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TITLE: EFFECTS OF AIRWAY EXPOSURE TO NANOPARTICLES ON LUNG INFLAMMATION INDUCED BY BACTERIAL ENDOTOXIN IN MICE

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ABSTRACT: Background: Although adverse health effects of particulate matter with a diameter of < 100 nm (nanoparticles) have been proposed, molecular and/or experimental evidence for their facilitation of lung inflammation in vivo is not fully defined.
Objective: In the present study we investigated the effects of nanoparticles on lung inflammation related to bacterial endotoxin [lipopolysaccharide (LPS) ] in mice. Results: We intratracheally administered vehicle, two sizes (14 nm, 56 nm) of carbon black nanoparticles (4 mg/kg) , LPS (2.5 mg/kg) , or LPS plus nanoparticles and evaluated parameters for lung inflammation and coagulation. Nanoparticles alone induced slight lung inflammation and significant pulmonary edema compared with vehicle. Fourteen-nanometer nanoparticles intensively aggravated LPS-elicited lung inflammation and pulmonary edema that was concomitant with the enhanced lung expression of interleukin-1â (IL-1â) , macrophage inflammatory protein-1 (MIP-1) , macrophage chemoattractant protein-1, MIP-2, and keratinocyte chemoattractant in overall trend, whereas 56-nm nanoparticles did not show apparent effects. Immunoreactivity for 8-hydroxyguanosine, a marker for oxidative stress, was more intense in the lungs from the LPS + 14-nm nanoparticle group than in those from the LPS group. Circulatory fibrinogen levels were higher in the LPS + plus 14-nm nanoparticle group than in the LPS group. Conclusions: Taken together, evidence indicates that nanoparticles can aggravate lung inflammation related to bacterial endotoxin, which is more prominent with smaller particles. The enhancement may be mediated, at least partly, via the increased local expression of proinflammatory cytokines and via the oxidative stress. Furthermore, nanoparticles can promote coagulatory disturbance accompanied by lung inflammation.