
Quantification of selected microplastics in Australian urban road dust

Stacey O'Brien^{*1,2}, Elvis Dartey Okoffo³, Cassandra Raeurt³, Jake W. O'Brien³, Francisca Ribeiro³, Stephen D. Burrows³, Tania Toapanta³, Xianyu Wang³, and Kevin V. Thomas³

¹Queensland Alliance for Environmental Health Sciences – The University of Queensland, 20 Cornwall Street, Woolloongabba, QLD, 4102, Australia

²Queensland Alliance for Environmental Health Sciences – The University of Queensland, 20 Cornwall Street, Woolloongabba, QLD, 4102, Australia

³Queensland Alliance for Environmental Health Sciences – 20 Cornwall Street, Woolloongabba QLD, Australia

Abstract

Microplastics (1 - 5000 μm) are pervasive in every compartment of our environment. However, little is understood regarding the concentration and size distribution of microplastics in road dust, and how they change in relation to human activity. Within road dust, microplastics move through the environment via atmospheric transportation and stormwater run-off into waterways. Human exposure pathways to road dust include dermal contact, inhalation and ingestion. In this study, road dust along an urban to rural transect within South-East Queensland, Australia was analysed using Accelerated Solvent Extraction followed by pyrolysis Gas Chromatography-Mass Spectrometry (Pyr-GC/MS). Polypropylene, polystyrene, polyethylene terephthalate, polyvinyl chloride, poly (methyl methacrylate) and polyethylene were quantified. Microplastic concentrations ranged from ~ 0.5 mg/g (rural site) to 6 mg/g (Brisbane city), consisting primarily of polyvinyl chloride (29%) and polyethylene terephthalate (29%). Size fractionation (< 250 μm , 250-500 μm , 500-1000 μm , 1000-2000 μm and 2000-5000 μm) established that the < 250 μm size fraction contained the majority of microplastics by mass (mg/g). Microplastic concentrations in road dust demonstrated a significant relationship with the volume of vehicles ($r^2 = 0.63$), suggesting traffic, as a proxy for human movement, is associated with increased microplastic concentrations in the built environment.

Keywords: Dust, Microplastic, Pyr, GC/MS, Quantification, Road traffic.

*Speaker