

Sensitivity of A-549 human lung cancer cells to nanoporous zinc oxide conjugated with Photofrin

Abstract

In the present study, we demonstrated the use of nanoporous zinc oxide (ZnO NPs) in photodynamic therapy. The ZnO NPs structure possesses a high surface to volume ratio due to its porosity and ZnO NPs can be used as an efficient photosensitizer carrier system. We were able to grow ZnO NPs on the tip of borosilicate glass capillaries (0.5 μm diameter) and conjugated this with Photofrin for efficient intracellular drug delivery. The ZnO NPs on the capillary tip could be excited intracellularly with 240 nm UV light, and the resultant 625 nm red light emitted in the presence of Photofrin activated a chemical reaction that produced reactive oxygen species (ROS). The procedure was tested in A-549 cells and led to cell death within a few minutes. The morphological changes in necrosed cells were examined by microscopy. The viability of control and treated A-549 cells with the optimum dose of UV/visible light was assessed using the MTT assay, and ROS were detected using a fluorescence microscopy procedure.