EPHEMARE

ECOTOXICOLOGICAL EFFECTS OF MICROPLASTICS IN MARINE ECOSYSTEMS

Project acronym: EPHEMARE

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http://jpi-oceans.eu/ephemare

PUBLISHABLE SUMMARY (SHORT VERSION)

EPHEMARE is an experimental project that investigated the ecotoxicological implications of microplastics (MP) in European marine ecosystems, using innovative end-points and cutting-edge experimentation with emphasis on quality control, standardization of methods, and ecological relevance. The project is constituted by a European Consortium of 16 partners from 10 European countries, and structured in 7 interconnected WPs designed to target (1) the sorption of hydrophobic chemicals to microplastics, (2) the uptake, tissue distribution, and final fate of microplastics in organisms, (3) the effects at individual level on organisms representative of pelagic and benthic ecosystems, (4) the molecular mechanisms underlying the toxic effects, (5) te trophic transfer across model food chains, (6) the environmental levels in model European coastal ecosystems. EPHEMARE aimed to produce practical results useful for the plastic industry and the regulatory agencies. The 7th WP focused on the dissemination of results to key public and private stakeholders, and organized activities to raise public awareness on this topic.

The results of the project can be summarized as follows:

-MP of environmentally relevant shape (Fig. 1a) are **easily ingested**, but also **easily egested** by filter-feeders and predators. In mussels (Fig. 1b), they are excreted through feces (large ones) or **translocated** from digestive gland into the gills (smaller ones) and further excreted. Once experimental data fit uptake and distribution models, models predict that there is **no accumulation** of MP in mussels exposed to environmental concentrations. This is confirmed by field samples.

Fig. 1a

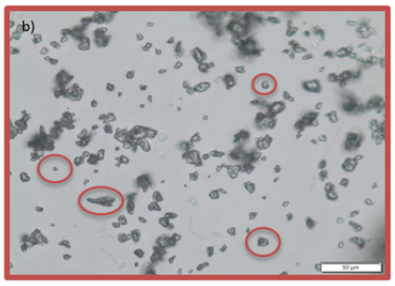
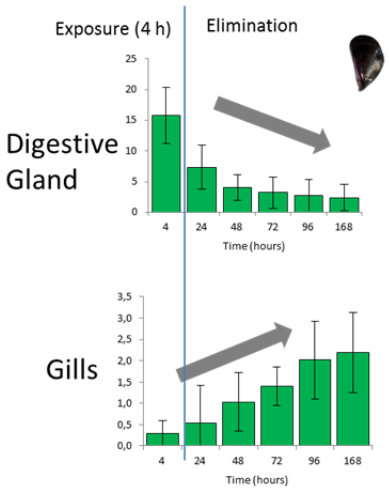
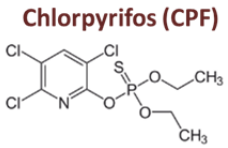


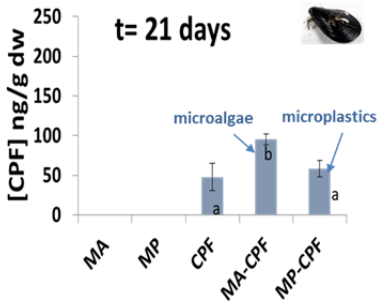
Fig. 1b



-MP may act as vectors of pollutants but they **do not increase bioavailability** and effects of model chemicals **compared to natural particulate matter**. Fig. 2 shows an example studying the accumulation in the mussel of the hydrophobic organic pesticide chlorpyrifos in absence of particles and in presence of microalgae and microplastics.

Fig. 2



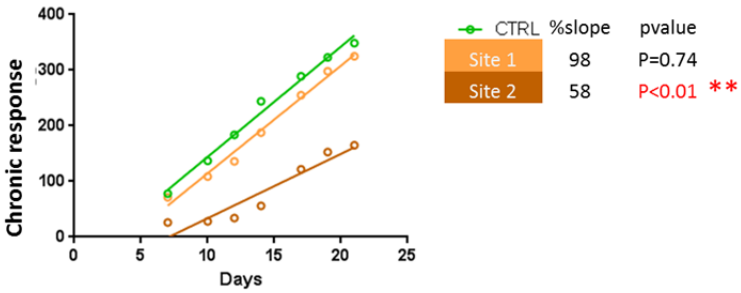


- MP **are transferred** form preys to predators but they are egested and **do not bioaccumulate in predators**.

-Conventional acute toxicity end-points are not sensitive enough and not appropriate for MP Risk Assessment, which should be based on long-term **reproductive**, **immune** and **behavioural** endpoints.

-EPHEMARE developed methods (Fig. 3) based on **chronic effects** using early life stages of fish suitable to **assess the toxicity** of microplastics. Those methods can be useful for both **industry** (to develop environmentally friendly materials) and **regulatory agencies**.

Fig. 3



During the second half of the project, EPHEMARE partners were actively involved in international outreach and dissemination activities, including a **stakeholder's workshop** (Antwerp 2018), invited participations in the **European Commission** Blue Growth Info-day, **Plastics Europe** PolyTalk, and **JRC** Seminar "Sustainability and Impacts of Plastics", active involvement in the **MSFD** Marine Litter working group, broad contributions to **ECHA**'s activities concerning REACH restriction on intentional use of MP, educational courses and other activities published in EPHEMARE website (http://jpi-oceans.eu/ephemare).