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Turmeric silver nanoparticles in melanoma photodynamic therapy

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Abstract. Melanoma is a very aggressive and lethal type of skin cancer due to its elevated propensity to spread to other organs. Melanoma treatment has advanced significantly in the past decades, with different treatment modalities, including chemotherapy, surgery, radiotherapy, immunotherapy, and targeted therapy, utilized to treat melanoma. However, these treatment options remain limited because of their inability to prevent resistance and disease progression. Photodynamic therapy (PDT) is a promising, less-invasive therapeutic method for treating neoplastic and premalignant lesions. It utilizes light of a specific wavelength to activate a photosensitizer, triggering reactive oxygen species production and subsequently causing cytotoxic cell damage and death. The purpose of this study is to examine the efficacy of turmeric-derived silver nanoparticles (TuAgNPs) in mediating melanoma PDT. TuAgNPs were synthesized and characterized using UV-vis spectroscopy, zeta potential analysis, and high-resolution transmission electron microscopy (HRTEM). A375 cells Melanoma cell lines (A375) were seeded and cultivated in complete media in an incubator set at 37℃, 85% humidity, and 5% CO_2. The cells were treated with different concentrations of TuAgNPs, then irradiated using laser light at a 430 nm wavelength and 5 J/cm². Post-laser irradiation assays, including MTT (3-(4,5-dimethylthazolk-2-yl)-2,5-diphenyl tetrazolium bromide), localization analysis, and morphological studies, were conducted to evaluate the cellular response of the treated cells. The TuAgNPs characterization analysis confirmed the formation of stable and spherically shaped nanoparticles. The localization analysis showed the cellular uptake and internalization of TuAgNPs in A375 cells. The MTT results indicated increased cytotoxicity in the treated cells, and morphological changes and deformations were observed in the PDT-treated cells. These findings suggest that TuAgNPs can serve as effective photosensitizers in melanoma PDT. Further, in vivo research could be required to assess the clinical efficacy of TuAgNPs-mediated PDT.

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