

PROJECT REVIEW

“Single vs. combinatory effects of non-prohibited Beta-2 agonists at threshold doses on skeletal muscle metabolism and endurance performance

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Beta-2 agonists are routinely prescribed in sports practice to alleviate asthma-like symptoms and airway hyper-responsiveness (AHR) due to their powerful bronchodilatory effects. As beta-2 agonist users among Olympic athletes have been shown to win a disproportionately high number of medals, there is an ongoing debate about putative ergogenic effects.

While the aerobic performance enhancing effects have received much attention, the effects on skeletal muscle hypertrophy, metabolism or regeneration capacity have been neglected. Currently, inhaled forms of common beta-2 agonists in therapeutic doses are considered to have no performance enhancing effects and are permitted for use by WADA. While older generation beta-2 agonists, such as clenbuterol, have the proven ability to increase skeletal muscle mass and decrease body fat, the lack of reliable data for new generation beta-2 agonists prevents a general risk assessment for doping abuse. Likewise, no data are available regarding additive effects (cocktail formulations) induced by the combined application of different beta-2 agonist in low doses (micro-dosing).

In this project, the main objective is to investigate dose-dependent *additive/synergistic effects* of short- and long-acting beta-2 agonists in terms of skeletal muscle metabolism/hypertrophy, endocrine regulation, cardiopulmonary function and endurance performance. In this human pharmacological study, single vs. combinatory threshold doses of non-prohibited, short-acting (salbutamol) and long-acting (formoterol) beta-2 agonists will be administered by inhalation and potential additive effects will be investigated by measuring skeletal muscle metabolic and hypertrophic signaling, endurance performance (cycling time trial) and cardiopulmonary function (cardiac output and VO₂max).