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FOR MORE INFORMATION, CONTACT:

Dacia Morris

dmorris@thoracic.org

ATS Office 212-315-8620 (until May 17)

Cell Phone 917-561-6545

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Mediterranean Diet May Blunt Air Pollution's Ill Health Effects

ATS 2018, San Diego, CA – Eating a Mediterranean diet may protect people from some of the harm of long-term exposure to [air pollution](#), and reduce their risk of dying from heart attacks, stroke and other causes of death, according to new research presented at the ATS 2018 International Conference.

“Previous studies have shown that dietary changes, particularly the addition of antioxidants, can blunt the adverse effects of exposure to high levels of air pollution over short time periods,” said Chris C. Lim, MS, a doctoral student at the NYU School of Medicine. “What we did not know was whether diet can influence the association between long-term air pollution exposure and health effects.”

Rich in antioxidants, the Mediterranean diet favors fruits, vegetables, whole grains, legumes, olive oils, fish and poultry over red meat and processed foods. Antioxidants are molecules that disarm oxidized and highly reactive molecules, or free radicals, that are known to cause cell and tissue damage.

The researchers analyzed data from the National Institutes of Health (NIH)-American Association of Retired Persons (AARP) Diet and Health Study. Over 17 years, the study followed 548,699 people (average age 62 at enrollment) from 6 states--California, North Carolina, New Jersey, Florida, Louisiana and Pennsylvania--and two cities--Atlanta and Detroit. During that time, 126,835 people in the study group died.

The researchers created five groups of participants based on their level of adherence to a Mediterranean diet and linked participants to estimates of long-term exposure to fine particulate matter (PM_{2.5}), nitrous oxide (NO₂) and ozone (O₃) based on census tract information.

When comparing those least and most adherent to a Mediterranean diet, the study found that:

- Deaths from all causes increased by 5 percent for every 10 parts per billion (ppb) increase in long-term average NO₂ exposure in those least adherent, compared to 2 percent among the most adherent.
- Cardiovascular disease deaths increased by 17 percent for every 10 micrograms per cubic meter (µg/m³) increase in long-term average PM_{2.5} exposure in those least adherent, compared to 5 percent among the most adherent.
- Cardiovascular disease deaths increased by 10 percent for every 10 ppb increase in NO₂ exposure in those least adherent, compared to 2 percent among the most adherent.
- Heart attack deaths increased by 20 percent for every 10 µg/m³ increase in PM_{2.5} exposure in those least adherent, compared to 5 percent among the most adherent.
- Heart attack deaths increased by 12 percent for every single ppb increase in NO₂ exposure in those least adherent, compared to 4 percent among the most adherent.

Adherence to a Mediterranean diet did not appear, however, to protect against the harmful effects of long-term exposure to O₃. The diet did not reduce deaths from all causes, heart attack or other cardiovascular diseases associated with O₃ exposure.

“Given the benefits we found of a diet high in anti-oxidants, our results are consistent with the hypothesis that particle air pollution caused by fossil fuel combustion adversely affects health by inducing oxidative stress and inflammation,” said senior study author George Thurston, ScD, director of the Program in Exposure Assessment and Human Health Effects at the Department of Environmental Medicine, NYU School of Medicine. “On the other hand, the ozone effect was not significantly blunted by a Mediterranean diet, so ozone apparently affects cardiac health through a different mechanism.”

With about one-fourth of the study population living where air pollution levels were 10 $\mu\text{g}/\text{m}^3$ or more above the lowest exposure, he added, “adoption of a Mediterranean diet has the potential to reduce the effects of air pollution in a substantial population in the United States.”

Study limitations include only having dietary information from the point when participants enrolled in the study and enrolling a higher percentage of white and well-educated Americans than are represented in the U.S. population as a whole.

Contacts for Media

Chris C. Lim, MS
cchaeha@gmail.com
Cell: 512-913-6114

George Thurston ScD
george.thurston@nyu.edu
Cell: 914-589-5492

Jamie Liptack
Media Relations, NYU Langone Health
Jamie.liptack@nyumc.org
Cell: 646-530-0454

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Abstract 17198

Air Pollution, Mediterranean Diet, and Cause-Specific Mortality Risk in the NIH-AARP Diet and Health Study

Authors: C. C. Lim, R. Hayes, J. Ahn, Y. Shao, G. D. Thurston; NYU School of Medicine, New York, NY, United States.

Introduction: Recent results from experimental studies suggest that nutritional supplementation can blunt adverse cardiopulmonary effects induced by acute air pollution exposure. Epidemiological evidence on whether individual dietary patterns can modify the association between long-term exposure to air pollution and health outcomes is very limited.

Methods: We assessed whether adherence to a Mediterranean diet modifies the association between long-term exposure to ambient air pollution and cause-specific mortality. The NIH-AARP Diet and Health Study, a prospective cohort (N=548,699) across the 6 states and 2 cities in the United States, with a follow-up period of 17 years (1995-2011), was linked to estimates of

annual average exposures to PM_{2.5}, NO₂, and O₃ at the residential census-tract level. The alternative Mediterranean Diet Index (aMED), which uses a 9-point scale to assess conformity with a Mediterranean-style diet, was constructed per participant from information in cohort baseline dietary questionnaires.

Results: Adherence to a Mediterranean diet significantly attenuated air pollution-mortality associations for NO₂ with all-cause mortality; PM_{2.5} and NO₂ with CVD mortality; and PM_{2.5} and NO₂ with IHD mortality (*p interaction* < 0.05).

Conclusions: A Mediterranean diet reduced mortality risk associated with long-term exposure to air pollutants in a large prospective U.S cohort. The results are consistent with oxidative stress as the underlying mechanism in the air pollution-mortality association, and also suggest that air pollution originating from fossil fuel combustion products are mainly responsible for observed associations. Dietary guidelines promoting consumption of foods rich in antioxidant compounds could aid in reducing disease burden associated with ambient air pollution.