Assessment of the potential human health risk derived from metals associated to microplastics from recycled and biopolymer-based plastics

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Abstract

Microplastic pollution of seas and oceans have emerged as a priority fight in recent years. Thus, the Directive (EU) 2019/904 of the European Parliament establishes the use of recycled materials or biopolymers instead conventional plastics as regulatory measures, among others. However, the toxicity of microplastics is not considered in these guidelines.
Microplastics from conventional polymers contain potentially hazardous chemicals and toxic additives (metals, plasticizers, etc.) as well as can incorporate them from the environment. Alternative plastics are not free of these chemicals, as they incorporate them in the recycling and manufacturing processes. Therefore, to be considered them as truly sustainable alternatives, the potential environmental and human risks derived from their use must be assessed.

In this work, the assessment of the human health risk derived from metals in microplastics (MPs) of recycled conventional polymer (r-PET) and a renewable and biodegradable biopolymer (polylactic acid, PLA), was accomplished by oral bioaccessibility evaluation (1). Regarding r-PET, samples obtained after different recycling cycles were analyzed. MPs were previously analyzed to determine their metal composition and also submitted to adsorption experiments to simulate metal adsorption onto the polymeric matrix.

Intrinsic metals were found in PLA and r-PET samples, noting that the recycling cycles rised them. It was confirmed that both materials adsorb metals from the environment, which significantly enhances their risk as contamination vectors. However, metal bioaccessible fraction to humans was not appreciable for the metals studied.

(1) Chen, Xj. *et al.* Bioaccessibility of microplastic-associated heavy metals using an in vitro digestion model and its implications for human health risk assessment. *Environ Sci Pollut Res* (2022). (doi.org/10.1007/s11356-022-20983-8)
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