

Ketone supplementation protects against seizures caused by hyperbaric oxygen

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Video Abstract

Keywords: seizure, hyperbaric oxygen, tonic-clonic, ketogenic, keto diet, ketone, ketone ester, medium-chain triglyceride, supplement, supplementation, central nervous system oxygen toxicity, scuba diving, beta-hydroxybutyrate, acetoacetate, oxygen toxicity seizure, pressure, MCT, ketone salt, CNS-OT

Posted Date: September 20th, 2019

DOI: <https://doi.org/10.21203/rs.2.15031/v1>

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Abstract

The ketogenic diet may be one of the hottest trends in weight management, but doctors have long known of its potential to reduce seizures in those with epilepsy. In a new article in *Physiological Reports*, scientists suggest that strict adherence to the diet may not be needed to achieve this neuroprotective effect. Through a series of experiments in rats, they show that supplementing a normal, carbohydrate-rich diet with specific ketogenic agents may significantly delay seizures. The team specifically focused on tonic-clonic seizures caused by exposure to high levels of oxygen. This central nervous system oxygen toxicity is a complication that can arise following hyperbaric oxygen therapy, which involves inhaling pure oxygen in a pressurized or hyperbaric chamber. This kind of treatment is used to manage various medical conditions, including air/gas embolism, decompression sickness, carbon monoxide poisoning and diabetic wounds. Exposure to high-pressure oxygen is also a danger to recreational, technical and military scuba divers, as a seizure manifesting underwater can be lethal. To develop new methods for avoiding these seizures, the researchers employed a small hyperbaric environmental chamber to test the effects of ketogenic agents on rats. Animals placed in the chamber were exposed to pure oxygen, and the chamber was pressurized to simulate the pressures experienced in technical and military dive operations. These conditions were maintained until the rat produced physical symptoms of a seizure, which were recorded on live camera feeds. The researchers gave the rats different ketogenic agents one hour before exposing them to the hyperbaric conditions. Prior to the experiments, the animals were freely fed standard rodent chow, which contains an approximate 70% carbohydrate load. The team found that a combination of ketone ester and medium-chain triglyceride oil significantly delayed the onset of seizures. The supplements also increased the levels of ketone metabolites in the animals' blood. The findings show that boosting the level of blood ketones produces therapeutic ketosis, which, in turn, increases resistance to seizures induced by extreme levels of hyperbaric oxygen. Importantly, the findings support that this neuroprotective effect may not require strict adherence to dietary restrictions – it might be achieved through supplementation alone.