Synthesis and cytotoxicity evaluation of supported ionic liquids for the purification of p53-minicircle DNA biopharmaceuticals

***João Vasco Valente*[1], *Ana I. Valente*[1], *Augusto Q. Pedro* [1], *Mara G. Freire* [1]**

[1] *CICECO – Aveiro Institute of Materials, Chemistry Department, University of Aveiro, Portugal.*

[(*)] *valente.joao@ua.pt*

Keywords: Biopharmaceuticals; minicircle DNA (mcDNA); Suported Ionic Liquids (SILs); Toxicity.

ABSTRACT

In an aging society, cancer is the second cause of death worldwide with projections of 28.4 million new cases by the year of 2040. Nucleic acids-based biopharmaceuticals, among which the non-viral vector minicicle DNA (mcDNA), are emerging as groundbreaking therapeutic agents for cancer, primarily because of their enhanced therapeutic efficacy, specificity, and reduced occurrence of side effects.[1] Current mcDNA downstream processing methodologies are not as efficient as required, mostly due to the complexity of the biological medium in which mcDNA is produced. To overcome this limitation, innovative materials for the isolation of p53-mcDNA were prepared by covalent attachment of ionic liquids in a solid support (SILs, supported ionic liquid) were prepared, and their potential cytotoxicity was evaluated towards two human cell lines (Caco-2 and HepG2). SILs materials were prepared by the immobilization of different imidazolium- and ammonium-based ILs in spherical silica and characterized using elemental analysis, zeta potential and NMR. The studied materials exhibit low cytotoxic potential with a decrease in cell viability lower than 10% for Caco-2 and 30% for HepG2, respectively. These promising results open the possibility of supported ionic liquids for the purification of p53-minicircle DNA biopharmaceuticals with application in oncology, currently under investigation.

Acknowledgements: This work was developed within the scope of the project CICECO-Aveiro Institute of Materials, UIDB/50011/2020, UIDP/50011/2020 & LA/P/0006/2020, financed by national funds through the FCT/MCTES (PIDDAC). This work was also developed within the framework of the project "PureDNA - Development of cost-effective platforms based on ionic liquids for the purification of p53-minicircle DNA biopharmaceuticals with application in oncology", 2022.03394.PTDC, financially supported by national funds (OE), through FCT/MCTES. Augusto Q. Pedro acknowledge FCT for the research contract CEECIND/02599/2020 under the Scientific Stimulus – Individual Call.

References: [1]Walsh, G. Biopharmaceutical benchmarks 2018, Nature Biotechnology 2018, 36, 1136-1145, doi:10.1038/nbt.4305.