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Inhaled diesel exhaust decreases antimicrobial peptides alpha-defensin and S100A7 in human bronchial secretion

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Background:

Inhaled air pollution is a risk factor for chronic inflammatory respiratory diseases and increased susceptibility to pulmonary infections. Susceptibility to infections during airway inflammation is associated with decreased expression of antimicrobial peptides (AMPs) in the lungs.

Objective:

To examine the levels of AMPs secreted in bronchoalveolar lavage (BAL) in response to inhaled diesel exhaust (DE) a paradigm for traffic-related air pollution and allergen challenge in a controlled human exposure study.

Methods:

Mild asthmatics (n=7) inhaled filtered air (FA) and DE (300 mg/m^3) for 2h (crossover; random order), thereafter, contralateral lung segments were challenged with allergen or saline, and BAL obtained 48 h post-challenge. This procedure was repeated after 4 weeks, for opposite inhalation and new segmental challenge for allergen, resulting in BAL obtained from four different exposure conditions from each participant; FA and saline, DE and saline, FA and allergen, and DE and allergen co-exposure. BAL samples probed in immunoblots for human AMPs known to be expressed in the lungs; α-defensin1, S100A7, S100A4, SLPI, β-defensin1, β-defensin2 and LL-37. Wilcoxon's matched-pairs signed rank test and Friedman's test with Dunn's multiple comparisons test were used for statistical analysis.

Results:

Abundance of α-defensin1 and S100A7 was significantly decreased following inhaled DE+allergen co-exposure compared to allergen alone, using *a priori* pairwise comparison. Abundance of S100A7 was also decreased following inhaled DE compared to saline. The decrease in α-defensin1 remained statistically significant after applying corrections for multiple comparisons. Allergen exposure alone did not significantly increase any of the AMPs compared to saline control.

Conclusion:

This is the first study to show that inhaled DE decreases the abundance of specific AMPs in bronchial secretions of humans, which may contribute to the increase in susceptibility to infections associated with traffic-related air pollution.