ABSTRACT

The purpose of this thesis was to investigate the ergogenic potential of inhaled $\beta_2$-agonists (IBAs) in athletes with and without exercise-induced bronchoconstriction (EIB) from multiple angles: by assessing the effect of 400 $\mu$g of salbutamol, a commonly used IBA, in female athletes; and by analyzing athletic performance after the inhalation of the maximal daily dose of salbutamol, i.e. 1600 $\mu$g, by taking dose per kg of body mass into consideration. Furthermore, four methods of calculating the fall index (FI) in the eucapnic voluntary hyperpnea (EVH) challenge were evaluated.

Female (Chapter 2) and male cyclists (Chapter 3) were screened for EIB using the EVH challenge. On two subsequent visits, athletes performed one 10-km time trial per visit. In a randomized order, athletes inhaled either salbutamol or placebo before completing the time trials. Athletic performance was assessed using mean power output. In Chapter 4, the FIs of the EVH challenges from Chapters 2 and 3 were calculated using four previously published methods and compared to the pulmonary response to the placebo time trial. Additionally, the intensity of the EVH target ventilation, calculated as 30 x forced expiratory volume in 1 second (FEV$_1$), was evaluated by comparing it to the highest generated ventilations in a graded maximal exercise test (GXT).

Despite significant increases in FEV$_1$ after IBA use, athletic performance was not improved in female or male athletes, regardless of EVH status. In women, power output was decreased, despite a significant increase in oxygen consumption, suggestive of an increased stimulation of women's adrenergic $\beta_2$-system. Similarly, in male athletes, significant increases in heart rate, ventilation, and perceived leg discomfort could indicate an upregulation of the adrenergic nervous system, independent of the relative IBA dose. Lastly, there were significant differences between the four FI calculation methods, influencing the EVH interpretations. Normalizing FIs by the ventilations achieved during voluntary hyperpnea was not supported in athletes with high percent predicted values for FEV$_1$ due to an increased risk of false-positives. The intensity of the EVH target ventilation ranged between 67% - 135% when normalized to the GXT ventilations.

BIOGRAPHICAL NOTES

Academic Studies: Diplom, University of Potsdam, 2009  
M.Sc. University of British Columbia, 2011

GRADUATE STUDIES

Field of Study: Physiology of exercise-induced bronchoconstriction in humans

Courses:  
KIN 500B The Saltin International Graduate Course in Clinical & Exercise Physiology  
EPSE 592 Experimental Designs and Analysis in Educational Research

Instructors:  
Dr. Robert Boushel  
Dr. Eric Chan

AWARDS

Faculty of Education Graduate Award  
David Bates Scholarship  
AllerGen Research Skills Acquisition Award  
Four Year Fellowships (4YF) Tuition Award  
International Tuition Award

PUBLICATIONS


**SELECTED PRESENTATIONS**

**Koch, S**, Tran, R, Lee AD, Carlsten, C, Koehle MS. (2016): Thirty minutes of sub-maximal cycling improves cognitive function despite diesel exhaust exposure. Abstract accepted to be presented at the Annual Meeting of the American College of Sport Medicine (ACSM) in June, 2016, Boston, Massachusetts, USA.


