Size-dependent effects of PSNPLs on human hematopoietic cell lines

A. Tavakolpournegari[1], S. Pastor Benito[1], R. Marcos[1]and A. Hernández[1]

[1] *Departament de Genètica i Microbiology, Facultat de Biociències, Universitat Autònoma de Barcelona, Cerdanyola del Vallès (Barcelona), Spain*
Email: Alireza.tavakolpournegari@uab.cat

Plastics are a serious ecological problem since their wastes pollute any corner of our environment. In the environment, plastic wastes are degraded to microplastics (MPLs, < 5000 nm), and further to nanoplastics (NPLs, < 100 nm). The urgent question, then, is whether these MNPLs can affect human health.

One of the main plastics used for consumer packaging and construction purposes is polystyrene (PS). It is accepted that polystyrene nanoplastics (PSNPLs) can enter the human body translocating epithelial barriers and moving via the blood vessels to inner organs and tissues. Therefore, blood cells can be a direct target of PSNPLs. The hazardous effects of MNPLs may be modulated by various factors, including size. It seems appropriate to consider that size can be a relevant factor affecting cell uptake and, consequently, their potential hazards. Although some studies have focused on the effect of size, most of them involved only the micro range. Thus, there is a lack of data on the modulation of the *in-vitro* toxicological effects caused by PS in the nanometer (nm) range; PSNPLs.

To cover this gap, we have assessed the toxic effects of PSNPLs in three different sizes, 50 nm, 200 nm, and 500 nm on human hematopoietic cell lines. To such end, we have used TK6 (lymphoblast), THP-1(monocytes), and Raji-B (B-lymphocyte) as target cells. After a complete characterization of commercial PSNPLs by TEM (Transmission Electron Microscopy) and Nano Z-sizer, the three cell lines were exposed to different concentrations of all sizes of PSNPLs with various exposure times (24 and 48 hours) to determine cell viability, intracellular reactive oxygen (ROS) production, and cellular internalization (using TEM).

Preliminary results indicate that in exposures lasting for 24 h no changes in cell viability nor in ROS production were observed. These results are relevant if we take into consideration that cell internalization was observed for all sizes and in all three cell lines. Surprisingly, after cell internalization, 50 nm PSNPLs were able to reach the mitochondria of the Raji-B cells. To complete these findings, further mitochondrial function assays, intracellular ROS (at 48 h), and a deeper cell internalization study (by confocal microscopy and flow cytometry) with lab-made labeled PSNPLs are currently in progress.

FUNDING. This work was funded by the EU Horizon 2020 (965196, PlasticHeal) and the Spanish Ministry of Science and Innovation [PID2020-116789, RB-C43].