

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 (CO₂)/oxygen (O₂) mixtures at ambient pressure,¹ which Dr Eynan and colleagues concluded may have been due to normobaric CNS O₂ toxicity. While perhaps plausible, it should be noted that similar symptoms also consistent with O₂ 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.^{2,3} In a study of normoxic, normal volunteers (inspired PO₂ 21.3 kPa [0.21 atmospheres (atm)]) breathing CO₂ 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.⁴

In their report, Eynan and colleagues point out the extreme sensitivity of a diver to CO₂. However, it is not clear that he is sensitive to O₂. Notwithstanding the rarity of this man's symptoms, rather than an uncommon manifestation of CNS O₂ toxicity, the diver's symptoms at sea level pressure may instead be a rare manifestation of CO₂ narcosis at relatively low PCO₂. The authors should test their hypothesis by exposing the diver in a blinded manner to CO₂ at low and high PO₂.

References

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Reply

I should like to thank Dr Richard Moon for his comments on our article.¹ 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,² in which symptoms akin to those associated with central nervous system (CNS) oxygen toxicity were detected when the inspired PCO₂ 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 CO₂ in his inspired gas thanks to the CO₂ 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 CO₂ in the subject's inspired gas reached a level of 2 kPa during the CO₂ detection test, he complained of severe dizziness and headache. With CO₂ in excess of 3 kPa, he also reported twitching of his facial muscles, especially around the mouth. However, this level of inspired CO₂ is much lower than that reported by Gill and colleagues.²

These two points would indicate that our diver may have been extremely sensitive not only to CO₂, but also to hyperbaric oxygen.