Air pollution, cognitive deficits and brain abnormalities: a pilot study with children and dogs


Abstract

Exposure to air pollution is associated with neuroinflammation in healthy children and dogs in Mexico City. Comparative studies were carried out in healthy children and young dogs similarly exposed to ambient pollution in Mexico City. Children from Mexico City (n: 55) and a low polluted city (n:18) underwent psychometric testing and brain magnetic resonance imaging MRI. Seven healthy young dogs with similar exposure to Mexico City air pollution had brain MRI, measurement of mRNA abundance of two inflammatory genes cyclooxygenase-2, and interleukin 1 beta in target brain areas, and histopathological evaluation of brain tissue. Children with no known risk factors for neurological or cognitive disorders residing in a polluted urban environment exhibited significant deficits in a combination of fluid and crystallized cognition tasks. Fifty-six percent of Mexico City children tested showed prefrontal white matter hyperintense lesions and similar lesions were observed in dogs (57%). Exposed dogs had frontal lesions with vascular subcortical pathology associated with neuroinflammation, enlarged Virchow-Robin spaces, gliosis, and ultrafine particulate matter deposition. Based on the MRI findings, the prefrontal cortex was a target anatomical region in Mexico City children and its damage could have contributed to their cognitive dysfunction. The present work presents a groundbreaking, interdisciplinary methodology for addressing relationships between environmental pollution, structural brain alterations by MRI, and cognitive deficits/delays in healthy children.

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