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, Morris USA) was collected 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). Control exposure levels, noise, subject activity and temperature were measured 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). Conclusions: Our data suggest that, in addition to tonic HRV gender differences, 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). We are conducting heart rate variability of non-smoking volunteers to some acute airborne particulates.

METHODS: Subjects: 19 (10 male / 9 female) non-smoking volunteers (age 33.6 +/- 6.6 yrs) Protocol: Seated subjects for 10 minutes pre-exposure, exposure and post-exposure conducted inside an environmental chamber in order to control exposure levels, noise, subject activity and temperature. Stimuli: Environmental tobacco smoke (ETS), cooking oil fumes, wood smoke and sham (water vapor). Measurements: High-fidelity 12-lead ECG (CardioSoft, Morris USA). HRV was calculated using HRF-200 beats (adding window correction).

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

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

FUTURE PERSPECTIVE: The first authors are awaiting notification from the American Heart Association (AHA) in regards to the Pediatric Research grant proposal to conduct several new and/or emerging advanced ECG analysis techniques from collaborative efforts with NASA. The techniques include; 1) parameters obtained via signal averaged ECG (SAECG), including high frequency (HF) ECG, the ventricular gradient, and the variability of the ventricular gradient; 2) several parameters of the QT interval variability (CVT); and 3) several parameters of T wave morphology (TMW) derived from singular value decomposition (SVD).

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