
Which bacteria colonize plastics in coastal areas with human impact?

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Abstract

Due the ability of plastics to act as a substrate to develop biofilms and their persistence in the environment, plastics have been claimed as vectors of bacterial dispersal. We evaluated the presence of faecal and marine bacteria adhering to the biofilm developed on marine plastics and the abundance of antibiotic resistance genes (ARGs). Thus, we sampled coastal waters around the mouths of the Besòs and Llobregat rivers. Both areas are strongly impacted by human faecal pollution (either from rivers and submarine sewage outfalls). Samples of water, sediments and plastics from surface waters and sediments were collected during two campaigns in summer and autumn 2021. The presence of the faecal indicators *E. coli*, enterococci and crAssphage, 3 ARGs, potential pathogens like *Pseudomonas* spp. and *Vibrio* spp. and other marine bacteria was analysed by culture and/or molecular methods. Results indicate that plastics are covered by a bacterial biofilm mainly of marine bacteria (4.9-10 to 8.7·10⁶ gc mm⁻²) including *Vibrio* species. Low concentration of viable *E. coli* and Enterococci (42% and 67% of the samples) was detected on floating plastics. The ARGs *sulI*, *blaTEM* and *tetW* were detected in 67 - 88% of the surface plastic samples and 29 - 57% of the sediment plastics with a concentration of up to 6.7·10² gc·mm⁻². These results suggest that the plastic debris may have come from wastewater or been colonised in environments with faecal contamination. The presence of faecal indicators in sediment plastics was null or low. Therefore, although in low concentrations, faecal bacteria and species of *Pseudomonas* and *Vibrio* were identified in marine plastics, suggesting that plastic pollution may be a potential reservoir of human pathogens and ARGs. Considering the abundance of plastic in aquatic environments (expected to increase in the future), its potential risk to public health must be assessed.

Keywords: plastics, bacteria, antibiotic resistance genes, pathogens, faecal pollution

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