Abstract

BACKGROUND: Studies provide compelling evidences for particulate matter (PM) associated cardiovascular health effects. Elderly individuals, particularly those with preexisting conditions like hypertension are regarded to be vulnerable. Experimental data are warranted to reveal the molecular pathomechanism of PM related cardiovascular impairments among aged/predisposed individuals. Thus we investigated the cardiovascular effects of **ultrafine carbon** particles (UfCP) on aged (12-13 months) spontaneously hypertensive rats (SHRs) and compared the findings with our pervious study on adult SHRs (6-7 months) to identify age related predisposition events in cardiovascular compromised elderly individuals.

METHODS: Aged SHRs were inhalation exposed to UfCP for 24 h (~180 μg/m(3)) followed by radio-telemetric assessment for blood pressure (BP) and heart rate (HR). Bronchoalveolar lavage (BAL) fluid cell differentials, interleukin 6 (IL-6) and other proinflammatory cytokines; serum C-reactive protein (CRP) and haptoglobin (HPT); and plasma fibrinogen were measured. Transcript levels of hemeoxygenase 1 (HO-1), endothelin 1 (ET1), endothelin receptors A, B (ETA, ETB), tissue factor (TF), and plasminogen activator inhibitor-1 (PAI-1) were measured in the lung and heart to assess oxidative stress, endothelial dysfunction and coagulation cascade.

RESULT: UfCP exposed aged SHRs exhibited increased BP (4.4%) and HR (6.3%) on 1(st) recovery day paralleled by a 58% increase of neutrophils and 25% increase of IL-6 in the BAL fluid. Simultaneously higher CRP, HPT and fibrinogen levels in exposed SHRs indicate systemic inflammation. HO-1, ET1, ET-A, ET-B, TF and PAI-1 were induced by 1.5-2.0 folds in lungs of aged SHRs on 1(st) recovery day. However, in UfCP exposed adult SHRs these markers were up-regulated (2.5-6 fold) on 3(rd) recovery day in lung without detectable pulmonary/systemic inflammation.

CONCLUSIONS: The UfCP induced pulmonary and systemic inflammation in aged SHRs is associated with oxidative stress, endothelial dysfunction and disturbed coagulatory hemostasis. UfCP exposure increased BP and HR in aged SHRs rats which was associated with lung inflammation, and increased expression of inflammatory, vasoconstriction and coagulation markers as well as systemic changes in biomarkers of thrombosis in aged SHRs. Our study