Interaction of Genetic Variation in the ABO Locus and Short-Term Exposure to Elevations in Fine Particulate Matter Air Pollution Differentially Affects Associations with Acute Coronary Events

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Background

Ambient fine particulate matter (PM2.5) air pollution is associated with greater cardiovascular risk, including long-term development of coronary heart disease and short-term acute coronary syndrome (ACS) events such as myocardial infarction (MI) and unstable angina (USA).

Evidence indicates that short-term (hours to a few days) exposure to PM2.5 may trigger ACS events, especially among individuals with pre-existing cardiovascular disease.

Odds ratios for PM2.5 with adjustment for daily temperature, dew point, and barometric pressure were determined for linear models using a 25-μg/m3 threshold on the same day of the week and in the same geographic area.

Hypothesis

Short-term exposure to elevated PM2.5 is differentially associated with ACS event risk among carriers of the ABO rs687289 A allele (non-O blood types: A, B, AB) vs. GG genotype (O blood type).

Methods

Patients who had ≥1 coronary vessel with flow-limiting coronary artery disease (>70% stenosis) and residing on Utah's Wasatch Front were studied if they were hospitalized at Intermountain Healthcare for an ACS event (acute MI or USA) between October 1993 and May 2007.

ABO variants rs687289 (primary hypothesis), rs657152 (r2=0.86 with ABO), and rs579459 (+ imputed) were previously validated by GWAS to predict MI in patients with coronary artery disease (Reilly MP, et al. Lancet, 2011).

Results

A stronger association was found when modeling used a PM2.5 exposure threshold of 25-μg/m3 than when using no-threshold models.

• Short-term exposure to elevations in PM2.5 was associated more strongly with risk of ACS events in ABO risk allele carriers (A allele) corresponding to A, B, and AB blood types, with lower association in GG genotype (corresponding to O blood type).

• A stronger association was found when modeling used a PM2.5 exposure threshold of 25 μg/m3, above which the effect was linear.