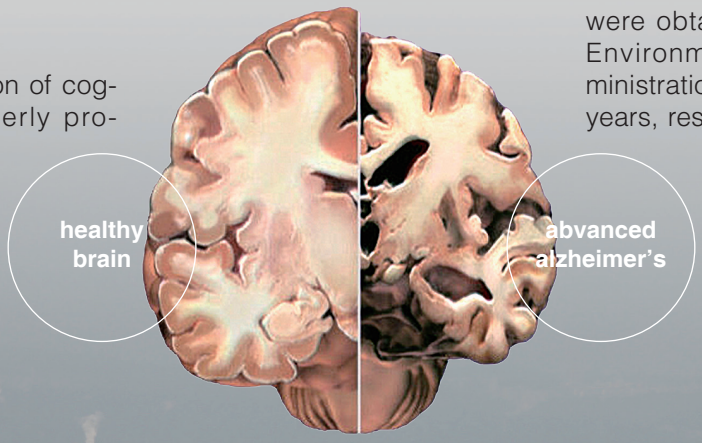
Air pollution and dementia risk

Long-term exposure to particulate matter<10 μm (PM_{10}) and ozone increases the risk of developing Alzheimer's disease and vascular dementia in the elderly

Evidence suggests that exposure to air pollution induces changes in the brain. In a new study of elderly people living in northern Taiwan, researchers from National Taiwan University found that long-term exposure to airborne particulates and ozone increases the risk of developing Alzheimer's disease (AD) and small-vessel vascular dementia (VaD) by two-fold to fourfold. This work has been selected as a Special Invited Article[1] with a featured video[2] and an Invited Commentary[3] for publication in an open access journal of the Alzheimer's Association, USA.

"Only a small portion of cognitively impaired elderly progress to dementia each year. Therefore, studies of cognitive impairment have been unable to fully explain the association between air pollution and the risk of dementia," explained lead investigator Dr. Yen-Ching Chen. "To the best of our knowledge, this is the first case-control study to assess the association between longitudinal air pollution [particulate matter (PM) and ozone] exposure with clinically diagnosed dementia (AD and VaD)." Currently, there is no cure for dementia, and a better understanding of the association between air pollutants and dementia will be helpful in unraveling the complex etiology of dementia.

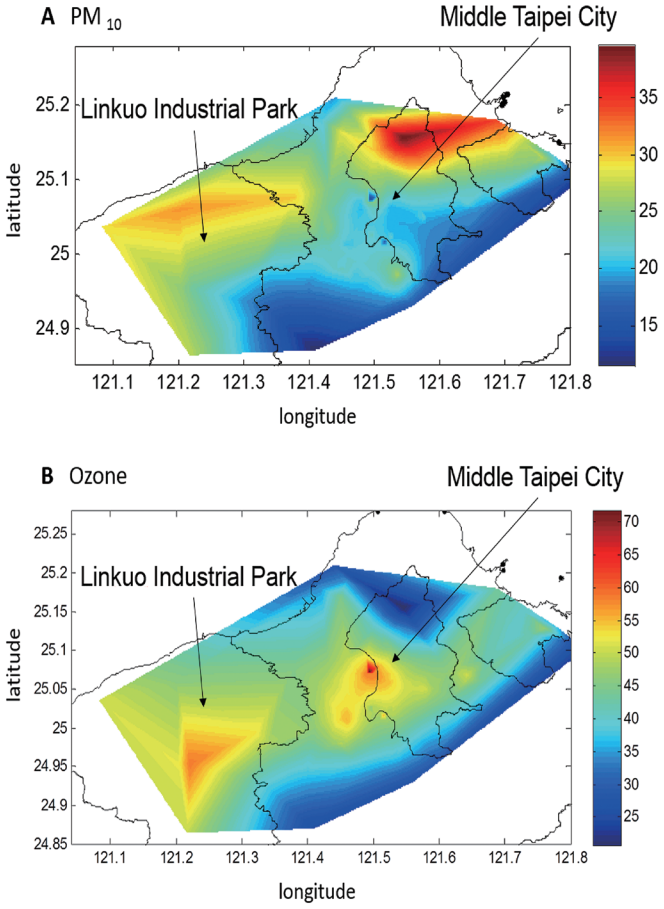
This case-control study comprised 249 AD patients, 125 small-vessel VaD patients, and 497 controls recruited from three teaching hospitals in northern Taiwan from 2007 to 2010. All participants were aged 60 years or older. "The long-term exposure data are especially important because the progression of dementia is slow, which may not be easily explained by short-term exposure," says Dr. Chen. Therefore, PM_{10} and ozone data were obtained from the Taiwan Environmental Protection Administration (EPA) for 12 and 14 years, respectively. A spatiotem-



poral tool (Bayesian maximum entropy) was used to estimate the individual exposure level of air pollutants.

Long-term exposures to ≥ 49 μg/m^3 of PM_{10} (Taiwan 24-hr standard: 125 μg/m^3; annual standard: 65 μg/m^3) and ≥ 22 ppb of ozone (Taiwan 8-hr standard: 60 ppb) were significantly associated with increased risks of AD (highest vs. lowest tertile of PM_{10}: adjusted odds ratio (AOR) = 4.17; highest vs. lowest tertile of ozone: AOR = 2.00). Similar findings were observed for VaD. In addition, this study was the first to reveal a dose-response relationship between PM_{10} and the risk of AD and VaD.

Published papers on air pollution and health outcomes will be considered by the EPA to determine standards. "This study found a significant increase in dementia risk despite the long-term exposure to air pollutants with levels below the current standard. Therefore, it is important to clarify the role of air pollutants on the occurrence of dementia, and studies evaluating this association have been lacking. Future studies are warranted to explore the role of other air pollutants in the etiology of AD and VaD," noted Dr. Chen. This study is therefore a crucial starting point for future work on the effect of air pollution and the risk of dementia.



Maps showing the average annual PM_{10} exposure over 12 years (A) and the average annual ozone exposure over 14 years (B) in northern Taiwan.

Reference

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2. Video: http://www.dadm.alzdem.com
3. Kathleen M. Hayden, Kevin M. Farmer. Invited commentary: The importance of studying environmental risk factors for dementia Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring 1(2): 268-269 (2015). http://www.dadm.alzdem.com/article/S2352-8729(15)00050-0/pdf.

Associate Professor
Yen-Ching Chen
Institute of Epidemiology and Preventive Medicine
karenchen@ntu.edu.tw

Professor Hwa-Lung Yu
Department of Bioenvironmental Systems Engineering
hlyu@ntu.edu.tw