

Air Pollution Induces Oxidative Stress

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Free radical is referred to an atom with a single unpaired electron. Within a biological system free radicals can react indiscriminately with neighboring molecule causing extensive cellular damage which is termed as oxidative stress. Oxidative stress can arise for many reasons including consumption of alcohol, medications, trauma, cold, air pollutants, toxins and radiation. Air pollutants induced oxidative stress adversely affects health particularly the pulmonary system.

Ambient air contains a range of pollutants such as nitrogen oxide, ozone and particulate materials. Out of them ozone derived from photochemical smog have the ability to drive free radical reactions which gives rise to oxidative stress within the lung. This process initiates responses that are particularly dangerous to susceptible population. Influx of inflammatory cells to the lung is one important response. Activated inflammatory cells also generate and release large quantities of free radicals which attack local tissue components and cause cell injury. Free radical derived ozonation product breathing results in a range of respiratory symptoms of the healthy population. Effects include decreased lung function, increased air way hyperactivity and pulmonary inflammation.

Nitrogen dioxide, nitrogen centered free radical reacts with substrate present in lung lining fluid. Particles less than 10 μm adversely affect health. Out of them, soluble transitional metals also develop oxidative stress.

Exposure to air pollution in different climatic condition is an important determinant of pulmonary damage. Although each environmental pollutant has its own mechanism of toxicity, most pollutants like ozone, nitrogen oxide, particulate and transition metals are oxidants or capable of reactive oxygen species production which trigger biological process like inflammation and cell death.

Short and long-term exposure to air pollution has consistently been linked to adverse health outcome such as acute respiratory infection specially in children, cancers of respiratory systems and other cardiopulmonary disease leading to morbidity, mortality and disability. Awareness should be emphasized among the health workers and health system planners about the public health hazards of air pollutants induced oxidative stress and as well as the remedies to overcome the challenges.