Selective uptake of microplastics by a marine bivalve (*Mytilus edulis)*

Van Cauwenberghe Lisbeth, Michiel Claessens and Colin R. Janssen

Laboratory of Environmental Toxicology and Aquatic Ecology, Ghent University (UGent), Jozef Plateaustraat 22, B-9000 Ghent, Belgium
E-mail: Lisbeth.VanCauwenberghe@UGent.be

Microplastics, the degradation product of larger plastic debris, are accumulating in marine habitats worldwide. Given their small size (< 1mm) these particles can potentially be ingested by a wide array of marine animals. Data on the ingestion, and subsequent translocation to the tissues, of these ingested microplastics in invertebrates is, however, scarce. In this study, we tested the hypothesis that the translocation of microplastics from the gut to tissues is size-selective and has an adverse effect on the energy allocation in the mussel.

The blue mussel (*Mytilus edulis*) was exposed to three different sizes of microplastics simultaneously (10, 30 and 90µm) for 14 days. 10µm-particles, as well as 30µm-particles, were added at 50 particles.ml^{-1} and 90 µm-particles at 10 particles.ml^{-1}, resulting in a total concentration of 110 particles.ml^{-1}. Analysis of the faeces demonstrated that *M. edulis* filtered and ingested all particle sizes. In the faeces, the 30 and 90µm-particles were detected in the same ratio as they were added to the seawater (i.e. 5/1). However, the 10µm-particles were detected in much smaller quantities than expected based on the observations of the other particle sizes, i.e. 8 times less than the 30µm-particles were observed (eventhough they were initially present at the same concentration). Although this discrepancy was probably partly due to difficulties in detecting the particles in the faeces, analysis of acid-destructed mussels and hemolymph samples demonstrated that 10µm-particles were able to translocate to the circulatory system of the mussel. Using a syringe, 300µl of hemolymph was extracted from the posterior adductor muscle and on average 15.3±3.2 particles (n=15) were found in the hemolymph of the mussels. This translocation accounts for less than 0.3% of all 10µm-particles ingested. The uptake and translocation of microplastics showed no significant effects on cellular energy allocation. Exposed mussels did show a significant increase in energy consumption, indicating a rise in metabolic activity.

Although *M. edulis* was exposed to a very high concentration of microplastics, which was aproximately 1,000 times higher than the concentration encountered in the field, no significant short-term adverse effects of ingestion and translocation were detected. Long-term exposure studies will be performed to provide more conclusive answers on the effects of uptake and translocation of microplastics in *Mytilus edulis*.