THE EFFECT OF EXPOSURE TO AIR POLLUTANTS ON INSULIN RESISTANCE MODIFIED BY GENOTYPES OF *GSTM1* AND *NAT2* IN THE KOREAN ELDERLY ENVIRONMENTAL PANEL STUDY (KEEPS)

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Background and Aims: Previous studies have found that air pollutants increase cardiovascular outcome and diabetes mellitus (DM) increases the impact of air pollutants on cardiovascular outcome. However, recently, a possibility that DM may be an outcome of air pollution exposures in addition to being an effect modifier for air pollution-associated cardiovascular disease was suggested. Moreover, *GSTM1* and *NAT2*, in relation with detoxification, have been known to affect air pollution-related outcomes. Therefore, in this study, we evaluated the effect of air pollutants on insulin resistance (IR) which is an underlying mechanism of DM and metabolic syndrome and the effect modification by *GSTM1* and *NAT2* genotypes in the Korean elderly.
Methods: We recruited 560 of aged persons more than 60-years old and obtained blood samples three times during five medical examinations between 2008 and 2010. All ambient air pollutant concentration data (PM_{10}, SO_2, O_3, NO_2, and CO) during the study period were obtained from the Korea National Institute of Environmental Research air quality monitoring system. We measured levels of insulin and glucose in serum in order to assess IR. In addition, the HOMA, an indirect index for the assessment of IR, was calculated using the formula as follows; insulin (• U/ml) × [glucose (mmol/l)/22.5]. We also measured urinary level of cotinine as an indicator of smoking amount.
Results: When we estimated the effect of PM_{10}, SO_2, O_3, NO_2, and CO on each insulin resistance index using linear mixed-effect model, PM_{10}, O_3, and NO_2 were found to be associated with increased insulin resistance indices in the elderly after being adjusted for age, sex, BMI, cotinine level, and outdoor temperature (PM_{10}-glucose, p=0.0002; PM_{10}-insulin, p=0.3308; PM_{10}-HOMA, p=0.0888; O_3-glucose, p<0.0001; O_3-insulin, p=0.1061; O_3-HOMA, p=0.0423; NO_2-glucose, p=0.0004; NO_2-insulin, p=0.0302; and NO_2-HOMA, p=0.0019). The positive relationships between air pollutants and insulin resistance indices were apparent only in subjects with *GSTM1* null and *NAT2* GG genotypes.
Conclusions: Our study results suggest that PM_{10}, O_3, and NO_2 affect insulin resistance in the elderly and those with *GSTM1* null and *NAT2* GG genotypes are susceptible to PM_{10}, O_3, and NO_2 in respect of insulin resistance.
References:
Puett RC, Hart JE, Schwartz J, Hu FB, Liese AD, and Laden F. Are particulate matter exposures associated with risk of type 2 diabetes? Environ Health Perspect 2011;119:384-9.
Brook RD, Jerrett M, Brook JR, Bard RL, and Finkelstein MM. The relationship between diabetes mellitus and traffic-related air pollution. J Occup Environ Med 2008;50:32-8.
Probst-Hensch NM. Chronic age-related diseases share risk factors: do they share pathophysiological mechanisms and why does that matter? Swiss Med Wkly 2010;140:w13072.