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FATE AND IMPACT OF MICROPLASTICS: KNOWLEDGE, ACTIONS AND SOLUTIONS.

CONFERENCE PROCEEDINGS

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suspended particles. The particles are mostly of natural origin, i.e. fine sand grains, diatoms shells, cellulose fibres or chitinous fragments. Since several decades, however, man-made syn- thetic plastic particles are accumulating in the environment. The later are of great interest in environmental and toxicological sciences as they are suspected to induce cellular modifications and stress in organisms upon ingestion. This situation raises a number of questions whether natural and synthetic microparticles induce similar effects and damage in cells and organisms. In order to investigate this issue, marine organisms with different feeding modes will be subjected to natural and synthetic particles. Blue mussels (Mytilus edulis) and brown shrimps (Crangon crangon) will be collected from the field, acclimatized to laboratory conditions, and exposed to natural and synthetic particles for 6, 24, and 48 hours. Microscopic analysis will be done to localize the particles in digestive organs. Histochemical and biochemical analyses will be used to detect stress markers in cells and tissues. The goal of this doctoral project is to understand the hazardous effects of microparticles and to differentiate between anthropogenic and natural items. The findings will be beneficial in estimating the actual hazard potential of microplastics and in defining actual threat boundaries for marine invertebrates.

Keywords: Crustacea, Bivalvia, Oxidative Stress, Histochemical and Biochemical Analyses

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Zebrafish exposure to high-density polyethylene and polystyrene microplastics: effects on liver transcriptome and gastrointestinal histology

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Due to the constant increase of plastic use and production, microplastics (MPs) have become a contaminant of serious concern for the aquatic environment. However, the biological pathways affected by the exposure to different MP polymers still needs to be elucidated, in particular at the ”omic” level. The present study focuses on the identification of the molecular pathways affected by the expo- sure of zebrafish (Danio rerio) to different concentrations of a mixture of two environmentally relevant MPs. Adult zebrafish were fed daily with dry fish food (control group, N=12) and food supplemented with a mix of pristine high-density polyethylene and polystyrene microplas- tics (two experimental groups: 0.1 and 1 mg/L, N=12 each) for 20 days. The MPs

dimension ranged from 25 im to 90 im for both polymers.

At the end of the exposure period, the fish liver was dissected, and its whole transcriptome was analyzed by next-generation RNA-sequencing technologies on an Illumina platform. In addition, the gastrointestinal tract and the gills were dissected and fixed for histology and immunohistochemistry. The exposure to polyethylene and polystyrene microplastics affected the liver transcriptome in a dose-dependent way, inducing the differential regulation of specific suites of genes compared to the control. Histological analyses evidenced changes in the inflammatory response occurring at the two mucosal tissues selected for observation in the MPs treated fish. The correlation of histological alterations with differential gene expression could represent a useful approach to decipher early warning for effects at higher biological organization. This study provides a comprehensive transcriptomic dataset, useful to understand a wide range of biological pathways affected by MPs exposure as a model for studies on fish also in the field.

Keywords: microplastics, polyethylene, polystyrene, zebrafish, liver transcriptome, histology

∗Speaker

Bioaccumulation and gut microbiome response in the great pond snail Lymnaea stagnalis exposed to PBDEs in the presence and absence of nylon microplastics

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It is recognised that microplastics will associate with persistent organic chemicals within the environment, potentially changing their bioavailability and the interaction of organisms with these chemicals. The aims of this study were to investigate how the presence of microplastics affect PBDE bioaccumulation and the gut microbiome in the great pond snail Lymnaea stag- nalis. Snails were exposed to microplastics and PBDEs independently and in combination for 96 hours. Microplastic particles (13-15 µm nylon powder) were mixed with quartz sand sedi- ment at 1% w/w. A PBDE mix (containing BDE-47, 99, 100, 153 and PBB-153) was added to the sediment-microplastic mix in glass vessels at six environmentally relevant concentrations (94, 188, 375, 750, 1500, 3000 ng g-1 each PBDE), with six replicates consisting of one snail per treatment. There was no significant