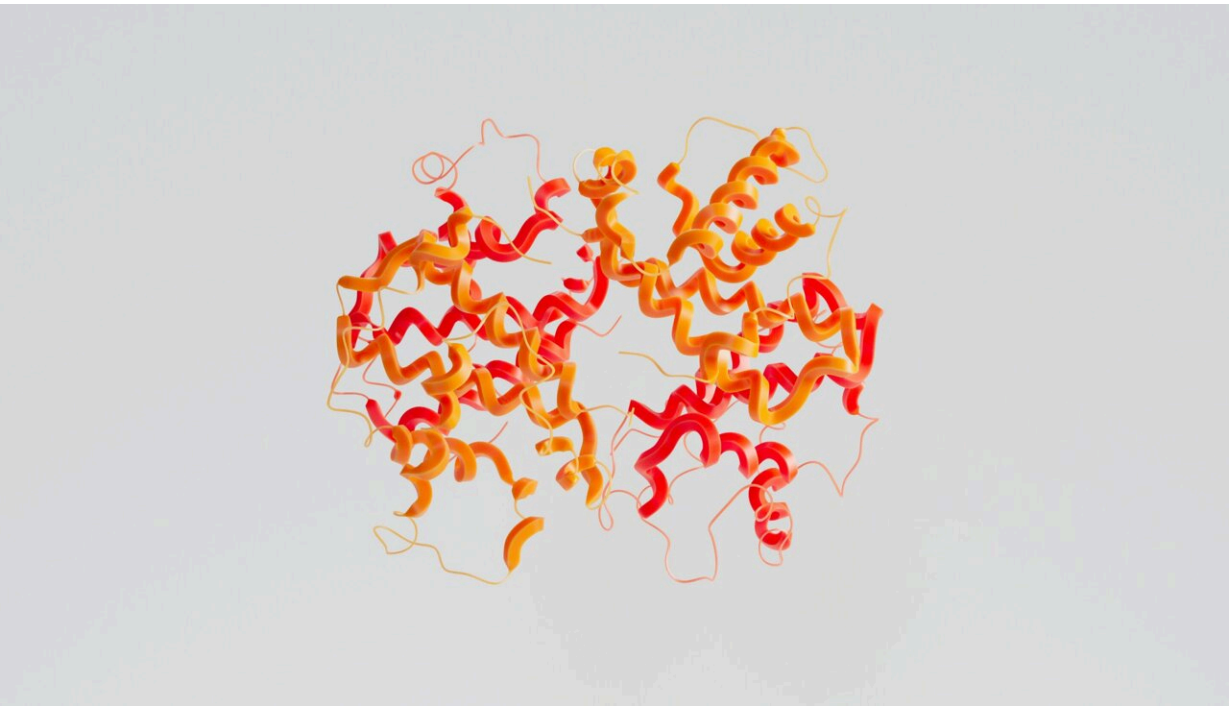
Do certain amino acids modify the risk of dementia linked to air pollution?

July 19 2023



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Higher levels of vitamin B-related amino acids may be linked to the risk of dementia associated with a certain type of air pollutants called particulate matter, according to a study published in *Neurology*. The study does not prove that pollution or amino acids cause dementia, but it suggests a possible link among them.

Researchers looked at fine particulate matter, $PM_{2.5}$, which consists of pollutant particles of less than 2.5 microns in diameter suspended in air. They also looked at two amino acids, methionine and homocysteine. Methionine is an essential amino acid found in foods such as meat, fish, dairy, beans and eggs and is involved in normal brain functions. Homocysteine is an amino acid produced in the cells that can be transformed to methionine through a reaction that requires both vitamin B12 and folate, a nutrient important in red blood cell formation and for healthy cell growth and function.

"Previous studies have found a link between air pollution and dementia risk, but we don't have a good understanding of the mechanisms through which air pollution impacts the brain," said study author Giulia Grande, MD, Ph.D., of the Karolinska Institutet in Stockholm, Sweden. "In this study, we found that two types of vitamin B-related amino acids played a role in increasing or decreasing the risk of dementia caused by air pollution."

For the study, over 2,500 adults with an average age of 73 living in central Stockholm were followed for up to 12 years. Of these, 376 people developed dementia.

Participants completed interviews and blood tests, along with questionnaires on physical activity and diet habits.

Researchers then calculated annual average levels of $PM_{2.5}$ at the home addresses of the participants. The people who developed dementia had an average exposure to $PM_{2.5}$ pollution of 8.4 micrograms per cubic meter ($\mu g/m^3$), compared to 8.3 $\mu g/m^3$ for the people who did not develop dementia. These annual average level of $PM_{2.5}$ are low compared to the average levels of $PM_{2.5}$ in the rest of Europe, which is 13.8 $\mu g/m^3$.

After adjusting for several factors that affect a person's risk of dementia including age, sex, smoking, and education, researchers found that the risk of dementia increased by 70% for every one $\mu g/m^3$ increase of $PM_{2.5}$ exposure during the five years before the start of the study.

Then researchers looked at whether the impact of air pollution exposure on dementia was affected by the amino acids.

Overall, researchers found that about half of the increased risk of dementia due to $PM_{2.5}$ was due to an interaction between air pollution and high homocysteine levels or low methionine levels.

"Our results indicated that raised homocysteine levels and low methionine values played a role in determining the dementia risk related to air pollution, but also showed that a substantial direct effect of air pollution on dementia exists suggesting that air pollution affects the development of dementia through multiple pathways," Grande said. "This highlights the need for further research into the exact biological mechanisms behind the brain damage of air pollution."

A limitation of the study was that it included only the Kungsholmen district of Stockholm, which is small, so comparisons regarding air pollutants were limited.

More information: Giulia Grande et al, Association of Long-term Exposure to Air Pollution and Dementia Risk: The Role of Homocysteine, Methionine, and Cardiovascular Burden, *Neurology* (2023). DOI: 10.1212/WNL.0000000000207656 , dx.doi.org/10.1212/WNL.0000000000207656

Provided by American Academy of Neurology