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Chitosan encapsulated ZnO nanoparticles with cell specific apoptosis induction through P53 activation and G2/M arrest in breast cancer cells (MCF 7) – *in vitro* approaches

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The anti-cancer agents that induce apoptosis are one of the most efficient strategies in cancer chemotherapy. Hence the present investigation was aimed to explore the anticancer potentials of Rivina humilis. So, reduced zinc nanoparticles capped with chitosan against breast cancer cell line (MCF-7) were used. The zinc oxide nanoparticle reduction and encapsulation of chitosan was studied using biophysical characterization like UV, FTIR which depicted the proper bonding of Ch-Rh-ZnONPS. The size, shape, dispersion and uniform distribution of biosynthesized nanoparticle was examined using field emission scanning electron microscope (FESEM) and transmission electron microscope (TEM) respectively. The spherical and cubic shaped nanoparticles were dispersed in water and used for anticancer study on MCF-7 *in vitro* model. MTT assay showed the toxicity induced by Ch-Rh-ZnONPS at dose dependent manner of 20, 40, 60, 80 and 100 µg/mL whose IC50 value 42 µg/mL respectively. Bright field light microscopic study showed the apoptotic morphology of treated and control MCF-7 cells. Fluorescence staining A/O: EB and DAPI nuclear staining methods further cleared the chromosome condensation, nuclear fragmentation and confirms the apoptosis induced by Ch-Rh-ZnONPS within IC50 concentrations. Significant cell cycle arrest at particular stage of G2/M was achieved with the nano complex treatment at dose dependent manner. Finally, it was observed that the apoptotic genes and protein expressions of MCF-7 cell line were up and down regulation with the treatment of Ch-Rh-ZnONPS when compared to normal cells.

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