Biodistribution of europium-doped polystyrene nanoplastics in a model invertebrate organism

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Abstract

Tracking unlabelled nanoplastic particles in biological matrices is an analytical challenge due to the chemical similarity between the particles and the surrounding biological material. For biodistribution studies, plastic particles need to be labelled. One of the techniques for tracking metal labelled particles in organisms is laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). The aim of our study was imaging of Eu-doped polystyrene nanoplastics (EuPSs) biodistribution in isopod *Porcellio scaber.* Organisms were exposed to EuPSs via food. Water suspension of EuPSs (10 μg Eu/g dry leaf) was applied onto the hazelnut leaves surface, and fed to isopods for 14 days. EuCl3 was tested (10 and 100 μg Eu/g dry leaf) for comparison of biodistrubution of Eu in case of ionic form with exposure to particles. Morphology of the applied EuPSs on dry leaves as well exposed animals were inspected with scanning electron microscopy (SEM). For LA-ICP-MS, paraffin cross sections of animals were prepared. With SEM we were able to identify EuPSs in the lumen of gut based on their morphological characteristic. Elemental maps obtained by LA-ICP-MS revealed high signal of Eu in the area of the gut and lower in digestive glands. After detailed analysis of selected area of animal exposed to EuPSs, we confirmed that Eu was present only in the lumen of gut and glands and not in the epithelial cells of glands. The results indicate the potential assimilation of Eu from EuPSs, most probably due to dissolution in the digestive tract of the organism or potentially some particles entered the lumen of the glands. **Acknowledgements.** Horizon 2020 PAPILLONS (101000210), PlasticsFatE (965367), Slovenian Research and Innovation Agency (J1-50014; J1-2482, P1-0184, P1-0153), Infrastructural Centre for Microscopy of Biological samples (I0-0022-0481-08) at Biotechnical faculty, UL.

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