

## RESULTS AND RECOMMENDATIONS OF THE 7<sup>TH</sup> EUROPEAN HYPOXIA SYMPOSIUM

**Markus Tannheimer<sup>1</sup>, Corado Angelini<sup>2,3</sup>, Martin Faulhaber<sup>4</sup>, David Hillebrandt<sup>5</sup>, Zbigniew Szygula<sup>6</sup>, Hans-Volkhart Ulmer<sup>7</sup>, Anton Usaj<sup>8</sup>, Rianne van der Spek<sup>3,9</sup>, Thomas Küpper<sup>3,10</sup>**

<sup>1</sup>Department of Sport and Rehabilitation Medicine, University of Ulm, Ulm, Germany

<sup>2</sup>Department Neurosciences University of Padova and IRCCS Fondazione San Camillo Hospital of Venice, Venice, Italy

<sup>3</sup>Medical Commission of the Union Internationale des Associations d'Alpinisme (UIAA MedCom), Bern, Switzerland

<sup>4</sup>Department of Sport Science, University Innsbruck, Innsbruck, Austria

<sup>5</sup>President UIAA Medcom, Vice President ISMM, Hon Medical Advisor to British Mountaineering Council

<sup>6</sup>Department of Sports Medicine and Human Nutrition, Faculty of Physical Education and Sport, University of Physical Education, Krakow, Poland

<sup>7</sup>Institute of Sport Science, University of Mainz, Mainz, Germany

<sup>8</sup>Laboratory of Biodynamics, Faculty of Sport, University of Ljubljana, Ljubljana, Slovenia

<sup>9</sup>Department of Endocrinology & Metabolism, Academic Medical Center - University of Amsterdam, Amsterdam, The Netherlands

<sup>10</sup>Department of Occupational and Social Medicine, RWTH Aachen University, Aachen, Germany

One of the main themes of the 7<sup>th</sup> European Hypoxia Symposium (<http://www.hypoxiasymposium.org>; September 19-21st. 2014, Berchtesgaden, Germany) was „Contraindications for exposure to Hypoxia“ [1]. Participants from 10 countries engaged in an animated discussion with the speakers that presented data on various aspects of high altitude sojourns with pre-existing conditions. In this paper, we summarize the statements and recommendations that resulted from the presentations and discussions.

Exposure to real or artificial altitude (normobaric hypoxia) is increasingly common [2-4], not only in classical mountaineering but in a growing number of occupational settings as well. For example, hypoxia is used to protect cultural heritage, and scarcity of natural resources leads to mining at higher altitudes. In public opinion, climbing and mountaineering are often perceived as dangerous [5]. However, objective data grade mountaineering and climbing as relatively harmless [6]. Trekking is associated with a minor risk of accidents and it is more and more popular amongst elderly people (mean 42.7 yrs.: min 18, max 76 yrs.) [7]. Therefore the number of trekkers with pre-existing medical conditions is rising [8], as is the number of physicians' consultations prior to a planned high altitude sojourn. High altitude medicine and alpine medicine are rarely taught in the medical university system [9], and as a result most consulted physicians

tend to be too cautious in their recommendations [2]. To support doctors that are consulted in hypoxia or high altitude related matters, the Medical Commission of the UIAA (Union Internationale des Associations d'Alpinisme) has published 24 recommendations. The topics of these recommendations range from travelling at altitude with pre-existing cardiovascular conditions to the use of portable hyperbaric chambers, and they are available in several languages, including German ([http://www.theuiaa.org/medical\\_advice.html](http://www.theuiaa.org/medical_advice.html)).

Anyone travelling to high altitude should be aware of high altitude diseases and should know what to do when symptoms develop. Good sources of information include [www.ismmed.org](http://www.ismmed.org) and [www.medex.org.uk](http://www.medex.org.uk) [10].

Risk assessment in clinical practice should start with evaluation of any cardiopulmonary diseases that could worsen during a sojourn involving high altitude [10]. For persons with no previous experience of prolonged stay at high altitude, risk assessment is difficult [11,12]. The most reliable predicting factor for developing high altitude related disease is previous episodes in the patients' medical history [10]. If previous sojourns were unproblematic, further sojourns with comparable rates of ascent and final altitude will be most likely be unproblematic too [13]. Mountaineers should therefore be advised to initially choose a tour with moderate demands. The rate of

ascend is of crucial importance [14], and a simple altitude profile graph provides clear insight into the risk of developing altitude related diseases. Above 2500 m acclimatization is necessary but time needed for proper acclimatization varies between individuals [15]. Therefore, the daily gain in sleeping altitude should not exceed 300–500 m [16]. Furthermore, after every 1000 m of altitude gain an additional day for proper acclimatization is recommended [17]. These easy recommendations are frequently ignored [18]. For example, the incidence of acute mountain sickness (AMS) on Mount Kilimanjaro was reported to range between 47% and 75% [19-21], and high altitude pulmonary edema (HAPE) occurs often [22]. Despite the relative lack of technical difficulties, only 53% of climbers reach the summit [19]. The high incidence of avoidable high altitude related diseases make this peak one of the most dangerous mountains in the world [23].

When high altitude disease does occur, or pre-existing medical conditions worsen, the aetiology is of major interest. In many cases altitude profiles were too ambitious, a frequent problem in commercially offered tours [18,24]. Common causes are group dynamics, burning ambition or even lack of knowledge among the participants, as well as economic motives from the company side. As early as 1992 Shlim [25] showed that amongst trekkers in Nepal, mortality was 5-fold higher in commercial tours compared to individually organized tours. According to the preliminary data of the ADEMEX-Expedition ([www.ademed.de](http://www.ademed.de)) [7], nothing has changed up to now.

In the advisory setting, the fundamental question is: 'will the pre-existing medical condition aggravate during the high altitude stay or can it compromise the safety of the patient respectively his partner?' [2,26]. For example, a hypoglycemic episode in a patient with type 1 diabetes endangers both the patient and his climbing partner. From an ethical point of view, it is necessary to inform the climbing partner about relevant diseases. Returning to our diabetic patient, in case of well-trained handling of the disease, even multi-pitch alpine climbing tours should be possible [27]. The UIAA recommendation 'Drugs at altitude': gives a good overview of temperature stability of many frequently used drugs [28].

## Conclusions and Consensus

In general, even for people with pre-existing medical conditions, high altitude sojourns should be possible, provided fundamental recommendations of acclimatization are followed [11]. The UIAA guidelines have been developed to assist physicians without high altitude expertise to give advice in uncomplicated cases. In complex cases or severe pre-existing medical conditions, advice of a physician with expertise in

high altitude (and travel) medicine should be sought to assess specific individual risks [8,26].

## Declaration of interest

The authors report no conflicts of interest.

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Accepted: November 10, 2014  
Published: November 14, 2014

Address for correspondence:  
Markus Tannheimer  
Department of Sport and Rehabilitation Medicine  
University of Ulm  
Leimgrubenweg 12-14  
89070 Ulm, Germany  
Markus.Tannheimer@arcor.de

Corrado Angelini: corrado.angelini@unipd.it  
Martin Faulhaber: martin.faulhaber@uibk.ac.at  
David Hillebrandt: dh@hillebrandt.org.uk  
Zbigniew Szygula: wfzygul@cyf-kr.edu.pl  
Hans-Volkhart Ulmer: ulmer@uni-mainz.de  
Anton Usaj: anton.usaj@fsp.uni-lj.si  
Rianne van der Spek: riannevdspek@gmail.com  
Thomas Küpper: tkuepper@ukaachen.de