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Acute effects of single vs. combinatory inhaled β2-agonists Salbutamol and Formoterol on Time Trial performance, lung function, metabolic and endocrine parameters

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INTRODUCTION:
High prevalence rates of β2-agonists amongst athletes makes it tempting to speculate that illegitimate use of β2-agonists might boost performance in competitive sports. However, data regarding the underlying molecular basis of potential performance-enhancing effects of β2-agonists are scarce.
METHODS:
To investigate single vs. combinatory doses of nonprohibited, effects of the short-acting β2-agonists salbutamol (SAL) and long-acting formoterol (FOR), 24 competitive endurance athletes (12f/12m) participated in a double-blinded balanced 4-way block cross-over trial to evaluate the performance-enhancing potential of SAL and FOR compared to placebo (PLA). Measurements included skeletal muscle gene and protein expression of nuclear NR4A receptors, endocrine regulation, urinary and serum β2-agonist concentrations, cardiac markers, cardiopulmonary and lung function as well as the 10-min time trial performance (TT) on a bicycle ergometer as main outcome variables. Blood and urine samples were collected Pre-, Post-, 3h Post-, and 24h Post TT.
RESULTS:
Mean power output during TT was not different between the respective study arms. Treatment effects regarding lung function, echocardiographic and metabolic parameters were observable without any influence on performance as well as higher total serum β2-agonist concentrations in female athletes for SAL and FOR. Muscle and microarray analysis did not show any treatment effect on NR4A protein and NR4A1/NR4A3 gene expression, whereas a whole group treatment effect was observable for NR4A2 and further target genes with strongest effect by SAL+FOR. Noradrenaline, adrenaline, and transforming growth factor-β concentrations in blood were not affected by treatment or sex, whereas insulin-like growth factor, follicle-stimulating hormone, luteinizing hormone, and insulin concentrations showed a treatment effect at different time points.
CONCLUSION:
There is no performance-enhancing effect in this study design with the used doses of β2-agonists either alone (SAL or FOR) or in combination (SAL+FOR) compared to PLA.
An acute effect on the lung and cardiac function as well as endocrine and metabolic parameters was observable without clinically relevant side effects and with presumably no impact on exercise performance capacity in healthy subjects, but the impact of chronic applications of β2-agonists to healthy individuals and sex-specific thresholds have still to be determined.

Topic: **Physiology**

Presentation **Poster**