

## ***“The Long-Term Ergogenic Effect of Long Acting Beta-2-Agonists”***

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### **Project Overview**

This research project will contribute to the understanding of inhaling high therapeutic doses of asthma medication (long acting Beta-2-agonists) over a sustained period of time on athletic performance. The majority of research undertaken with inhaled Beta-2-agonists involves acute doses of short acting Beta-2-agonists in male athletes. Investigating acute doses of Beta-2-agonists does not necessarily replicate real life situations, where athletes prescribed Beta-2-agonists will use them on a daily basis for a prolonged period of the time.

The potential performance enhancement from inhaled Beta-2-agonists focuses on increases in skeletal muscle protein, leading to increased muscle mass. Increased muscle mass is associated with increased muscle force production. In addition the long term use of Beta-2-agonists may also decrease body fat. No study has investigated the potential for these performance gains to occur when athletes inhale long acting Beta-2-agonists over a prolonged period of time.

There is limited ecologically valid data available that demonstrates whether long acting Beta-2-agonists, taken over a prolonged period of time is performance enhancing. Further to this there is no data available that details the movement of Beta-2-agonists through the body following long-term use of high therapeutic doses of inhaled long-acting Beta-2-agonists.

This research project will investigate the impact of inhaling the long acting Beta-2-agonists Salmeterol or Formoterol twice daily over a 12 week period on sprint performance, strength, power, recovery and body composition in male and female athletes. In addition the movement of the inhaled long acting Beta-2-agonists through the body will be analysed at 6 weeks and 12 weeks. The results of this study will provide data to inform the use of inhaled Beta-2-agonists by elite athletes. In particular they will provide data to assist in the implementation of regulations on the use of inhaled Salmeterol and Formoterol and assist in the resolution of contested doping violations.

### **Results and Conclusions:**

The purpose of this study was to contribute to the understanding of inhaling high therapeutic doses of long acting  $\beta_2$ -agonists over a

sustained period of time on athletic performance. In particular this study investigated the impact of inhaling Salmeterol or Formoterol twice daily over a ten week period on strength, power, recovery and body composition in male and female athletes.

To carry out the investigation into the potential ergogenic effect of long term use of long acting  $\beta_2$ -agonists we recruited 38 participants (23 male and 15 female) who had no history of asthma. All participants underwent a eucapnic voluntary hyperpnoea challenge to confirm absence of asthma. Participants completed baseline assessments which included measuring strength and power performance as well as assessing body composition. Participants were randomly assigned to one of three groups: placebo inhaler, salmeterol inhaler (100  $\mu\text{g}$  twice daily) or formoterol inhaler (12  $\mu\text{g}$  twice daily). The participants undertook a 10 week training protocol with a repeat of the baseline assessments taking place at five and ten weeks. Over the course of the training periods participants took their assigned inhaled dose of  $\beta_2$ -agonists twice daily. During the training weeks participants attended three training sessions a week that focused specifically on developing strength, power and sprint performance. Assessments of recovery and mood were recorded via questionnaires during the training period.

All 38 participants completed all data collection between weeks 0 and 5, however only the male participants completed all 10 weeks. Between week zero and week five 30 m sprint time improved in both the formoterol ( $-0.29 \pm 0.11$  s;  $P < 0.049$ ) and salmeterol ( $-0.35 \pm 0.05$  s;  $P < 0.04$ ) groups when compared to the placebo group ( $+0.01 \pm 0.11$  s). However, there were no changes in other strength and power measurements, recovery, mood or sum of 4 skin folds between groups over the course of the 5 weeks between groups. Between weeks 5 and 10 decreases in sprint time in salmeterol and formoterol groups were similar to placebo group in the male participants.

Our results suggest that large daily doses of salmeterol and formoterol may lead to improvements in sprint performance over a 5 week period. However the improvements in sprint performance are not sustained over a longer period of time. Future work investigating the mechanisms will provide an understanding how daily use of long acting  $\beta_2$ -agonists may influence sprint performance over a sustained period of time.