Protective effect of metal nanoparticles functionalized against ionizing radiation induced oxidative stress

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Exposure to ionizing radiation causes oxidative stress due to the generation of reactive oxygen species, which can lead to severe cellular damage. Functionalized metallic nanoparticles, such as silver (AgNPs) and gold (AuNPs), have emerged as promising candidates for radioprotective applications, thanks to their tunable surface chemistry and ability to interact with biological systems. It is already acknowledged that the use of AuNPs functionalized with GSH (glutathione) brings a reduction of oxidative stress levels in human neural stem cells [1]. The goal of this study is to investigate the potential protective role of AgNPs and AuNPs functionalized with GSH against radiation-induced oxidative damage. Surface characterization of the proposed nanomaterials was carried out using synchrotron-based XPS and NEXAFS techniques to understand nanoparticle composition and molecular and electronic structure. Biological assays include fibroblast viability tests under different nanoparticle concentrations and incubation times, as well as TEM imaging to evaluate nanoparticle internalization. The next phase of the research will focus on irradiating cell cultures under controlled conditions, to compare the effects of silver- and gold-based nanosystems. These results are expected to inform the design of efficient and selective nanomaterials for use in radiation protection.

[1] Chiang MC, Nicol CJB. GSH-AuNP anti-oxidative stress, ER stress and mitochondrial dysfunction in amyloid-beta peptide-treated human neural stem cells. Free Radic Biol Med. **2022** Jul;187:185-201. doi: 10.1016/j.freeradbiomed.2022.05.025. Epub 2022 Jun 1.