Hyperbaric training review

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Achieving an appropriate balance between training and competition stresses and recovery is important in maximising the performance of athletes. A wide range of recovery modalities are now used as integral parts of the training programmes of elite athletes to help attain this balance. This review examined the evidence available as to the efficacy of these recovery modalities in enhancing between-training session recovery in elite athletes. Recovery modalities have largely been investigated with regard to their ability to enhance the rate of blood lactate removal following high-intensity exercise or to reduce the severity and duration of exercise-induced muscle injury and delayed onset muscle soreness (DOMS). Neither of these reflects the circumstances of between-training session recovery in elite athletes. After high-intensity exercise, rest alone will return blood lactate to baseline levels well within the normal time period between the training sessions of athletes. The majority of studies examining exercise-induced muscle injury and DOMS have used untrained subjects undertaking large amounts of unfamiliar eccentric exercise. This model is unlikely to closely reflect the circumstances of elite athletes. Even without considering the above limitations, there is no substantial scientific evidence to support the use of the recovery modalities reviewed to enhance the between-training session recovery of elite athletes. Modalities reviewed were massage, active recovery, cryotherapy, contrast temperature water immersion therapy, hyperbaric oxygen therapy, nonsteroidal anti-inflammatory drugs, compression garments, stretching, electromyostimulation and combination modalities. Experimental models designed to reflect the circumstances of elite athletes are needed to further investigate the efficacy of various recovery modalities for elite athletes. Other potentially important factors associated with recovery, such as the rate of post-exercise glycogen synthesis and the role of inflammation in the recovery and adaptation process, also need to be considered in this future assessment.

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Seizure incidence in 80,000 patient treatments with hyperbaric oxygen.

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INTRODUCTION: Hyperbaric oxygen treatment (HBOT) involves some risk of central nervous system (CNS) oxygen toxicity, which may be revealed by various signs and symptoms including seizures in patients breathing O2 at pressures of 2 ATA or higher. The aim of this study was to determine the incidence of such seizures in the Underwater and Hyperbaric Medicine Departments of two university hospitals. METHODS: We retrospectively evaluated 80,679 patient-treatments for 9 clinical indications to determine the incidence of seizures attributable to CNS O2 toxicity. Because different protocols were used for HBOT, the treatments were studied in four groups according to the chamber type used and the medical facility at which it was located. RESULTS: Only 2 seizures were documented, yielding an incidence of 2.4 per 100,000 patient-treatments. Both cases occurred in a multiplace chamber pressurized to 2.4 ATA with O2 delivered by mask for three x 30 min with 5-min air breaks. DISCUSSION: The seizure incidence reported here is lower than other studies published in the literature. The delivery of O2 by mask rather than hood may be a factor. Nevertheless, it appears that the risk of seizures due to CNS O2 toxicity during HBOT is very low as long as appropriate exclusion criteria and treatment profiles are used.

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Effect of hyperbaric oxygen on oxygen uptake and measurements in the blood and tissues in a normobaric environment.

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OBJECTIVE: To examine venous partial pressure of oxygen (PvO(2)), transcutaneous oxygen tension (tcPO(2)), and VO(2)MAX in a normobaric environment after a single hyperbaric oxygen (HBO(2)) treatment. METHODS: This was a prospective study of conditions after the intervention compared with baseline. The participants were 10 moderately trained (VO(2)MAX = 57.6 ml/kg/min) men. Two HBO(2) treatments consisting of breathing 95% oxygen at 2.5 atmospheres absolute (ATA) for 90 minutes were administered on non-consecutive days. Baseline testing included measures of VO(2)MAX, tcPO(2), and anthropometry. At 6.0 (1.0) minutes after the first HBO(2) treatment, a VO(2)MAX test was performed. After the second HBO(2) treatment, leg and chest tcPO(2) and PvO(2) were monitored for 60 minutes. RESULTS: VO(2)MAX, running time, and peak blood lactate were not altered after the HBO(2) treatment. Leg tcPO(2) was lower ($p = 0.003$) and chest tcPO(2) was unchanged after the HBO(2) treatment compared with baseline values. PvO(2) was significantly ($p<0.001$) lower in the first three minutes after treatment than subsequent values, but no other differences were found. CONCLUSIONS: A single HBO(2) treatment at 2.5 ATA for 90 minutes does not raise PvO(2), tcPO(2), or VO(2)MAX in a normobaric, normoxic environment.

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Hyperoxia may reduce energetic efficiency in the trained rat.

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BACKGROUND: Several studies have been conducted in recent years in the attempt to improve running performance by the use of hyperbaric oxygen, but there is disagreement as to whether this has any beneficial effect. The purpose of this study was to measure the effect of 24 h breathing 100% O_2 in normobaric conditions on energetic efficiency in the trained rat. METHODS: Experiments were carried out on trained rats whose oxygen consumption was evaluated during the training period and on its completion. At the end of the training period, the rats were divided into two groups: 1) rats exposed to air (21% O_2) in normobaric conditions; and 2) rats exposed to 100% O_2 in normobaric conditions. In addition, two groups of sedentary rats were used: 3) sedentary rats exposed to air (21% O_2) in normobaric conditions; and 4) sedentary rats exposed to 100% O_2 in normobaric conditions. Energetic efficiency was estimated by measuring O_2 consumption at submaximal exercise (45 $m.min^{-1}$, 10 degrees incline). RESULTS: Training alone reduced O_2 consumption by 18% during submaximal exercise. Exposure to 100% oxygen for 24 h in normobaric conditions reversed the effect of complete training by elevating the O_2 consumption by 17%, which was close to the oxygen consumption of the rats during the incomplete training period. CONCLUSIONS: Our results suggest that prolonged exposure to hyperoxia induces a reduction in the energetic efficiency of the trained rat. The relevance of these findings to sports and diving is discussed.

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[Technology of hyperbaric chambers]

[Article in German]

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Technical requirements for hyperbaric chambers are subject to permanent change. Medical gas supplies, the chamber hulls, control systems, medical equipment as well as the security check-up modalities have been constantly adapted according to the most recent technical developments. Moreover, different subtypes of hyperbaric chambers such as treatment facilities, chambers used for training purposes or facilities set up for primary experimental use require specific technical outfit. Keeping in mind some recent tragic accidents in hyperbaric facilities, chamber security is of foremost importance. Alarm- as well as technical monitoring systems, fire-fighting equipment, deluge systems and pressure locks are absolute requirements for any hyperbaric chamber. In chambers used for therapeutic purposes the possibility of invasive and noninvasive patient monitoring as well as hygienic standards have to be ensured.