

# Letters to the Editor

## Central nervous system oxygen toxicity during 100% oxygen breathing at normobaric pressure

I read with interest the report of symptoms suggesting central nervous system (CNS) oxygen toxicity while breathing carbon dioxide (CO<sub>2</sub>)/oxygen (O<sub>2</sub>) mixtures at ambient pressure,<sup>1</sup> which Dr Eynan and colleagues concluded may have been due to normobaric CNS O<sub>2</sub> toxicity. While perhaps plausible, it should be noted that similar symptoms also consistent with O<sub>2</sub> toxicity have been reported from hypercapnia alone. These have included muscle twitching, facial tremors, myoclonus, extremity paralysis, hyporeflexia, flaccid paralysis, impaired consciousness and generalized convulsions.<sup>2,3</sup> In a study of normoxic, normal volunteers (inspired PO<sub>2</sub> 21.3 kPa [0.21 atmospheres (atm)]) breathing CO<sub>2</sub> at 6.6–8.6 kPa (0.065–0.085 atm) in a dry hyperbaric chamber at 1.46 atm absolute, other symptoms typical of CNS oxygen toxicity were reported: tunnel vision, vision loss, dizziness and near-syncope.<sup>4</sup>

In their report, Eynan and colleagues point out the extreme sensitivity of a diver to CO<sub>2</sub>. However, it is not clear that he is sensitive to O<sub>2</sub>. Notwithstanding the rarity of this man's symptoms, rather than an uncommon manifestation of CNS O<sub>2</sub> toxicity, the diver's symptoms at sea level pressure may instead be a rare manifestation of CO<sub>2</sub> narcosis at relatively low PCO<sub>2</sub>. The authors should test their hypothesis by exposing the diver in a blinded manner to CO<sub>2</sub> at low and high PO<sub>2</sub>.

### References

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### Key words

Carbon dioxide; Hypercapnia; Hyperoxia; Toxicity; Side effects; Letters (to the Editor)

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## Reply

I should like to thank Dr Richard Moon for his comments on our article.<sup>1</sup> I read with interest his letter regarding the possibility that the symptoms we reported may have been due to hypercapnia alone, because our subject was breathing 100% oxygen at normobaric pressure. He reached this conclusion on the basis of the article by Gill and colleagues,<sup>2</sup> in which symptoms akin to those associated with central nervous system (CNS) oxygen toxicity were detected when the inspired PCO<sub>2</sub> was between 6.6–8.6 kPa (0.065–0.085 atm).

I should like to raise two points, which may demonstrate that the diver in question is in fact highly sensitive to oxygen.

1. During his interview before the test, the subject complained of dizziness, headaches and nausea he had experienced during the series of dives using closed-circuit apparatus commenced two weeks previously. It is unlikely that he would have suffered from severe hypercapnia during his dives with the oxygen rebreather. It is more plausible that with no elevation at all of CO<sub>2</sub> in his inspired gas thanks to the CO<sub>2</sub> absorbent, the only aspect we have to consider in our attempt to determine the reason for his symptoms may be the hyperbaric oxygen he inspired during the dive.

2. When the CO<sub>2</sub> in the subject's inspired gas reached a level of 2 kPa during the CO<sub>2</sub> detection test, he complained of severe dizziness and headache. With CO<sub>2</sub> in excess of 3 kPa, he also reported twitching of his facial muscles, especially around the mouth. However, this level of inspired CO<sub>2</sub> is much lower than that reported by Gill and colleagues.<sup>2</sup>

These two points would indicate that our diver may have been extremely sensitive not only to CO<sub>2</sub>, but also to hyperbaric oxygen.

## References

- 1 Eynan M, Arieli Y, Taran B, Yanir Y. Symptoms of central nervous system oxygen toxicity during 100% oxygen breathing at normobaric pressure with increasing inspired levels of carbon dioxide: a case report. *Diving Hyperb Med.* 2020;50:70–4. doi: [10.28920/dhm50.1.70-74](https://doi.org/10.28920/dhm50.1.70-74). PMID: [32187621](https://pubmed.ncbi.nlm.nih.gov/32187621/). PMCID: [PMC7276268](https://pubmed.ncbi.nlm.nih.gov/PMC7276268/).
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