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 @fieraproject

FIERA: Fate and Impact of Environmentally Realistic nanoplastics and of novel bioplastics in aquatic organisms

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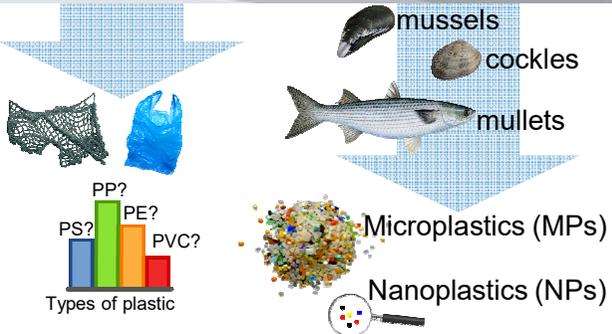
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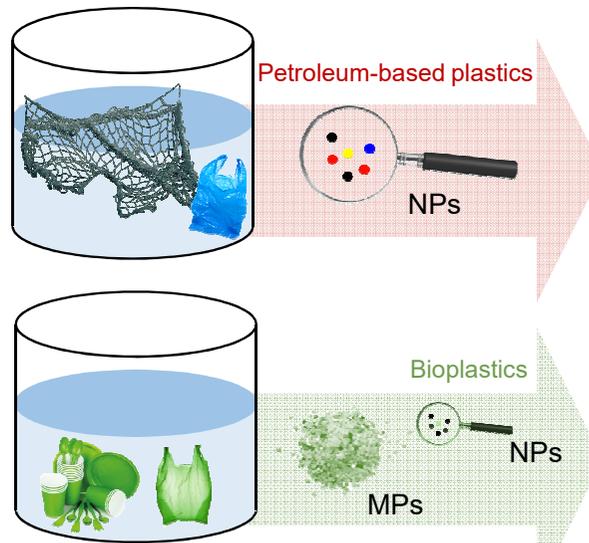


Funded by MCIN/ AEI /10.13039/501100011033/ and FEDER
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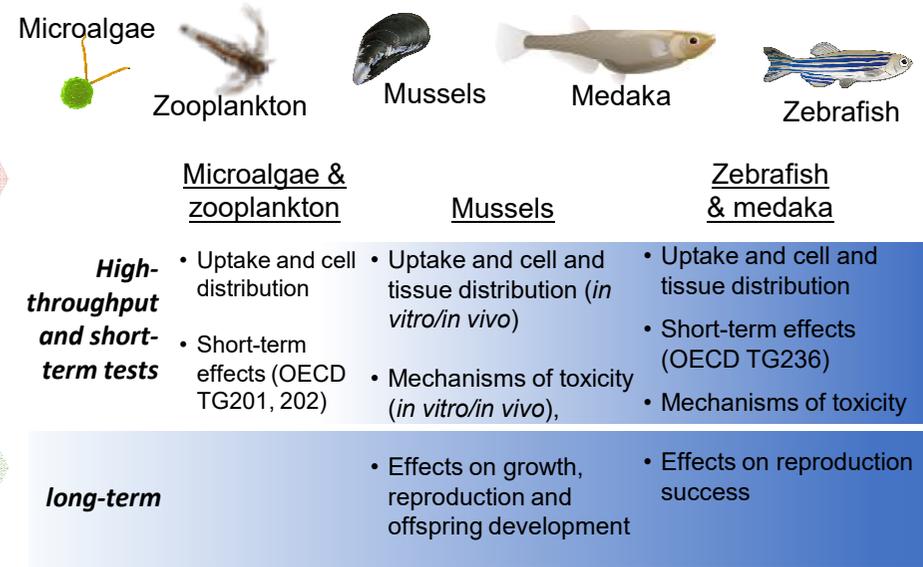
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1) Survey of plastics in the coastal ecosystem, MPs and NPs in marine organisms and weathering of plastic



2) Obtention and production of environmentally relevant NPs and 3) production of bioplastics at micro and nano scales



4) Toxicity profiling, 5) mechanisms of uptake and short-term toxicity and 6) long-term effects of environmental NPs and of bioplastics on growth, reproduction and offspring development

