

## PM<sub>2.5</sub> as a potential carrier of Antibiotic Resistance Genes in São Paulo: A Preliminary Study

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**Introduction:** According to the World Health Organization (WHO), air pollution is responsible for 7 million deaths worldwide each year and is the second leading risk factor for mortality. Fine Particulate Matter (PM<sub>2.5</sub>) is considered the most significant atmospheric pollutant, capable of transporting various toxic substances, including antibiotic-resistant microorganisms and, consequently, antibiotic resistance genes (ARGs), thus posing a potential route for human exposure. **Objective:** This study aimed to determine the presence of *bla*<sub>CTX-M</sub> genes in PM<sub>2.5</sub> samples collected in São Paulo. **Method:** PM<sub>2.5</sub> samples were collected in São Paulo (-23.55316, -46.67299) between June and July 2024 using a High-Volume sampler (1,13 m<sup>3</sup>/h) over 24 hours. Quartz filters (Whatman® QM-A) were baked at 500°C for 8 hours and UV-sterilized for 10 minutes per side prior to sampling. DNA was extracted from filter pieces using the DNeasy® PowerWater® kit (Qiagen), and qPCR assays were performed to detect *bla*<sub>CTX-M</sub> groups 1, 2, 8, and 9. **Results:** The mean PM<sub>2.5</sub> concentration across eight samples was 35.0 µg/m<sup>3</sup> (range: 23.2 - 52.5 µg/m<sup>3</sup>). *bla*<sub>CTX-M</sub> group 1 genes were detected in two samples collected in June, with concentrations of  $3.89 \times 10^2$  DNA copies/m<sup>3</sup> and  $2.80 \times 10^2$  DNA copies/m<sup>3</sup>. No *bla*CTX-M genes from groups 2, 8, or 9 were detected in the remaining samples. **Conclusion:** Our findings identify PM<sub>2.5</sub> as a novel environmental source of ARGs in São Paulo, adding to concerns beyond established reservoirs like water and soil. This study represents the first investigation of ARGs in airborne samples in Brazil and contributes to the limited global research on CTX-M genes in this environmental compartment. Consequently, continuous monitoring and further research are essential to fully understand the implications of PM<sub>2.5</sub> in the spread of antibiotic resistance.

**Key-Words:** Fine Particulate Matter, Air pollution, ARGs, qPCR, Air Sampling

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