

Plastic particles derived from 3D printed objects, assessment of their cellular transforming potential

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Humans are consistently exposed to micro- and nano-plastics (MNPs) resulting from the degradation of plastic waste, affecting their health. MPs accumulation in tissues and organs raises concerns about cancer induction and validated carcinogenic studies conducted with rodents present economic and ethical dilemmas. Conversely, in vitro cell transformation assays (CTAs) provide information regarding in vivo simulation of initiation and promotion stages of carcinogenesis.

The aim of this study was to assess the cell-transforming potential of MNPs generated during the degradation of 3D printed objects at the end of their lifecycle, using the validated Bhas-42 CTA.

Polycarbonate particles with and without single walled carbon nanotubes (PC-CNT and PC, respectively), and polypropylene particles with and without silver nanoparticles (PP-Ag and PP, respectively) were obtained by cryomilling 3D printed objects. The obtained particles (~0.30 µm) were dispersed following the NanoGenotox protocol and evaluated through the Bhas-42 CTA (OECD guidance 231). In the initiation assay, cells were exposed to the particles for four days and in the promotion assay, for 14 days. The concentrations tested were from 6.25 to 100 µg/ml. Cell growth, internalization and gene expression were assessed in parallel cultures at day 4 of exposure.

All the materials induced concentration-dependent cell growth decrease in the initiation assays, especially PP-Ag. The cell growth decrease was less pronounced in the promotion assays. All the materials were internalized into the cells, nevertheless none of them induced transformed foci in the initiation or promotion assays. Gene expression is still being analysed.

Funding: This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 862419 (SAbyNA).