Use of Imaging Flow Cytometry (FlowCam®) in the Study of Microplastics

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Identify and Enumerate Microplastic Fibers Using FlowCam In Feeding Experiment

Woods et al. (2017) quantified the uptake, digestion, and egestion of polyethylene terephthalate microplastic fibers (MPF) in mussels. Mussels were placed in filtered seawater with MPF concentrations ranging from 3,000 MPF/L to 30,000 MPF/L and fed a diet of Rhodomonas salina (Fig. 5).

The MPF and microalgal uptake rates of each mussel were determined by calculating the total area-based diameter of all particulate matter following each digestive step to evaluate its efficacy.

Digestive Isolation of Microplastics Evaluated Using FlowCam

Lorenz et al. (2017) evaluated the efficacy of microplastic isolation in a natural marine water sample. Each step of the enzymatic-oxidative digestion developed by Leder et al. (2017) was calculated using the FlowCam to determine the total area-based diameter of particulate matter from before to after each digestive step (Fig. 7).

The efficiency of each digestive step was evaluated by calculating the change in total surface area of particulate matter from before to after the digestive step (Fig. 7). The FlowCam captured an image of each particle (microplastic or plankton) from which the area-based diameter (ABD) was calculated by VisualSpreadsheet. The efficacy of each digestive step is indicated by the reduction in total particulate matter ABD. Lorenz et al. (2017) observed that the complete digestion process (all six steps) resulted in a 98.6% reduction in total particulate area.

Following the digestion, the remaining particulate matter was filtered from the water matrix. The total area of particulate matter per mL of sample was calculated using the FlowCam to determine an appropriate volume to be filtered so as not to overburden the filter.