

PROJECT REVIEW

“Decreased pulmonary artery pressure by oral sildenafil ingestion at mild altitude and during exercise in air pollution increases exercise performance”

K.W. Rundell, W. Dempsey, K. Uhranowsky (Marywood University, Scranton, Pennsylvania, USA), **W. Rowland** (Tufts University School of Medicine, Massachusetts, USA)

Sildenafil (phosphodiesterase-5 inhibitor) is recognized as treatment for pulmonary hypertension and erectile dysfunction. Ingestion at therapeutic dose shows profound improvement in pulmonary artery pressure, cardiac output, VO_2peak , and exercise capacity at hypoxic conditions; at sea level breathing 10% O_2 and at Mount Everest base camp (>5,000 m) in subjects free of lung disease. Olympic Nordic venues are often at mild altitude; the Salt Lake Olympic Nordic venue is approximately 1,700 m and the Turin venue is at 1,540 m altitude. Although the Vancouver Nordic venue is at 860 m altitude, significant reductions in VO_2peak (-5.9%) and maximal 5-min cycle ergometry performance (total kJ, -3.6%) has been documented at simulated 580 m altitude. Therefore, further studies are needed to characterize potential ergogenic effects of sildenafil at mild altitude.

Likewise, short-term inhalation of concentrated ambient air particles (PM) promotes vasoconstriction of small pulmonary arteries and produces pathologic features consistent with pulmonary hypertension. We recently found that breathing high levels of combustion-derived PM during exercise caused a significant (~5%) decrease in 6 min cycle ergometry work output. Since the pulmonary vasculature is a target for effects of ambient PM from fossil fuel combustion, oral sildenafil may enhance performance at ice rink venues (resurfaced with fossil-fueled machines) and at the upcoming Beijing and London Olympics venues which are likely to have high levels of PM.

The aims of this project are to determine if a therapeutic dose of sildenafil enhances exercise performance and aerobic capacity 1) in high PM pollution and 2) at mild simulated altitude consistent with Olympic venue altitudes, 3) elucidate a potential mechanism, and 4) confirm measurement of sildenafil and metabolites in plasma and urine. These studies will provide evidence detailing performance enhancement from prior-to-competition ingestion of oral sildenafil at 1) high air pollution venues and at 2) mild altitude.

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