

P59

A new source of representative secondary PET nanoplastics. Obtention, characterization, and hazard evaluation

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Micro and nanoplastics (MNPLs) are emergent environmental pollutants requiring urgent information on their potential risks to human health. One of the problems associated with the evaluation of their undesirable effects is the lack of real samples, matching with those resulting from the environmental degradation of plastic wastes. To such end, we propose an easy method to obtain polyethylene terephthalate nanoplastics from water plastic bottles (PET-NPLs) but, in principle, applicable to any other plastic goods sources. An extensive characterization indicates that the proposed process produces uniform samples of PET-NPLs of around 100 nm, as determined by using a multi-angle and dynamic light scattering methodology. An important point to be highlighted is that to avoid the metal contamination resulting from methods using metal blades/burrs for milling, trituration, or sanding, we propose to use diamond burrs to produce metal-free samples. To visualize the toxicological profile of the produced PET-NPLs we have evaluated their ability to be internalized by cells, their cytotoxicity, their ability to induce oxidative stress, and to induce DNA damage. In this preliminary approach, we have detected their cellular uptake, but without the induction of significant biological effects. Thus, no relevant increases in toxicity, reactive oxygen species (ROS) induction, or DNA damage -as detected with the comet assay- have been observed. The use of real samples, as produced in this study, will generate relevant data in the discussion about the potential health risks associated with MNPLs exposures.

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