

BETA BLOCKERS MODIFY THE EFFECT OF ULTRAFINE PARTICLES ON VAGAL TONE IN SUBJECTS WITH ISCHEMIC HEART DISEASE – RESULTS FROM THE PMCARE STUDY

Serena Fossati, *Department of Environmental Health, Harvard School of Public Health, Boston, USA and Department of Occupational and Environmental Health, Luigi Sacco Hospital Unit, University of Milan, Milan, Italy*

Joel Schwartz, *Departments of Environmental Health and Epidemiology, Harvard School of Public Health, Boston, USA*

Patrizia Urso, *Department of Occupational and Environmental Health, Luigi Sacco Hospital Unit, University of Milan, Milan, Italy*

Andrea Cattaneo, *Department of Occupational and Environmental Health, University of Milan, Milan, Italy*

Giovanni De Vito, *Department of Clinical Medicine and Prevention, University of Milan-Bicocca, Milan, Italy*

Alessandro Pini, *Department of Cardiology, Luigi Sacco Hospital, Milan, Italy*

Antonella Zanobetti, *Department of Environmental Health, Harvard School of Public Health, Boston, USA*

Domenico Cavallo, *Department of Chemical and Environmental Sciences, University of Insubria, Como, Italy*

Paolo Carrer, *Department of Occupational and Environmental Health, Luigi Sacco Hospital Unit, University of Milan, Milan, Italy*

Background and Aims: Particulate matter exposure has been associated with increased cardiovascular morbidity and mortality, and several studies showed that exposure to fine particles may influence vagal regulation of heart rhythm. We studied the effect of exposure to ultrafine particles (UFP) on heart rate variability (HRV) in subjects with ischemic heart disease.

Methods: Personal exposure to UFP (number concentration) was continuously monitored during 24-hr, in the warm and in the cold season, in 37 non-smokers individuals with ischemic heart disease. Simultaneously, a 24-hr ambulatory ECG was recorded to measure the standard deviation of normal-to-normal intervals (SDNN), a marker of overall HRV, and two HRV markers of vagal modulation, i.e. the percentage of intervals that vary more than 50 ms from the previous interval (pNN50) and the power in high frequency (HF). The associations between UFP exposure (lag0 and 1-hr to 4-hr moving averages, MA) and HRV indices were assessed with mixed effects models.

Results: A negative association was observed between UFP exposure and all investigated HRV indices only in subjects not taking beta-blockers. This effect was greater on pNN50, with a -6.2% decrease (95% confidence interval (CI) -8.6 to -3.7) and on SDNN with a -3.1% decrease (95%CI -4.9 to -1.2) for an interquartile increase in 1-hr average UFP ($13.59 \times 10^3 \text{ \#/cm}^3$). The interaction with beta-blockers was significant for pNN50 ($p < 0.001$) and SDNN ($p < 0.002$), and marginally significant ($p = 0.052$) for HF.

Conclusions: Our results suggest an acute effect of UFP on vagal tone modified by beta-blockers use, and confirm previous findings for fine particles (de Hartog et al 2009).

References:

de Hartog JJ et al. Associations between PM_{2.5} and heart rate variability are modified by particle composition and beta-blocker use in patients with coronary heart disease. *Environ Health Perspect.* 2009;117(1):105-11.