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EDITED BY
Mark R. Patterson,
Northeastern University, United States

REVIEWED BY
Arnaud Druelle,
L'Hôpital d'Instruction des Armées
Sainte-Anne, France

*CORRESPONDENCE
Gerardo Bosco
gerardo.bosco@unipd.it

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Response: Commentary: Arterial blood gases in SCUBA divers at depth

Richard E. Moon[1], Matteo Paganini[2], Enrico M. Camporesi[3] and Gerardo Bosco[2]*

[1]Center for Hyperbaric Medicine and Environmental Physiology, Department of Anesthesiology, Duke University Medical Center, Durham, NC, United States, [2]Department of Biomedical Sciences, University of Padova, Padova, Italy, [3]TEAMHealth Research Institute, Tampa General Hospital, Tampa, FL, United States

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A Commentary on
Commentary: Arterial blood gases in SCUBA divers at depth

by Arieli R (2025) *Front. Mar. Sci.* 12:1557303. doi: 10.3389/fmars.2025.1557303

In his commentary (Arieli, 2025), Dr. Arieli has pointed out that in a series of arterial blood gas measurements in divers at 15 and 42 meters of freshwater (mfw), using a prediction method based on constant arterial:alveolar (a:A) PO_2 ratio (Moon et al., 1987), the predicted arterial PO_2 at the greater depth was inaccurate (Paganini et al., 2024). Indeed, at predicted PO_2 values in the range of 650–750 mmHg measured values were significantly lower: 427–511 mmHg. He suggests that this might be due to augmented tidal changes in perfusion as a result of the breathing cycle and greater gas density. Arieli has proposed this plausible mechanism to explain why arterial PO_2 might be higher than expected during diving (Arieli, 1992). He notes that this is supported by the observations of Weaver (Weaver and Howe, 1992), where arterial PO_2 was higher than predicted by the constant a:A ratio.

However, in our case the measured PO_2 was *lower* than predicted. All of the measurements in this study were obtained at 1 ATA, with predicted arterial PO_2's close to atmospheric pressure (around 760 mmHg at sea level). Accurate calibration of any blood gas analyzer requires a two-point calibration below and above the unknown blood sample. During this experiment the measurements were obtained at 1 ATA, where a high point calibration is not possible for a PO_2 close to or exceeding ambient pressure minus water vapor pressure (around 713 mmHg). Similarly, in Weaver's report of PO_2 values in volunteers in a hyperbaric chamber measured at 1 ATA, for which an empirical correction algorithm was developed (Weaver and Howe, 1992). On the other hand, the hyperbaric measurements reported by Moon et al. up to PO_2 values close to 1,700 mmHg (Moon et al., 1987) were obtained using an arterial blood gas machine calibrated inside the hyperbaric chamber. Additionally, blood samples with high PO_2 are inordinately predisposed to erroneously low measurements due to diffusion of oxygen

from the sample into small gas bubbles that may be present in the syringe, as may have been the case in the highest values reported by Moon (Moon et al., 1987).

We believe therefore that the measurements at 42 mfw were artifactually low due to the challenge of accurate calibration of the PO_2 electrode.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that no Generative AI was used in the creation of this manuscript.

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