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# Microbes living on marine plastic debris: the Tara Mediterranean expedition

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## Abstract

Plastic litters have become the most common form of marine debris and they became a major and growing global pollution concern. In marine waters, plastic fragments are rapidly colonized by microorganisms, characterized by a very diverse community called "plastisphere". The research on biodegradability of plastics began in the early 1980s and numerous papers provide culture-based evidence of various microorganisms able to degrade a variety of plastics under controlled conditions.

Our researches focus on the characterization of the microbial communities living at the surface of microplastics (< 5mm). Most of our samples were collected during the Tara Mediterranean expedition, which demonstrated that 100% of the seasurface of Mediterranean Sea (from coast to open ocean) is contaminated by microplastics. We evaluated the abundance, activity and diversity of the microbial communities using a wide range of techniques, including optic and atomic force microscopy, flow cytometry, prokaryotic heterotrophic production, ectoenzymatic activity and metagenomic analysis. Other studies performed under microcosm conditions (2L) but directly connected to the sea allowed us to follow the colonisation during 4 months of new selected plastics, including low density polyethylene, oxo-biodegradable and biosourced polymers together with artificially aged plastics. All our analysis were coupled with chemical characterization of plastics and showed that plastisphere were different depending on the type of plastic. Our results indicated also that microbes living in microplastics present distinct patterns from surrounding free-living and particle-attached fractions in seawater, implying that plastic serves as a novel ecological habitat in the ocean.

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