

Obese Rats Are More Vulnerable To Inflammation, Genotoxicity And Oxidative stress Induced By Coal Dust Inhalation Than Non-Obese Rats

Moreira Fonseca, José Cláudio; Gelain, D. P; Borges, Malu Siqueira; Soares, Karina; Nordin, Adriane Perachi; Da Silva, Fernanda Rabaioli; Da Silva, Jeferson D; Rabelo, Thallita Kelly; Silva Oliveira, Luis Felipe; Bortolin, Rafael Calixto; Da Rosa Siva, Helen Tais; Da Boit Martinello, Katia; Chaves Rodrigues, Paloma; Gasparotto, Juciano.

Abstract

Obesity is an important nutritional disorder worldwide. Its association with environmental pollution may trigger an increase in oxidative stress and inflammatory parameters. Coal is a resource used throughout the world as an important fuel source for generating electricity. The ashes released by the coal combustion cause serious problems for human health due to their high toxicity and their capacity to bioaccumulate. The aim of this work was to investigate the effects of coal dust inhalation in the organs of obese and non-obese Wistar rats. Pro-inflammatory cytokines, oxidative stress, oxidative damage, histological analysis, comet assay, and micronuclei were investigated. Both obesity and coal dust inhalation increased the pro-inflammatory cytokines IL-1 β and TNF- α and decreased HSP70 levels in serum, however, in obese animals that inhaled coal dust these changes were more pronounced. Liver histological analysis showed severe microvesicular steatosis in obese animals that inhaled coal dust. Lung histologic investigation showed abnormalities in lung structure of animals exposed to coal dust and showed severe lung distensibility in obese animals exposed to coal dust. The comet assay showed DNA damage in animals subjected to coal. In addition, there were modulations in enzymatic activities and damage to protein and lipids. Based on our results, the coal dust inhalation can potentiate the pro-inflammatory profile present in obese rats. We also observed an increase in the protein oxidative damage in obese rats that inhaled coal dust. Taken together, our results suggest that the combination of obesity and coal inhalation increased the risks of the development of diseases related to oxidative stress and inflammation.

Keywords

Coal; Inflammation; Inhalation; Obesity; Oxidative Stress