SYNERGISTIC ANTICANCER POTENTIAL OF GREEN SYNTHESIZEDNANOPARTICLES AND PHEOPHORBIDE A-MEDIATED PHOTODYNAMIC THERAPY IN LUNG CANCER

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Lung cancer is one of the most common cancers that affects both men and women and is regarded as the leading cause of cancer related deaths. It is characterized by the unregulated cell division of altered cells within the lung tissues. Green nanotechnology is a promising therapeutic option that is adopted in cancer research. Dicoma anomala (D. anomala) is an African medicinal plant used for the treatment of various medical conditions which includes cancer. In this study, silver nanoparticles (AgNPs) were synthesized using D. anomala MeOH root extract. We further evaluated the anticancer efficacy of the synthesized AgNPs as an individual treatment as well as in combination with pheophorbide a (PPBa) mediated photodynamic therapy (PDT). UV-VIS spectroscopy, high-resolution transmission electron microscopy (HR-TEM), Scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS) was used to confirm the formation of D.A AgNPs. Post 24 h treatment, A549 cells were evaluated for ATP proliferation, morphological changes supported by LIVE/DEAD assay, and caspase activities. The results revealed a dose-dependent decrease in cell proliferation in both individual and combination therapy of PPBa mediated PDT and D.A AgNPs on A549 lung cancer cells with significant morphological changes. Additionally, the LIVE/DEAD assay displayed a significant increase in the number of dead cell population in individual treatments (i.e., IC50's treated A549 cells) as well as in combination therapy. In conclusion, the findings from this study demonstrated the anticancer efficacy of green synthesized AgNPs as a mono-therapeutic drug as well as in combination with a chlorophyll derivative PPBa in PDT. Taken together, the findings highlight the therapeutic potential of green nanotechnology in medicine.

Keywords: Lung cancer; green nanoparticles; silver nanoparticles; Dicoma anomala; photodynamic therapy; pheophorbide a

Biography

Blassan George is a Professor at the Laser Research Centre, Faculty of Health Sciences, University of Johannesburg, South Africa. His research focuses on the photodynamic therapy of cancer. He is an NRF Y1 rated scientist, and received funding from various external funding bodies including South Africa Medical Research Council, National Research Foundation, African Laser Centre etc. He has presented his research outcomes in more than 30 international conferences. He is supervising 2 masters, 4 PhD and 2 postdoc students and completed 3 PhD, and 10 masters. He has published 75 articles in peer-reviewed international journals, 16 book chapters and 8 conference proceedings with h-index (21-Scopus, 23-Google Scholar).