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Abstract 147: Modeled Deposition of Inhaled Particulate Matter in Athletes at Exertion

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INTRODUCTION: Mechanisms and effects of inhaled environmental particulate matter on athletic performance is not well understood. To formulate a framework on which future studies may be developed relating regional airway deposition to subsequent performance effects in athletes at exertion, modeling is indicated.

METHODS: Multiple-Path Particle Dosimetry computer modeling was utilized to predict regional deposition of particles in 26 male athletes at increasing levels of exertion. Deposition doses of inhaled spherical, monodisperse particles of unit density measuring 0.05, 0.1, 1.0, 2.5, and 10.0 μm in diameter were calculated. Repeated Measures ANOVA testing was used to test for differences in regional airway deposition (naso-oro-pharyngo-larangeal, tracheobronchial, pulmonary, and total airway) at exertion.

RESULTS: Analysis revealed a statistically significant effect of increasing exertion ($p<0.01$) on deposition of all particle sizes in all airway regions. Trends indicate possible phenomena that may impact athletic performance. While overall total airway deposition dose of all particle diameters increases as expected with increasing exertion, pulmonary regional deposition dose at exertion tapers off and decreases in the case of larger particles (2.5 and 10.0 μm).

CONCLUSIONS: To assess the impact of inhaled particulate matter on athletic performance, understanding of regional deposition and subsequent physiologic impacts is critical. This study indicates that while overall total airway deposited doses increase with increasing exertion, deposited doses in the pulmonary region (deep lung) may be reduced at higher levels of exertion, depending on particle diameter. Future studies should focus on elucidating mechanisms of acute and chronic performance effects based on regional deposition and subsequent response to inhaled particles.

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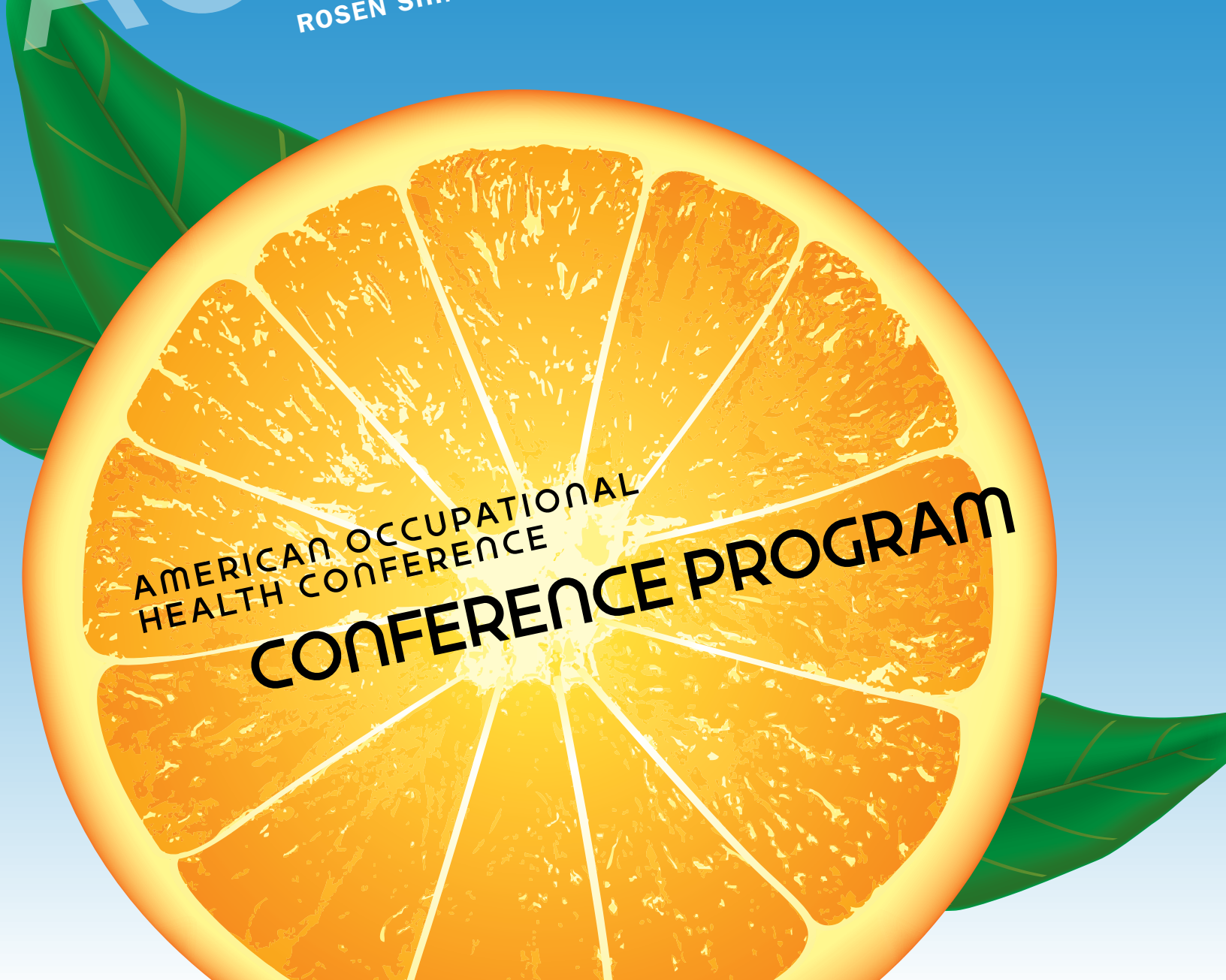

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