European Respiratory Society
Annual Congress 2012

Abstract Number: 819

Publication Number: 3309

Abstract Group: 4.1. Clinical physiology and Exercise

Keyword 1: Gas exchange **Keyword 2:** Exercise **Keyword 3:** Physiology

Title: Cerebral cortex blood flow, oxygen delivery and oxygenation during normoxic and hypoxic exercise in healthy humans

Mr. Zafeiris 6605 Louvaris zafkimi@phed.uoa.gr [1,2], Dr. Ioannis 6606 Vogiatzis gianvog@phed.uoa.gr [1,2], Prof. Dr Helmut 6607 Habazettl helmut.habazettl@charite.de MD [3,4], Mr. Vasileios 6608 Andrianopoulos andrianopoulos.v@lycos.com [1], Dr. Harrieth 6799 Wagner hewagner@ucsd.edu MD [5], Dr. George 6800 Zakynthinos gzakynthinos@hotmail.com MD [1], Prof. Dr Charis 6801 Roussos croussos@med.uoa.gr MD [1] and Prof. Dr Peter 9313 Wagner pdwagner@ucsd.edu MD [5]. [1] Department of Critical Care Medicine and Pulmonary Services, Evangelismos Hospital, "M. Simou, and G.P. Livanos Laboratories", National and Kapodistrian University, Athens, Greece ; [2] Department of Physical Education and Sport Sciences, National and Kapodistrian University, Athens, Greece ; [3] Institute of Physiology, Charité Campus Benjamin Franklin, Berlin, Germany ; [4] Institute of Anesthesiology, German Heart Institute, Berlin, Germany and [5] Department of Medicine, University of California San Diego, La Jolla, CA, United States .

Body: Background: During maximal hypoxic exercise a reduction in cerebral oxygen delivery may constitute a signal to terminate exercise. Aim: To investigate whether the rate of increase in cerebral cortex oxygen delivery is limited in hypoxic compared to normoxic exercise. Methods: We assessed frontal cerebral cortex blood flow using near infrared spectroscopy and the light-absorbing tracer indocyanine green dye, as well as frontal cortex oxygen saturation (StO_2%) in 11 cyclists during incremental exercise to the limit of tolerance (WR_{max}) in normoxia and acute hypoxia (F_IO_2:0.12). Results: In normoxia, cerebral cortex blood flow and oxygen delivery increased ($p<0.05$) from baseline to sub-maximal exercise reaching peak values at near-maximal exercise (80%WR_{max}: 287±9W; 81±23% and 75±22% increase relative to baseline, respectively), both leveling off thereafter up to WR_{max} (382±10W). Cerebral cortex StO_2% did not change from baseline (66±3%) throughout graded exercise. During hypoxic exercise, cerebral cortex blood flow increased from baseline to sub-maximal exercise peaking at 80%WR_{max} (213±6W; 60±15% relative increase) before declining towards baseline at WR_{max} (289±5W). Despite this, cerebral cortex oxygen delivery remained unchanged from baseline throughout graded exercise, being at WR_{max} lower than at comparable loads (287±9W) in normoxia (by 58±12%). Cerebral cortex StO_2% fell from baseline (58±2%) on moderate exercise in parallel with arterial oxygen saturation, but then remained unchanged to exhaustion (47±1%). Conclusion: Cerebral cortex oxygen delivery is limited in hypoxia compared to normoxia, thus potentialy compromising maximal exercise capacity in hypoxia.