

Genotoxic effects of exposure to urban traffic related air pollutants on children in Klang Valley, Malaysia

ABSTRACT

Traffic-related air pollutants (TRAPs) are currently increasing due to the increment of vehicle numbers in Malaysia. The emission of pollutants from these vehicles have genotoxic properties that can potentially induce genetic damage in human. In this study, micronuclei assay is used to determine the potential genotoxic exposure by assessing the presence of micronuclei frequency (MN) in buccal cells. The specific objective of this study is to determine the association between TRAPs and frequency of MN among school children in Klang Valley. A comparative cross-sectional study was conducted among primary school children (9–11 years old) in high-density traffic area (n = 94, Kuala Lumpur) and low-density traffic area (n = 94, Hulu Langat). A questionnaire was distributed to the parents to obtain respiratory symptoms information. Buccal cells were analyzed to determine the frequency of micronuclei. Air quality assessment was carried out in a total of 6 schools (consisted of exposed and comparative groups) by using TSI DustTrak DRX Aerosol Monitor 8534 for measurement of PM_{2.5} and PM₁₀, LaMotte's Model BD Air Sampling Pump for measurement of Nitrogen dioxide (NO₂) and Sulphur dioxide (SO₂), ppbRAE 3000 for total Volatile Organic Compound (TVOC) and TSI Q-TRAK 7565 for measurement of Carbon dioxide (CO₂) and Carbon monoxide (CO). The concentrations of PM₁₀, PM_{2.5}, NO₂, SO₂, TVOC and CO at exposed schools were significantly higher ($p < 0.005$). compared to those in comparative schools. All pollutants were significantly associated ($p < 0.001$) with respiratory symptom phlegm and MN frequency. Additionally, the MN frequency in the exposed group was significantly higher ($p < 0.001$) than in the comparative group. All in all, this study demonstrated that air pollutants, especially NO₂ and CO, have significantly influenced the MN frequency among children in primary schools. This study suggested that exposure to TRAPs among Malaysian school children has increased the risk for respiratory complications with the formation of MN.

Keyword: TRAPs; Urban traffic pollutants; Genotoxicity; Micronuclei frequency; Children