THE HIGHLY REPRODUCIBLE AND ECO-FRIENDLY SYNTHESIS OF SILVER, GOLD AND SILVER/GOLD NANOCRYSTALS AND THEIR POTENTIAL ANTI-CANCER THERAPEUTIC PROPERTIES

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Monometallic silver and gold, and bimetallic silver/gold nanocrystals (Ag-NCs, Au-NCs, and Ag/Au-NCs, respectively) have been object of intense research during the last years, mainly due to their excellent antimicrobial effects, as well as their potential applications in anticancer treatments. The aim of this experimental work was to establish a highly reproducible green synthesis of colloidal noble metal nanocrystals. Furthermore, the potential anti-cancer therapeutic properties of the synthesized nanostructures were evaluated on the breast cancer cell line SKBR-3 by MTT cytotoxicity assay. In this work, we report the eco-friendly synthesis of Ag-NCs, Au-NCs, and Ag/Au-NCs using starch as capping and reducing agent. The optical properties, reproducibility and stability of the colloidal nanomaterials were characterized by UV-visible, in which the wavelength of the maximum absorbance \( \lambda_{\text{max}} \) were localized at \( \lambda_{\text{max}} = 405 \pm 3, 525 \pm 2 \) and \( 460 \pm 2 \) nm for Ag-NCs, Au-NCs, and Ag/Au-NCs, respectively. The structural properties were determined by means of IR spectroscopy and X-ray diffraction, in which the diffraction signals due to fcc crystal structure were observed for all the samples. The shape and size of the nanocrystals were studied by high-resolution TEM and DLS. These experimental results showed that the metallic nanostructures are icosahedral in shape with a narrow particle size distribution of 11.3 ± 4.7, 30.7 ± 2.4 and 10.2 ± 3.7 nm for Ag-NCs, Au-NCs, and Ag/Au-NCs, respectively. The evaluation of the cytotoxic effect of the nanomaterials on the breast cancer cell line SKBR-3 showed that the IC50 after 72 h of treatment for Ag-NCs, Au-NCs and Ag/Au-NCs were 11.5, 93.6 and 15.4 mM, respectively. Finally, this study may open up the possibility to test the noble metallic nanostructures using a complete breast cancer cell line panel.

Keywords: Green synthesis, Anti-cancer treatment, Noble metal nanoparticles

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