic is of interest, but the paper suffered from serious flaws in methodology and unlikely data.

Recommendations on fluid intake are challenging since fluid is derived from both liquid and solid food intake. The critical goal is to ensure sufficient intake to maintain an appropriate state of hydration and optimal physiological function. State of hydration is most reliably assessed through direct measures of plasma volume. It can be estimated through analysis of a pooled sample of urine captured in a 24-hour collection, or more roughly estimated through analysis of the first waking sample of urine. It is a major shortcoming that there was no measure or estimate of state of hydration in the work under discussion. The described check for post-dive “*symptoms of dehydration*” is not a meaningful assessment. Without objective measures it is impossible to know whether individual subjects were dehydrated, euhydrated, or hyperhydrated with any of the four pre-hydration levels.

The two-day interval between dive exposures was sufficient for inert gas clearance, but it may be insufficient for resolution of secondary biochemical changes induced by diving. The fixed treatment order is a substantial shortcoming, potentially introducing a confounding effect. Similarly, measuring bubble scores only twice post-dive fails to meet the recommended practice to investigate decompression stress.² The authors’ acknowledgment of the limitation does not overcome it.

The handling of the bubble data was also problematic. Most fundamental is the fact that bubble data are ordinal and as such cannot be subjected to parametric analysis. The data are also over-analysed by considering the individual parameters of the integrated Kisman-Masurel data separately.

The raw data described in the results are extremely troubling. It is difficult to believe that all baseline scores were grades

I and II when the norm is to see grade 0 at baseline. This raises serious questions as to the validity of the bubble data.

The collective effect of the shortcomings described here is an inability to trust the interpretations or conclusions of the work. The absence of state of hydration measures makes it invalid to say that the effort confirms appropriate pre-hydration to minimise decompression stress. More carefully designed, conducted, and analysed research is needed to address the open questions. In the meantime, it is important to be mindful that while a state of dehydration can likely increase decompression stress, a state of hyperhydration can increase the risk of immersion pulmonary oedema, and extreme cases can lead to hyponatraemia, both serious conditions. Divers need to be thoughtful in balancing many risks, and should generally avoid extremes in any direction.

References

- 1 Han K-H, Hyun G-S, Jee Y-S, Park J-M. Effect of water amount intake before scuba diving on the risk of decompression sickness. *Int J Environ Res Publ Health*. 2021;18:7601. doi: 10.3390/ijerph18147601. PMID: 34300051. PMCID: PMC8306992.
- 2 Møllerløkken A, Blogg SL, Doolette DJ, Nishi RY, Pollock NW. Consensus guidelines for the use of ultrasound for diving research. *Diving Hyperb Med*. 2016;46:26–32. PMID: 27044459. Available from: https://www.dhmjournal.com/images/IndividArticles/46March/Mollerlokken_dhm.46.1.26-32.pdf.

Editorial note: the authors of the paper discussed¹ did not respond to an invitation to address the criticisms articulated in this letter.

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Associate Professor Neal Pollock is a member of the editorial board and Lesley Blogg is the Deputy Editor of *Diving and Hyperbaric Medicine*, but neither was involved in the peer review or publication decision-making process for this article.

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Decompression; Diving; Ultrasound; Safety; Physiology; Science publication

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