

Available oxygen toxicity models vs. available oxygen toxicity data

Five separate categories of pulmonary oxygen toxicity models, all of which predict fractional changes in vital capacity (% Δ VC) during and after hyperbaric oxygen exposure, were examined in 2007. Four central nervous system (CNS) oxygen toxicity models, all of which estimate all-or-nothing risk of a toxic event, were found in the literature in 2013. All models in both categories were based on PO_2 and exposure time. The models were tested against their calibration sets plus all other diving data available. A striking finding was that models did not translate well to data from conditions different from their calibration set. CNS oxygen toxicity risk appeared to decrease after 1970. Models based on exposures to high PO_2 greatly overestimated risk at lower PO_2 . Different Navies recorded different incidence of CNS oxygen toxicity from shallow oxygen dives. Pulmonary models ignored large individual variation. Perhaps basic research into oxygen toxicity explains the difficulty. Pulmonary oxygen toxicity appears to be a set of signs and symptoms with multiple causes, not a unique pathological process, and oxygen toxicity risk depends on additional factors, for example, nitrogen partial pressure and nitric oxide precursors, in addition to PO_2 and time. Current models are only a first level explanation.