Title: Effects of Arsenic on White Blood Cell, Neutrophil and Lymphocyte Count

Lead Author: Sravya Uppalapati (MS3, Virginia Commonwealth University School of Medicine)

Abstract: Purpose: The effects of arsenic on the human body are mainly through its modulation of cell growth and apoptosis particularly in high cell turnover tissues. The data from cellular and animal studies demonstrating an association between arsenic and white blood cells (WBCs) is compelling; however, epidemiological studies examining such association are lacking. The purpose of this study was to examine the association of arsenic and its species with total WBC counts and subtypes of WBCs in adults. Methods: National Health and Nutrition Examination Survey (NHANES) data from 2003-2016 (14-year data; 7 cycles) were used. We excluded participants younger than 20 years. The relationship between total WBC count, neutrophil count, and lymphocyte count with urinary arsenic metabolites was examined using survey-weighted linear regression models. Results: In unadjusted analysis, each 10% increase in normalized total arsenic was associated with a 19 x 106 cells/L decrease in WBC. Decrease in lymphocyte count was associated with only dimethylarsonic acid and monomethylarsonic acid in adjusted analyses and not with other urinary arsenic metabolites. On the other hand, decrease in neutrophil count was associated with all normalized urinary metabolite species in adjusted analysis. Conclusion: The results suggest that arsenic has distinct effects on white blood cells. Higher intake of arsenic, as measured by creatinine-normalized urinary metabolite levels, was associated with decrease in total WBC count and neutrophil counts. Only methylated arsenic metabolites were associated with a decrease in lymphocyte count. Whether the decrease in WBC counts is associated with immunosuppression and higher risk of infections needs to be explored in future studies.