

Metabolomic Assessment of Exposure to Near-Highway Ultrafine Particles

By Anil Gurcan

Background

Studies show that exposure to traffic related pollutants is associated with many diseases, including heart disease, stroke and respiratory diseases. However, the underlying ways in which air pollution might cause these illnesses are not well understood. Identifying changes in chemicals in the body that are associated with exposure to pollutants might help us understand how pollution affects health.

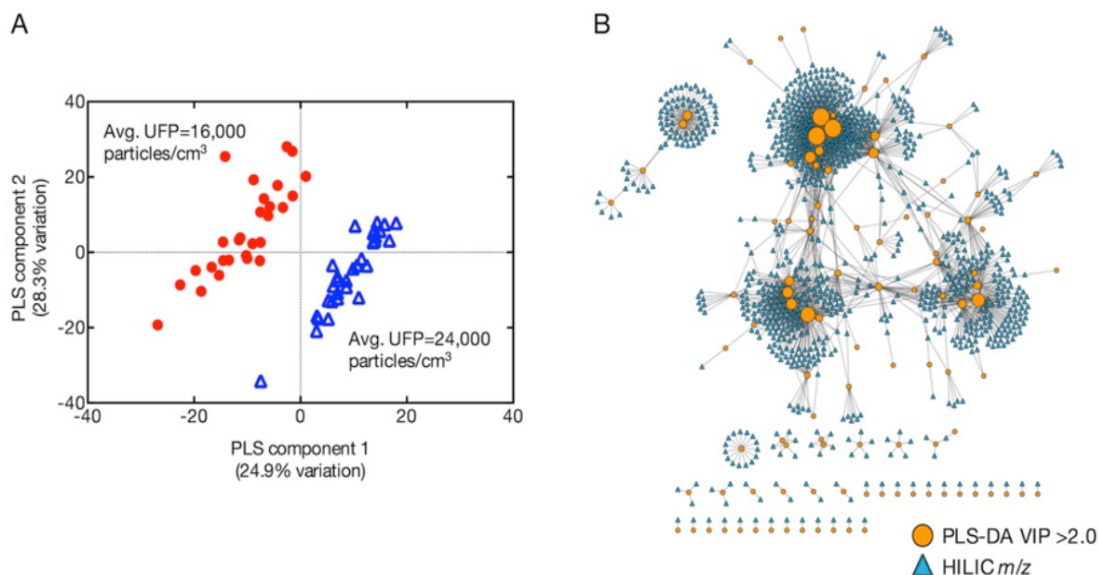


Figure 1. Metabolome-wide association study of UFP exposure using HILIC HRM data. a PLS-DA identified 178 m/z features discriminating CAFEH participants with low and high exposure, clearly separating the two groups. b Metabolic network structure using PLS-DA selected features and raw HILIC data identified an additional 928 m/z features strongly correlated with the discriminatory metabolites. Correlation network data was then used to evaluate metabolic pathway enrichment

What did we do?

We selected 59 participants from CAFEH study for whom we had stored blood samples. [CAFEH](#) is a series of studies about the relationship between traffic related air pollution and health effects in people living near highways in the Boston area. The samples were chosen to have either high or low exposure to Ultrafine Particles (UFP). In this paper, the blood samples were analyzed for thousands of small molecules from which it is possible to say something about the way a person's body is functioning.

What did we find?

We found that study participants with high vs. low UFP exposure and had some differences in the small molecules in their blood. Overall, these differences were consistent with increased inflammation, changes in arteries and energy production in cells. These changes are also consistent with CAFEH studies showing UFP associations with inflammation in the same population.

Why it is important?

Identifying changes in small molecules in the body that might be caused by exposure to pollutants could help us better understand how pollution causes disease. This is a small study and needs to be replicated at larger scale to give us a better understanding of the health effects of UFP exposure.

What can we do?

Exposure to UFPs from highways can be limited by closing windows during heavy traffic hours and using indoor air filtration. Sound barriers along highways in residential areas can also limit UFP exposure.

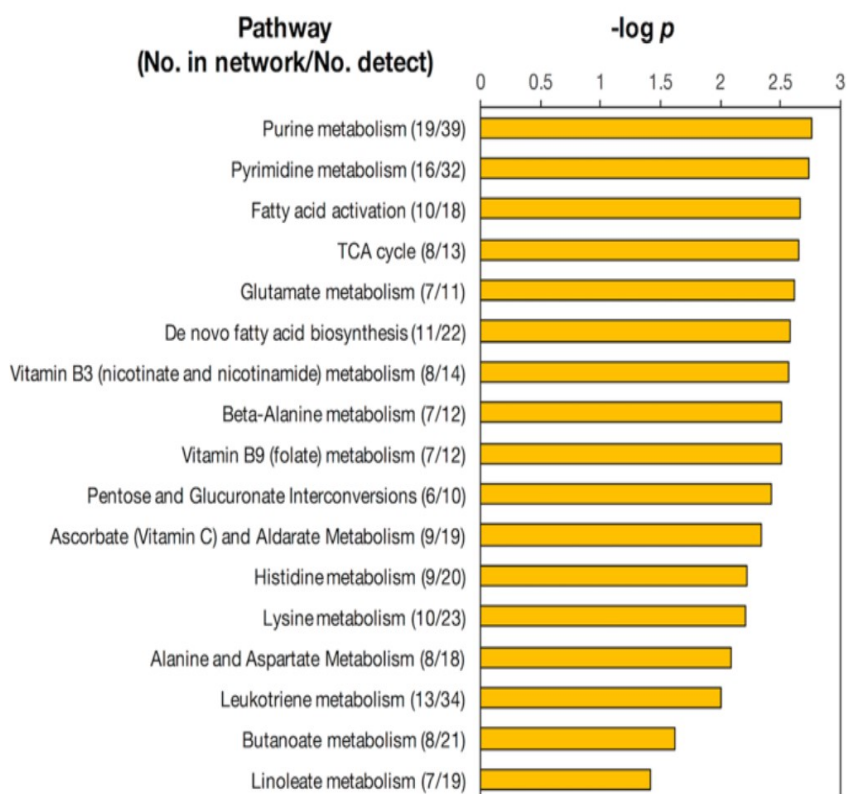


Figure 2: Metabolic pathways associated with exposure correlation network using RPC with negative ESI at $p < 0.05$.

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To learn more about this research, please refer to the following source:

<https://www.nature.com/articles/s41370-018-0102-5>