House Dust Endotoxin Levels Are Associated with Adult Asthma in the Agricultural Lung Health Study [Publication Page: A2781]

***Stephanie London*[1], *Jane A. Hoppin*[2], *Annah Wyss*[3], *John S. House*[1], *Paul K. Henneberger*[4], *David M. Umbach*[5], *Peter S. Thorne*[6], *Megan U. Carnes*[3].**

[1]Epidemiology Branch & Immunity, Inflammation, and Disease Laboratory, National Institute of Environmental Health Sciences, Research Triangle Park/NC/United States of America, [2]Department of Biological Sciences, Center for Human Health and the Environment, North Carolina State University, Raleigh/NC/United States of America, [3]Epidemiology Branch, National Institute of Environmental Health Sciences, Research Triangle Park/NC/United States of America, [4]Division of Respiratory Disease Studies, Cdc National Institute for Occupational Safety and Health (Niosh), Morgantown/WV/United States of America, [5]Biostatistics and Computational Biology Branch, National Institute of Environmental Health Sciences, Research Triangle Park/NC/United States of America, [6]Department of Occupation and Environmental Health, University of Iowa, Iowa City/IA/United States of America

RATIONALE: Endotoxins are large molecules located on the outer membrane of gram-negative bacteria that are recognized by immune cells and initiate an inflammatory response. Previous studies have found endotoxin concentrations to be associated with asthma severity and asthma-related symptoms. Much of the previous work has focused on asthma in children. Here we investigate the association of house dust endotoxin levels on adult asthma, lung function, and atopy in a farming population.
METHODS: House dust from 2,485 independent households was vacuumed from the bed and bedroom floor of farmers and spouses of farmers during home visits of the Agricultural Lung Health Study. Endotoxin concentration was measured by Limulus amebocyte lysate assay. With multivariate regression models, we calculated the association of endotoxin (EU/mg) as a log10 linear variable or by quartile analysis with 1) current asthma defined by questionnaire (N=2,485), 2) atopy (defined as having a specific IgE response to either Alternaria, bermuda, ragweed, timothy, cedar, cat, or dust mite using a 0.70 IU/mL cut-off) (N=2,430), and 3) lung function (forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC), and their ratio (FEV1/FVC)) (N=2,396). Spearman correlation (ρ) was calculated for repeat measures (N=188).
RESULTS: Endotoxin was significantly associated with asthma (OR=1.30 log10 EU/mg, 95% CI: 1.12-1.50). Quartile analysis revealed that this relationship was non-linear. Compared to the first quartile, quartile 2 (OR=1.40, 95% CI: 1.11-1.77), quartile 3 (OR=1.48, 95% CI: 1.17-1.87), and quartile 4 (OR=1.35, 95% CI: 1.07-1.71) had similar odds ratios. Endotoxin was not associated with atopy (OR=1.01 log10 EU/mg, 95% CI: 0.87-1.17). When asthma and atopy were considered together, endotoxin was significantly related to both atopic and non-atopic asthma. The association was slightly stronger for atopic asthma (OR=1.36, 95% CI: 1.08-1.70) than non-atopic asthma (OR=1.18, 95% CI: 1.03-1.34), but this difference was not statistically significant. Endotoxin was not associated with FEV1, FVC, or FEV1/FVC (FEV1: Beta= -14.32 mL; p=0.32, FVC: Beta= 0.10 mL; p=0.99, FEV1/FVC: Beta= -0.35%; p=0.13). Despite the long lag between repeat dust sample collections (mean = 12, SD = 10 months), the two measures were correlated (ρ=0.42, p<0.0001).
CONCLUSIONS: Endotoxin levels measured in house dust collected from the homes of farmers and spouses were associated with current asthma, but not atopy or lung function. Future analyses will examine effect modification by genetic factors and early life exposures and the determinants of house dust endotoxin levels by farming activities, lifestyle, and housing conditions.

Am J Respir Crit Care Med 193;2016:A2781