

Can Traffic-related Air Pollution Trigger Myocardial Infarction Within a Few Hours of Exposure? Identifying Hourly Hazard Periods*

Jenni A. Shearston

Columbia University, New York City, New York, USA

Background. Traffic-related air pollution is a known trigger for myocardial infarction (MI). However, the hourly hazard period of exposure to nitrogen dioxide (NO₂), a common traffic tracer, for incident MI has not been fully evaluated. Thus, the current hourly US national air quality standard is based on limited hourly-level effect estimates, which may not adequately protect cardiovascular health. We characterized the hourly hazard period of NO₂ exposure for MI in the US state of New York (NYS).

Methods. For nine cities in NYS, we obtained data on MI hospitalizations from the NYS Department of Health Statewide Planning and Research Cooperative System and hourly NO₂ concentrations from the US Environmental Protection Agency's Air Quality System database. We used city-wide exposures and a case-crossover study design with distributed lag non-linear terms to assess the relationship between hourly NO₂ concentrations over 24 hours and MI, adjusting for hourly temperature and relative humidity.

Results. The mean NO₂ concentration was 23.2 ppb (standard deviation: 12.6 ppb). In the six hours preceding MI, we found linearly increased risk with increasing NO₂ concentrations. At lag hour 0, a 10 ppb increase in NO₂ was associated with 0.2% increased risk of MI (Rate Ratio [RR]: 1.002; 95% Confidence Interval [CI]: 1.000, 1.004). We estimated a cumulative RR of 1.015 (95% CI: 1.008, 1.021) for all 24 lag hours per 10 ppb increase in NO₂. Lag hours 2-3 had consistently elevated risk ratios in sensitivity analyses.

Conclusion. We found robust associations between hourly NO₂ exposure and MI risk at concentrations far lower than current hourly NO₂ national standards. Risk of MI was most elevated in the six hours after exposure, consistent with experimental work evaluating physiologic responses after acute traffic exposure and prior studies. Our findings suggest that current hourly standards may be insufficient to protect population health.

*Study not funded by HEI