7) Integration for ERA of NPs and bioplastics and 8) coordination, dissemination and technological transfer



Keywords: Nanoplastics, environmentally realistic samples, bioplastics, fate and impact, toxicological profiling, short-term and long-term effects, plankton, bivalve molluscs, fish, environmental risk assessment

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Summary

Plastic pollution from synthetic “petroleum-derived” polymers is one of the most important environmental challenge nowadays, especially in aquatic environments. Despite the fact that plastic recycling is an increasing practice, great amounts are still reaching and being accumulated in the environment, due to incorrect waste management and to their persistence. Plastics found in the ocean vary from large plastics to smaller fragments called microplastics (MPs, 1 μm to 5 mm) and nanoplastics (NPs, <1000 nm), which are more bioavailable to organisms than larger plastics. During last years knowledge about the fate and effects of MPs in aquatic organisms has increased considerably whereas NPs have not received sufficient attention yet. Moreover, most current knowledge is based on laboratory studies involving commercial MP and NP beads. On the other hand, the growing concerns about the environmental hazards posed by petroleum-derived plastics has led to the development of novel bio-based plastics, but there is no evidence that such bioplastics could be less harmful than petroleum-derived ones. Thus, the FIERA project will focus on understanding the fate and impact of environmentally realistic NPs and also of novel bioplastics at micro and nano scales. The project will be carried out by an expert team lead by researchers at Univ of the Basque Country in collaboration with Univ of Bordeaux, CNRS and POLYMAT Institute, as a continuation of earlier studies on micro and nanoplastics (e.g JPI-Oceans PLASTOX and EPHEMARE) and in connection with undergoing international projects (EC JRC CAS6 on nanoplastics and JPI-Oceans RESPONSE). The project is supported by research/technological centres and companies such as AIMPLAS and IPROMA and by international organizations and networks including EC JRC, NORMAN and ICES-WGBEC. An international advisory board that supports the project will provide additional guidance to achieve our goals. The first goal of the project is to identify and characterize MPs and NPs in marine organisms (bivalves and fish) as well as to collect plastic litter in the Bay of Biscay, in collaboration with NGOs 4G SHORES & SEAS, SURFRIDER and MATER MUSEOA. Second goal is to produce environmentally relevant NPs from plastics collected in the field and plastics (fishing gear) aged in the field. Third, MPs and NPs of commercial and novel bioplastics will also be produced. The fourth objective is to assess the toxicity of these MPs and NPs using rapid high-throughput bioassays in microalgae, zooplankton, cell cultures of bivalve and fish cells, and in fish embryos. Direct *versus* indirect effects due to leakage/desorption of contaminants from plastics will be addressed. Then, in the fifth objective, the uptake, cell and tissue distribution and short-term effects of selected MPs and NPs will be determined in bivalves and fish, whereas the sixth objective will address the long-term effects on growth, reproduction and offspring development. Deciphering the complex interactions of NPs and bioplastics with aquatic organisms represents a step forward in environmental risk assessment of these emerging pollutants in aquatic ecosystems. Gained knowledge can lead industry to safe(r) by design strategies of production of plastics and bioplastics and can help us all move forward to reach the UN sustainable development goals and the zero pollution goal of the European Green Deal.

Supporting institutions:



IPROMA



Related projects:



PLASFITO

“Fate and effect of the microplastics, nanoplastics and additives coming from the degradation of fishing gears during their life cycle. Study in the Bay of Biscay”
(Euskampus Missions 1.0)
2022-2023.



FIERA

“Fate and Impact of Environmentally ReAListic nanoplastics and of novel bioplastics in the aquatic environment”
(Spanish Ministry MCIU)
2022-2025.



CAS6

“Towards a technological platform for nanoplastics detection”
(EC JRC, CAS Project 30602)
2021-2023.



MIKRONANOPLAS

“Microplastics in mollusc and fish species of interest for human consumption in the Basque Country”
(Basque Government, ELIKA)
2022-2023.



ENSURE2

“ENvironmental Safety of polyUrethanes from REnewable sources and from REcycled plastics: hazard assessment based on a battery of alternative methods”
(Spanish Ministry MCIU)
2022-2024.