EFFECTS OF ACUTE OR CHRONIC HYPOXIA ON REACTIVE OXYGEN SPECIES PRODUCTION ASSESSED BY ELECTRON PARAMAGNETIC RESONANCE

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There is indirect evidence from cells and tissue experiments that acute hypoxia induces accumulation of reactive oxygen species (ROS). This is also the case for the whole body of animals and man as appears from muscle proteomic analysis. Electronic Paramagnetic Resonance (EPR) is the only non-invasive technique available to detect and quantitate ROS accumulation. By means of a recently developed EPR Scanner (Bruker e-scan) suitable for 50 µl sample analysis and sensitive to very low (nM) concentration levels, the time course of ROS in capillary blood could be monitored: a) in sedentary subjects (n=6) at the onset (square wave), during and after 2-4 h of acute hypoxic exposure (equivalent to 4500 meters a. s.l.); b) in athletes (n=18) before and after 2wk exposure to moderate altitude (1860m). The data were compared with complementary enzymatic assays of Protein Carbonyls, PC and ThioBarbituric Acid Reactive Substances, TBARS. **Results**: In (a), a fast, initial elevation of ROS was observed, whose size appears to be related to the subjects' capillary PO_2, followed within 2 h by a return to pre-hypoxia levels. Parenthetically, plasmatic concentrations of TBARS and PC were significantly increased after 4 h of hypoxia exposure and up to 1 h into recovery, then resuming pre-hypoxia levels within 8 h; (b) two weeks exposure to moderate hypoxia induced significant increases in both ROS and oxidative markers concentration. The experimental conditions under investigation, even though very different for degree of hypoxia and duration, were both characterized by comparable accumulation of ROS and oxidative damage.