



Characterization of airborne PAHs and metals associated with PM₁₀ fractions collected from an urban area of Sri Lanka and the impact on airway epithelial cells.

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HIGHLIGHTS

- First comprehensive analysis and exposure assessment supported by bioassays for airborne PAHs and heavy metals in Sri Lanka.
- Few PAH and heavy metal levels in the Kandy city air are above maximum permissible levels.
- The compounds in the Kandy city air have inflammatory, carcinogenic and mutagenic potentials.
- Immediate attention is required to establish emission control and safeguard the quality of air in Kandy city, Sri Lanka.

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ABSTRACT

Airborne particulate matter (PM), polycyclic aromatic hydrocarbons (PAHs) and heavy metals (HMs) are significant contributors leading to many human health issues. Thus, this study was designed to perform chemical analysis and biological impact of airborne particulate matter 10 (PM₁₀) in the World heritage City of Kandy City in Sri Lanka. 12 priority PAHs and 34 metals, including 10 highly toxic HMs were quantified. The biological effects of organic extracts were assayed using an *in vitro* primary porcine airway epithelial cell culture model. Cytotoxicity, DNA damage, and gene expressions of selected inflammatory and cancer-related genes were also assessed. Results showed that the total PAHs ranged from 3.062 to 36.887 ng/m³. The metals were dominated by Na > Ca > Mg > Al > K > Fe > Ti, while a few toxic HMs were much higher in the air than the existing ambient air quality standards. In the bioassays, a significant cytotoxicity ($p < 0.05$) was observed at 300 µg/mL treatment, and significant ($p < 0.05$) DNA damages were noted in all treatment groups. All genes assessed were found to be significantly up-regulated ($p < 0.05$) after 24 h of exposure and after 48 h, only *TGF-β1* and *p53* did not significantly up-regulate ($p < 0.05$). These findings confirm that the Kandy city air contains potential carcinogenic and mutagenic compounds and thus, exposure to Kandy air may increase the health risks and respiratory tract-related anomalies.

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