

TRAFFIC-RELATED AIR POLLUTION AND HEART RATE VARIABILITY IN A PANEL OF HEALTHY ADULTS

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Background and Aims: Epidemiological studies have linked particulate matter (PM) and carbon monoxide (CO) exposures with alterations in cardiac autonomic function as measured by heart rate variability (HRV) in populations. Recently we reported association of several HRV indices with marked changes in particulate air pollution around the Beijing 2008 Olympic Games in a panel of healthy taxi drivers (Wu et al., 2010). We further investigated the cardiac effects of traffic-related air pollutants over wide exposure ranges with expanded data set in this panel of healthy adults.

Methods: We obtained real-time data on nine taxi drivers' in-car exposures to particulate matter ≤ 2.5 μm in aerodynamic diameter ($\text{PM}_{2.5}$) and CO, and on multiple HRV indices during a separate daily work shift in four study periods with dramatically-changing air pollution levels around the Beijing 2008 Olympic Games. Mixed-effects models and a loess smoother method were used to investigate the associations of exposures with HRV indices.

Results: Results showed overall negative associations of traffic-related air pollutants with HRV indices across periods, as well as differences in period-specific and individual associations. After stratifying the individuals into two different response groups (positive group/negative group), cardiac effects of air pollutants became stronger within each group. For example, a 7.5% (95% CI, 2.8%, 12.5%) increase and a 3.6% (95% CI, -5.4%, -1.8%) decline in standard deviations of normal-to-normal (SDNN) intervals per interquartile range (IQR: 75.1 $\mu\text{g}/\text{m}^3$) increase at 30-min $\text{PM}_{2.5}$ moving average were found for the positive group and negative group, respectively. Exposure-response modeling identified changed curvilinear relationships between air pollution exposures and HRV indices with threshold effects.

Conclusions: Our results support the association of exposure to traffic-related air pollution with altered cardiac autonomic function in healthy adults free of cardiovascular compromises. These results suggest a complicated mechanism that traffic-related air pollutants influence the cardiovascular system of healthy adults.

References:

Wu S, Deng F, Niu J, Huang Q, Liu Y, and Guo X. Association of Heart Rate Variability in Taxi Drivers with Marked Changes in Particulate Air Pollution in Beijing in 2008. *Environ Health Perspect* 2010;118:87-91.

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