NEWS

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NYCU Study Links Improved Air Quality to Better Brain Health in Older Adults

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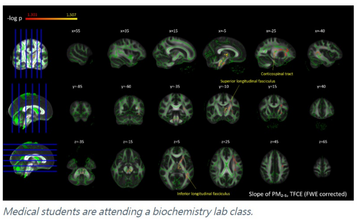
While air pollution is widely known to contribute to lung cancer, recent research suggests it may also impact brain health, potentially increasing the risk of dementia.

A recent epidemiological study conducted by National Yang Ming Chiao Tung University (NYCU) has found that improved air quality is closely linked to enhanced attention and better structural integrity of brain white matter in older adults. Published in *Environment International* under the title "Yearly Change in Air Pollution and Brain Aging Among Older Adults: A Community-Based Study in Taiwan", the study provides valuable insights into the potential mechanisms connecting air pollution and brain health.

Tracking Pollution's Impact: A Decade-Long Study on Air Quality and Brain Health

The research analyzed data from 412 healthy individuals aged 60 and above residing in rural and urban communities. Using spatial models, researchers estimated the participants' exposure to air pollutants over 10 years, including delicate particulate matter (PM2.5), nitrogen dioxide (NO2), ozone (O3), and suspended particles (PM10). Participants also underwent cognitive function tests and MRI scans to assess brain structure changes.



Medical students are attending a biochemistry lab class.

The finding revealed that reduced PM2.5 and NO2 concentrations were positively associated with improved attention in elderly participants. MRI scans further indicated decreased pollutant levels correlated with better structural integrity in several white matter regions responsible for attention and memory.

Bridging the Knowledge Gap: NYCU Study Unveils Air Quality's Role in Brain Health

Although the exact mechanisms by which air pollution affects the brain remain unclear, scientists widely believe that pollutants may stimulate the immune system through olfactory pathways, triggering systemic inflammation. This process may damage the blood-brain barrier, inflame cerebral blood vessels, and ultimately impair neurological health.

Dr. Yi-Fang Chuang, Associate Professor at NYCU's Institute of Public Health and lead author of the research, emphasized that air pollution has long been considered a significant risk factor for cognitive decline. However, research exploring the structural impact of air pollution on the brain has been limited. "Our study fills this scientific gap, demonstrating the potential benefits of improved air quality for attention and white matter integrity in older adults," Chuang stated.

Professor Chuang further highlighted that while genetic factors are unavoidable in brain aging, lifestyle choices and environmental factors can be adjusted to slow cognitive decline. "Improving air quality not only protects the environment but also enhances brain health and cognitive function in the elderly," she added.

Uniting Expertise: Collaborative Efforts Unlock Key Findings

Dr. Wen-Chi Pan, Associate Professor at NYCU's Institute of Environmental and Occupational Health Sciences, was key in interpreting the study's data. He noted that this research is particularly significant in environmental health, as previous studies from Western countries have primarily focused on air pollution's links to cardiovascular disease and lung cancer. Studies investigating air pollution's impact on brain health, especially in Asian populations, have been relatively rare.

The study also benefited from the expertise of Professor Chih-Da Wu from National Cheng Kung University's Department of Geomatics, who provided air pollution exposure estimates for participants over the past decade. His contributions were pivotal in enabling the team to identify these significant findings.

A Call for Change: Improving Air Quality for a Healthier Future

The research team stressed that improving air quality is crucial for environmental protection and a vital strategy for promoting public health, particularly in aging societies. As populations worldwide grow older, safeguarding cognitive well-being through better environmental policies becomes increasingly urgent.

By shedding light on the connection between air pollution and brain health, the NYCU study underscores the need for collective efforts — from policymakers to community members — to reduce pollutant exposure. With targeted actions to improve air quality, societies can foster healthier aging, preserve cognitive function, and enhance overall quality of life.

The study was led by Associate Professor Yi-Fang Chuang (second from right), with Associate Professor Wen-Chi Pan (second from left) responsible for data interpretation and analysis. The research team also included medical graduate Ying-Cen Lin (first from left) and sixth-year medical student Kang-Chen Fan (first from right).

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Back

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