

Name of research institute or organization:

¹ **Institut und Poliklinik für Arbeits-, Sozial- und Umweltmedizin,
Ludwig-Maximilians-Universität, München**

² **Viasys Healthcare GmbH, Würzburg**

³ **Pneumologie, Medizinische Klinik Innenstadt, Ludwig-
Maximilians-Universität, München**

Title of project:

Acute exposure to hypobaric hypoxia: influence on combined lung diffusion capacity for NO and CO

Project leader and team:

Holger Dressel¹, Kristin Vierling¹, Laura Filser¹, Dorothea de la Motte¹, Engelbert Kienle², Werner Steinhäusser², Rudolf M. Huber³, Dennis Nowak¹, Rudolf A. Jörres¹, Rainald Fischer³

Project description:

Exposition to hypoxia in high altitudes leads to cardio-pulmonary adaptation processes with hyperventilation, increased pulmonary blood flow and edema formation. In principle the combined diffusion capacity for nitrogen monoxide (DLNO) and carbon monoxide (DLCO) can distinguish between changes of alveolo-capillary diffusion (DM) and pulmonary blood volume (Vc).

Methods: We measured in 17 subjects (14 m, mean±SD age 39±9 years; FEV1 111±12 % predicted) DLNO and DLCO as well as the concentration of exhaled nitrogen monoxide (FENO) in Grindelwald Grund (height 940 m, M1) as well as immediately after travel to Jungfrauoch (height of 3454 m, M2) and after one night at Jungfrauoch (M3). For all time points, we evaluated vital capacity, arterial oxygen saturation, pulse rate and symptoms of the high altitude illness with the Lake Louis Score.

Results: FENO did not show differences between the times M1, M2 and M3 (geometrical mean 27; 25; 25 ppb). Also DLNO and DM did not show any change over time and altitude (50,5; 50,2; to 50,4 mmol/min/kPa).

In contrast, DLCO was significantly increased at altitude compared to low altitude (13,6; 14,9; 15,2 mmol/min/kPa). The same significant change was found for the quotient DLNO/DLCO. Regardless of the increase of the DLCO no difference in vital capacity resulted after conventional correction for the oxygen partial pressure. As shown previously, we found an increase in pulse rate and altitude related symptoms and a decrease in oxygen saturation (each $p < 0.01$).

Conclusions: The data did not show a diffusion disturbance as a result of pulmonary or bronchial edema formation. We found also no signs of an increased pulmonary capillary blood volume. However this conclusion depends critically on the method of the altitude correction for DLNO.

Key words:

altitude, diffusion capacity, DLNO, DLCO, high altitude pulmonary edema

Scientific publications and public outreach 2007:

Conference papers

Holger Dressel, Kristin Vierling, Laura Filser, Dorothea de la Motte, Engelbert Kienle, Werner Steinhäusser, Rudolf M. Huber, Dennis Nowak, Rudolf A. Jörres, Rainald Fischer. Acute exposure to hypobaric hypoxia: influence on combined lung diffusion capacity for NO and CO. Accepted for oral presentation at the congress of the German society for environmental medicine, April, 2008.

Address:

Div. Respiratory Medicine, Medizinische Klinik Innenstadt, University of Munich
Ziemssenstraße 1, D-80336 Munich

Contacts:

PD Dr. med. Rainald Fischer
Ziemssenstrasse 1, 80336 München
Tel +49 89 5160 7535 (Pforte -2111)
Fax +49 89 5160 5491
Mobil +49 17 9329 9197
e-mail rainald.fischer@med.lmu.de
Web pneu.klinikum.uni-muenchen.de