Ecological succession of prokaryotic and eukaryotic communities growing on everyday macroplastics in a river over one year

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Abstract

Rivers are considered one of the main sinks of plastics in the environment. Recent studies have proven that, once in the water, plastics can provide excellent habitat for the emergence of an active community of organisms known as the Plastisphere. However, the ecological succession of the plastisphere over long-term periods in rivers has not yet been explored. Moreover, these plastics could serve as vectors for potentially pathogenic organisms and antibiotic-resistant bacteria (ARBs). Here, we analyzed the diversity and community composition of prokaryotes and eukaryotes attached to four types of everyday plastics incubated *in situ* in two sites of the same river characterized by different levels of anthropogenic impact at different times over one year using Illumina MiSeq sequencing of the 16S rRNA and 18S rRNA. Also, we compared the relative abundance of four ARGs (*sul1*, *ermF*, *dfrA*, *qnrSrtF11A*) with non-plastic substrates (rock and borosilicate glass) and the surrounding water to check a possible increase of ARGs in the MP-attached community. The diversity and composition in the eukaryotic and prokaryotic macroplastic community showed an ecological succession, characterized by early colonizers in the first stage of colonization, intermediate colonizers, and late colonizers. The db-RDA analysis showed that the location of the essay was the factor that most explained the change in the plastisphere, followed by the type of substrate and incubation time. A core biome was identified in each everyday plastic including some pathogenic genera, resistant to antibiotics, or could implicate or may involve the development of a completely mature community. The relative abundance of ARGs was not significantly higher compared to the surrounding water, although a positive correlation was detected between the antibiotic concentration in the water and the relative abundance of ARGs in the plastics.

Keywords: plastisphere, macroplastics, antibiotic resistance genes, freshwater ecosystems, ecological succession

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