

PROJECT REVIEW

“Ergogenic effects of high doses beta2-agonist on aerobic capacity, muscular power and recovery in health trained men”

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The higher prevalence of asthma and shortness of breath during exercise among elite athletes has resulted in increased use of antiasthmatic medication among elite athletes. Studies of therapeutic doses of beta-agonists have in general not shown effect on the cardio-respiratory capacity. But these doses are probably not the case in prohibited use of medication among athletes. The last international doping cases have shown significantly high intake of beta2-agonist, indicating either above therapeutic level of inhaled use, or systemic use of ordinary used anti-asthma medication. If intake of high doses of beta-agonist leave the aerobic capacity, muscular power or recovery unchanged, ordinary used beta-agonist probably should be removed entirely from the prohibited list. Before this substantial change of the WADA code, more research is needed.

The cardiovascular effect of high doses of beta-agonists, with better overall performance, oxygen uptake and oxygen kinetics, has never been thoroughly studied, which is of importance as doping doses seldom are within therapeutic level.

Purpose: To examine whether high doses of salbutamol and Terbutaline is a class effect of beta2-agonists, different from therapeutic doses.

Animal models have shown that salbutamol, in higher doses than normal therapeutic asthma doses, increased the contraction of skeletal muscles and keep a persistent effort. Furthermore, another animal model has recently shown increased force and recovery of the skeletal muscles after Salbutamol. Based on the knowledge of therapeutic doses beta2-agonists seems to be unimportant, but illegal use of beta2-agonist probably would be in higher doses which could be of substantial importance.

Purpose: To examine whether Salbutamol and Terbutaline in a human in vivo model similar to the Rat model can show the same positive effect on peripheral leg muscles given as a single high dose prior to exercise and continuously over 2 weeks.

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Result and Conclusion

Our purpose was to investigate effects of high dose beta2-agonists on aerobic and anaerobic exercise performance along with muscular effects on contractile force, metabolism, and ion handling in healthy trained men. To investigate these purposes, we conducted seven experiments.

First four experiments investigated the effects of high dose inhaled terbutaline (15-20 mg) on exercise performance and sprinting peak and mean power, as well as on muscle metabolism, contractile properties, and ion handling. Our data showed that terbutaline increased contractile force and enhanced sprinting peak and mean power, but had no effect on time-trial performance or on endurance performance. In skeletal muscles, terbutaline improved Ca²⁺ handling and counteracted exercise-induced reductions in Na⁺/K⁺-ATPase V_{max}. Furthermore, terbutaline elevated rate of glycolysis. Thus, performance-enhancing effects of high dose terbutaline may be attributed to effects on skeletal muscles through enhanced Ca²⁺ handling and elevated glycolytic activity.

In the latter three experiments, we investigated the effects of acute and short-term administration of oral salbutamol (8 mg) and terbutaline (20-30 mg) on exercise performance, muscle contractile properties, and sprinting peak and mean power. Our data showed an acute enhancing effect of terbutaline on contractile properties of m. quadriceps. Four-week administration of oral terbutaline (2·10-15 mg/d) elicited muscle hypertrophy, reduced fat mass and increased contractile force. Acute and two-week administration of oral salbutamol enhanced sprinting peak power, but had no effect on endurance performance.

In conclusion, our data supports the restriction of high dose inhaled terbutaline and oral beta2-agonists in competitive sports *in and out* of competition.