Airborne Nanoparticle Concentrations are Associated with Brain Cancer Incidence in Canada's Two Largest Cities

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Transportation and industrial activities emit large quantities of nanoparticles (a.k.a. ultrafine particles; particulate matter < 100 nm in diameter) resulting in urban environments with high concentrations of airborne ambient (i.e. outdoor) nanoparticles. There is emerging evidence that long-term exposure to outdoor nanoparticles is associated with adverse health outcomes such as mortality [1] and brain cancer incidence [2], though there are very few studies investigating the latter. The aim of this research was to estimate the association between long-term exposure to outdoor nanoparticles and brain cancer incidence. Newly developed exposure models [3] were used to estimate outdoor nanoparticle concentrations at the residential addresses of a large, population-based cohort in Montreal and Toronto, Canada and this cohort was followed from 2001 – 2016. The associations between long-term exposures to outdoor nanoparticle concentrations and brain cancer incidence were estimated using Cox proportional hazards models. We observed that an increase in long-term exposure to outdoor nanoparticles was associated with an increased risk of brain cancer incidence (Hazard Ratio = 1.183, 95% Confidence Interval = 1.062, 1.320). Furthermore, we observed that this relationship was confounded (i.e. distorted) by nanoparticle size, with larger nanoparticles being more strongly associated with brain cancer incidence than smaller nanoparticles. There are very few known and modifiable risk factors for brain cancer [4] and our results suggest there is great potential to reduce the incidence of this deadly disease.

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