

Effects of erythropoietin and hypoxia on memory and anxiety

Alvarez-Sánchez M (1,2,3), Díaz V (1), Van Dijk RM (3), Fritz AK (3), Amrein I (3),
Wolfer DP (2,3,4), Gassmann M (1,2)

- (1) Institute of Veterinary Physiology, Vetsuisse Faculty, University of Zurich, Switzerland
- (2) Zurich Center for Integrative Human Physiology (ZIHP), University of Zurich, Switzerland
- (3) Institute of Anatomy, University of Zurich, Switzerland
- (4) Institute for Human Movement Sciences and Sport, ETH Zurich, Switzerland

Some studies have shown that hypoxia can improve learning and memory capabilities, but the duration and level of exposure can induce acclimatization or functional deficit. It is also known from previous studies that repeated erythropoietin (Epo) treatment leads to improvement on memory functions and decreases anxiety-like behavior. The concentration of Epo in the brain after these two different treatments and how much is needed to produce positive effect on learning and memory are not known.

In our study we treated one group with 5000IU/kg of Epo and exposed another three groups of mice to different protocols of hypoxia: Acute hypoxia: 8% of O₂ for 6h; Prolonged hypoxia: 10% of O₂ for 12h; Intermittent hypoxia 10% of O₂ for 48h in cycles of 7h. The brain was harvested to measure the concentration of Epo in the cortex and hippocampus and blood was collected to measure Epo concentration and hematocrit levels. All hypoxia protocols significantly increased Epo concentration levels in the cortex but not in the hippocampus. A new group of animals was treated with Epo or exposed to the “prolonged hypoxia” protocol and performed behavioral test to evaluate learning and memory, exploratory behavior and anxiety. In our hands, none of these treatments improved learning and memory or affected anxiety like behavior.