

Chitotriosidase And Immunoglobulin E Predict Lung Function Decline In World Trade Center Exposed New York City Firefighters

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RATIONALE: We have previously reported biomarkers predictive of lung function loss from a firefighter cohort (FDNY) from the World Trade Center (WTC) disaster. Some serum biomarkers were associated with increased risk of abnormal forced expiratory volume in 1 second (FEV₁) while others predicted reduced risk. Here we report the association of two additional biomarkers, chitotriosidase and Immunoglobulin E (IgE), with lung function loss in the FDNY firefighter cohort. Chitotriosidase, the most prominent macrophage-derived chitinase in the lung, plays an important role in innate immunity and is associated with abnormal lung function in pathological conditions such as systemic sclerosis. IgE is important in adaptive immunity and is associated with asthma severity. We investigated the effects of these two biomarkers on FEV₁.

METHODS: Serum samples were obtained within 6 months of 9/11 from 250 WTC-exposed firefighters with normal pre-9/11 lung function who presented for subspecialty pulmonary evaluation (SPE) for respiratory symptoms after 9/11 and before March 2008. Pulmonary function testing had been performed within 32 months post-9/11 on average. Serum IgE and chitotriosidase level were measured by ELISA. Multivariate linear regression models (adjusted for age, 9/11 exposure intensity, body mass index) were used to test if chitotriosidase and IgE predict FEV₁ at SPE. Data management and statistics were performed using SPSS.

RESULTS: Each 10-fold increase in serum chitotriosidase was associated with a 350 ml increase in FEV₁; the range of chitotriosidase levels was between 1 to 3,518 pg/ml. Each 10-fold increase in IgE was associated with a 170 ml decrease in FEV₁; the range of IgE levels were 0-640 IU/ml. The R squared of the model increased from 0.13 to 0.17 when the balance of chitotriosidase and IgE were analyzed.

CONCLUSION: Multivariate linear regression demonstrated that increasing IgE level independently predicted lower FEV₁ while increasing chitotriosidase independently predicted increased FEV₁. Chitotriosidase and IgE levels measured early after WTC exposure predict long-term FEV₁. Increased chitotriosidase is associated with improved lung function while increased IgE is associated with reduced lung function. This suggests that a balance between innate and adaptive immunity modulated by chitotriosidase and IgE may account for the lung function decline seen in our FDNY cohort.

This abstract is funded by: the Centers for Disease Control and Prevention [U1Q/CCU221158] and the National Institute of Occupational Safety and Health [U10-OH008243, U10-OH008242, and R01-OH07350], NIH [M0100096, K23HL084191, K24A1080298, and R01HL057879, UL1 TR000038]

Am J Respir Crit Care Med 187;2013:A1054

Internet address: www.atsjournals.org

Online Abstracts Issue