

## ABSTRACT

**Background:** Epidemiological and toxicological studies support a causative link between ambient air pollution exposure and increased cardiovascular morbidity and mortality. While the adverse health effects of single pollutants are documented, little is known of the health effects of multi-pollutant mixtures.

**Objectives:** This study was designed to assess the cardiovascular effects of exposure to photochemically altered urban gaseous mixtures generated by a photochemical reaction chamber (“smog chamber”) as a surrogate of “real-world” multi-pollutant exposures.

**Methods:** Female C57BL/6 mice were exposed to: filtered air (FA), smog mixtures (smog) or ozone (O<sub>3</sub>) for 4 hours in a chamber. Eight hours after exposure, cardiac responses were assessed using a Langendorff cardiac perfusion preparation. Cardiac function was measured by index of left ventricular developed pressure (LVDP) and contractility. Lung function and inflammation were measured by methacholine challenge and bronchoalveolar lavage.

**Results:** Exposure to smog lowered LVDP ( $69.2 \pm 16.0$  cm H<sub>2</sub>O vs.  $146.4 \pm 14.8$  cm H<sub>2</sub>O in the FA-group;  $p < 0.05$ ) and decreased left ventricular contractility significantly by lowering the maximum dP/dt ( $2764 \pm 558.8$  cmH<sub>2</sub>O/s vs.  $5405 \pm 400.2$  cmH<sub>2</sub>O/s in the FA group;  $p < 0.05$ ) and the minimum dP/dt ( $-1822 \pm 335.5$  cmH<sub>2</sub>O/s vs.  $-3675 \pm 242.0$  cmH<sub>2</sub>O/s for FA;  $p < 0.05$ ). Time to ischemic contracture was prolonged significantly in the smog-group ( $17.3 \pm 0.5$  min vs.  $13.2 \pm 1.4$  min in the FA group;  $p < 0.05$ ). In contrast, smog had little effect on lung inflammation.

**Conclusions:** This study demonstrated that acute smog inhalation decreases LVDP and cardiac contractility in non-ischemic murine hearts, suggesting that photo-chemically altered urban air pollution depresses cardiac function.