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RESEARCH PAPER

Synergistic effects of CuO/TiO₂-chitosan-farnesol nanocomposites: Synthesis, characterization, antimicrobial, and anticancer activities on melanoma cells SK-MEL-3

Thangavelu Indumathi , Jagadeesh Suriyaprakash, Abdullah A. Alarfaj, Abdurahman Hajinur Hirad, Ravindran Jaganathan, Maghimaa Mathanmohun

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Abstract

The current investigation focuses on synthesizing copper oxide (CuO)-titanium oxide (TiO₂)-chitosan-farnesol nanocomposites with potential antibacterial, antifungal, and anticancer properties against Melanoma cells (melanoma cells [SK-MEL-3]). The nanocomposites were synthesized using the standard acetic acid method and subsequently characterized using an X-ray diffractometer, scanning electron microscope, transmission electron microscopy, and Fourier transform infrared spectroscopy. The results from the antibacterial tests against *Streptococcus pneumoniae* and *Staphylococcus aureus* demonstrated significant antibacterial efficacy. Additionally, the antifungal studies using *Candida albicans* through the agar diffusion method displayed a considerable antifungal effect. For evaluating the anticancer activity, various assays such as MTT assay, acridine orange/ethidium bromide dual staining assay, reactive oxygen species (ROS) generation assay, and mitochondrial membrane potential (MMP) analysis were conducted on SK-MEL-3 cells. The nanocomposites exhibited the ability to induce ROS generation, decrease MMP levels, and trigger apoptosis in SK-MEL-3 cells. Collectively, the findings demonstrated a distinct pattern for the synthesized bimetallic nanocomposites. Furthermore, these nanocomposites also displayed significant ($p < 0.05$) antibacterial, antifungal, and anticancer effects when tested on the SK-MEL-3 cell line.

CONFLICT OF INTEREST STATEMENT