

Alteration in Lung Particle Translocation, Macrophage Function, and Microfilament Arrangement in Monocrotaline-Treated Rats

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Individuals with preexisting cardiopulmonary disease are thought to be more susceptible to acute episodes of particulate pollution resulting in increased morbidity and mortality. Our study was designed to evaluate particle fate and macrophage function in an animal model of monocrotaline (MCT)-induced pulmonary hypertension. Two weeks following a single MCT injection, Sprague–Dawley rats were exposed sequentially to two different colored fluorescent microspheres 1.0 μm in diameter by aerosolization. Morphometric evaluation of lung sections was performed 0 and 24 h following the final particle exposure to determine the intrapulmonary location of inhaled microspheres. A decrease in the number of particles phagocytized by alveolar macrophages and an increase of free particles overlying the epithelium were found in MCT-treated animals compared with control. Pulmonary macrophages recovered by bronchoalveolar lavage were evaluated for chemotactic and phagocytic ability. Macrophage chemotaxis was significantly impaired following MCT treatment compared with controls, whereas phagocytic activity of macrophages lavaged from MCT and control treatment groups was similar. Macrophages were stained for filamentous (F) and globular (G) actin using Texas-Red-labeled phalloidin and Oregon-green-labeled DNase I, respectively. The area of microfilament staining for F and G actin increased, but the ratio of F/G actin was significantly decreased in animals with MCT treatment compared with control. While the responses observed with MCT treatment, such as pulmonary edema, polymorphonuclear leukocytes influx, and unique macrophage morphology may contribute to impaired macrophage function, the change in microfilament arrangement suggests that MCT may inhibit macrophage chemotaxis and impair particle clearance from the lungs.