

“Effects of snus administration on sport performance”

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Project Overview

Stimulants are banned in competition by the World Anti-Doping Agency, except for nicotine. Psychoactive substance as nicotine is widely reported to increase alertness, improve coordination and enhance cognitive performance. In healthy humans nicotine administration increases heart rate and blood pressure. Plasma nicotine concentrations improve anaerobic energy production and suggest a nicotine-induced sympathetic stimulation of the heart. Nicotine has been placed on WADA's 2013 Monitoring Program in order to detect potential patterns of abuse. Smokeless tobacco is a blanket term that refers to a number of tobacco products that are used by means other than smoking. Snus is a smokeless tobacco consumed orally, which has a long tradition of use that, is widespread in North America and Scandinavian countries. It is typically placed between the upper lip and the gum, toward the front of the mouth, for approximately 30min before it is discarded. Recently, some studies on snus in competitive events showed a high use among athletes mostly in a winter sporting environment. The aim of this study is to investigate the snus effects on sport performance. In the first year we will investigate the effects of snus in an aerobic performance by an exercise intensity nearly 80% VO₂max until exhaustion correlated with the perception of effort and time to exhaustion along with a range of physiological parameters. In the second and third year the aim is to investigate the effect of snus on high-intensity exercise by on a, short-term high-intensity cycling test, (Wingate) using trained athletes. If results will show a snus effect of increasing time to exhaustion, reduced perception of effort and increase anaerobic performance, an informed decision on the potential doping of nicotine will be done. WADA could consider to include nicotine in Prohibited List of Substances and Methods, prohibited in-competition.

Results and Conclusions:

Snus is a smokeless, orally consumed tobacco, traditionally produced and used in Sweden and in Scandinavian countries. Analytical chemistry studies showed an increase of nicotine use in athletes practicing different sports. Nicotine has also several physiological effects on heart and on the vascular system. This effect influence sport performances and exercise capacity.

The purpose of this study was to investigate the snus effects on aerobic performance (80% VO₂max) during exercise until exhaustion and the perception of fatigue during abstinence (AC) and satiety condition (SC). We recruited 18 healthy male athletes daily snus users. The study was a double-blind cross-over design. Subjects were tested during three sessions on cycle-

ergometer. Experimental session 1 (EXP1) consisted in maximal incremental exercise test (MIT) to determine the VO₂max. EXP2 and EXP3 consisted in exercise, after 25 min from snus administration, at 80% VO₂max until exhaustion (TTE) under AC and SC conditions. During the tests, muscle and cerebral oxygenation was recorded by means of NIRS (near-infrared spectroscopy) and the global rating of perceived exertion (RPE). We measured, non-invasively the dynamic response of tissue O₂ saturation (Ox%) on tight muscle by a vascular occlusion test (VOT).

Nicotine and cotinine analysis confirmed the different initial conditions (AC vs. SC). We found a significant increase (+13.1%) in TTE (24.1 ± 10.7 min; means \pm SD during AC session; 20.9 ± 8.0 min during SC session; means \pm SD, $P = 0.0131$). RPE values did not significantly change during exercise. We found significant differences in the oxygenation of the cerebral and muscular tissues at rest (T₀) and over VOT. Interestingly, our data showed significant differences in metabolic responses (VO₂; VCO₂; HR; VO₂/HR) and in cardiovascular responses (SV; EJT) at baseline (T₀). Our sample of athletes consumed 8.1 ± 4.0 (means \pm SD) daily snus portions with a value of 5.9 ± 1.9 (means \pm SD) of the Fagerstrom Test for Nicotine Dependence-Smokeless Tobacco (FTNDST).

The results of this project research showed that the increase of performance (+13.1% TTE) due to snus administration could be associated to the nicotine effects in order to keep the allostatic state. In conclusion, our study highlighted that athletes addicted to nicotine would use snus to maintain their nicotine level to "feel normal" in order to improve sport performance.