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Tire Particles of Different Sizes Induce a Proinflammatory Response of Varying Intensity in Lung Cells

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Extended Abstract

Air pollution is a major challenge to human health, especially in the current context of climate change and intense anthropogenic activities, which contribute to the exacerbation of health complications and pulmonary diseases. A significant proportion of this pollution comes from road transport, with exhaust emissions as well as non-exhaust emissions (including particulates from tires, brake, road surfaces, …). While several countries have introduced regulations to reduce exhaust particulate emissions, the non-exhaust fraction is unregulated and steadily increasing. Among the non-exhaust emissions, Tire and Road Wear Particles (TRWPs) are of particular importance. They result from friction between tires and the road, and form a variety of particles with different shapes and compositions, accompanied by a considerable size distribution. Our understanding of their toxicity to human health once inhaled remains incomplete. The aim of this study was to assess the in vitro toxicity of Tire Particles (TP) on lung cells. TP were obtained by grinding. A sieving step was performed to obtain four size distributions ranging from [≤ 1 µm] to [≥ 100 µm]. A detailed physicochemical analysis was performed to determine the TP composition, particle size distribution, and specific surface area. For toxicological analyses, RAW264.7 cells (murine lung macrophages) were exposed to four particle concentrations (15, 30, 60, 120 µg/mL) for 24h. The cell response was assessed in terms of cytotoxicity (LDH release assay), pro-inflammatory response (production of TNFα) and oxidative stress (ROS production). Results showed that TP did not elicit a significant cytotoxicity, nor a significant increase in ROS levels. However, TP significantly increased the production of TNFα in a concentration-dependent manner, in the [≥ 15 µm] and [≥ 30 µm] groups, suggesting an impact of TP size on the pro-inflammatory response.