HEALTH RESEARCH ABSTRACT SUBMISSIONS #37

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College *	College of Public Health
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Title of Research *	Effects of Copper Nanoparticle Exposure on Host Defense in a Murine Pulmonary Infection Model
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Introduction & Purpose *

Human exposure to nanoparticles (NPs) and pathogenic bacteria can occur simultaneously. NPs induce inflammatory responses and oxidative stress but may also have immune-suppressive effects, impairing macrophage function and altering epithelial barrier functions. Copper (Cu) oxide NPs have been reported to be among the more toxic nanomaterials in mammals. Therefore, it is important to assess interactions with Cu-based NPs and host defense against microbial infections. The purpose of this study was to assess the potential pulmonary effects of inhalation and instillation exposure to Cu NPs using a model of lung inflammation and host defense.

Experimental Design *	We used Klebsiella pneumoniae (K.p.) in a murine lung infection model to determine if pulmonary bacterial clearance is enhanced or impaired by Cu NP exposure. Two different exposure modes were tested: sub-acute inhalation and acute intratracheal instillation. Pulmonary responses were evaluated by lung histopathology plus measurement of differential cell counts, total protein, lactate dehydrogenase (LDH) activity, and inflammatory cytokines in bronchoalveolar lavage (BAL) fluid.

Results *

Cu NP exposure induced inflammatory responses with increased recruitment of total cells and neutrophils to the lungs as well as increased total protein and LDH activity in BAL fluid. Both inhalation and instillation exposure to Cu NPs significantly decreased the pulmonary clearance of K.p.-exposed mice measured 24 hr after bacterial infection following Cu NP exposure, indicating impaired pulmonary clearance versus sham-exposed mice also challenged with K.p (1.4 x 105 bacteria/mouse). The lung burden of Cu measured in mice after exposure was dose-dependently higher with increasing doses of the Cu NPs (R2=0.99).

Conclusions *	Cu NP exposure impaired host defense against bacterial lung infections and induced a dose-dependent decrease in bacterial clearance in which even our lowest dose demonstrated significantly lower clearance than observed in sham-exposed mice. Thus, exposure to Cu NPs may increase the risk of pulmonary infection.

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