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Biodegradation of textile waste by marine bacterial communities enhanced by light

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Abstract:

Knowledge of biofilm formation on pollutants in the marine realm is expanding, but how communities respond to substrates during colonization remains poorly understood. Here, we assess community assembly and respiration in response to two different micropollutants, virgin high-density polyethylene (HDPE) microbeads and textile fibres under different light settings. Raman characterization, high-throughput DNA sequencing data, quantitative PCR, and respiration measurements reveal how a stimulation of aerobic respiration by micropollutants is translated into selection for significantly different communities colonizing the substrates. Despite the lack of evidence for biodegradation of HDPE, an increased abundance and respiration of bacterial taxa closely related to hydrocarbonoclastic *Kordiimonas* spp. and *Alteromonas* spp. in the presence of textile waste highlights their biodegradation potential. Incubations with textile fibres exhibited significantly higher respiration rates in the presence of light, which could be partially explained by photochemical dissolution of the textile waste into smaller bioavailable compounds. Our results suggest that the development and increased respiration of these unique microbial communities may potentially play a role in the bioremediation of the relatively long-lived textile pollutants in marine habitats, and that the respiration of heterotrophic hydrocarbon-degrading bacteria colonizing marine pollutants can be stimulated by light.

Keywords: biofilm formation, micropollutants, polyethylene microbeads, textile fibres, biodegradation, bacterial respiration