612.15 Cardiac Autonomic Effects of Acute Exposures to Airborne Particulates in Men and Women

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ABSTRACT: The aim of this research was to investigate cardiac autonomic changes associated with acute exposures to airborne particulates. Methods: High-Fidelity 12-lead ECG (CardioSoft, Houston, TX) was acquired from 19 (10 male / 9 female) non-smoking volunteers (age 33.6 +/- 6.6 yrs) during 10 minutes pre-exposure, exposure and post-exposure to environmental tobacco smoke (ETS), cooking oil fumes, wood smoke and sham (water vapor). To control exposure levels, noise, subject activity and temperature, all studies were conducted inside an environmental chamber. Results: The short-term fractal scaling exponent (Alpha 1) and the ratio of low frequency to high frequency Heart Rate Variability (HRV) powers (LF/HF, a purported sympathetic index) were both higher in males (p<0.017 and p<0.05, respectively) whereas approximate entropy (ApEn) and HF/(LF+HF) (a purported parasympathetic index) were both lower in males (p<0.036, and p<0.044, respectively). Compared to pre-exposure (p<0.002) and sham exposure (p<0.047), male heart rates were elevated during early ETS post-exposure. Our data suggest that, in addition to toxic HIV, gender differences in cardiac responses to some acute airborne particulates are gender related. Supported by Philip Morris USA.

BACKGROUND: Exposure to environmental tobacco smoke has been found to result in potentially harmful changes in autonomic balance (heart rate variability, HRV) controlling heart rates of nonsmoking volunteers (age 33.6 +/- 6.6 yrs) for two hours in airport smoking rooms (Pope, 2001).

METHODS: Subjects: 19 (10 male / 9 female) non-smoking volunteers (age 33.6 +/- 6.6 yrs) were exposed to 5 stages of ETS (exposure stage) and 4 species of ETS (species). Post hoc testing consisted of least significant difference comparisons between desired states. p<0.05 was considered to be significant.

METHODS OF PRODUCING AEROSOL PARTICULATE STIMULI: Two gavel boxes (One for ETS and Wood) and One for Oil and Sham/Water Vapor

CONCLUSION: Our data suggest that, in addition to toxic HIV, gender differences in cardiac responses to some acute airborne particulates are gender related.

FUTURE PERSPECTIVE: The first author is awaiting notification from the American Heart Association (AHA) in regards to a Pre-Doctoral Fellowship proposal to conduct several new and/or emerging advanced ECG analysis techniques from collaborative efforts with NASA. The techniques include: 1) parameters derived via Signal Averaged ECG (SAECG), including high frequency QRS (HF-QRS) ECG, the ventricular gradient, and the variability of the ventricular gradient; 2) several parameters of beat-to-beat QT interval variability (QTV); and 3) several parameters of T-wave morphology (TWM) derived from singular value decomposition (SVD).

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ENVIRONMENTAL CHAMBER CONDITIONS: Particulate concentration, CO, CO2 and Temperature

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