Empirical Modeling of Zn/ZnO Nanoparticles Decorated/Conjugated with Fotolon (Chlorine e6) Based Photodynamic Therapy towards Liver Cancer Treatment

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Abstract:

The current study is based on Zn/ZnO nanoparticles photodynamic therapy (PDT) mediated effects on healthy liver cells and cancerous cells. The synthesis of Zn/ZnO nanoparticles was accomplished using chemical and hydrothermal methods. The characterization of the synthesized nanoparticles was carried out using manifold techniques (e.g., transmission electron microscopy (TEM), X-ray diffraction (XRD), and energy dispersive X-ray spectroscopy (EDS)). In order to study the biotoxicity of the grown nanoparticles, they were applied individually and in conjunction with the third generation photosensitiser Fotolon (Chlorine e6) in the in vivo model of the normal liver of the Wister rat, and in the in vitro cancerous liver (HepG2) model both in the dark and under a variety of laser exposures (630 nm, *Ultraviolet* (UV) light). The localization of ZnO nanoparticles was observed by applying fluorescence spectroscopy on a 1 cm^2 selected area of normal liver, whereas the in vitro cytotoxicity and reactive oxygen species (ROS) detection were carried out by calculating the loss in the cell viability of the hepatocellular model by applying a neutral red assay (NRA). Furthermore, a statistical analysis is carried out and it is ensured that the p value is less than 0.05. Thus, the current study has highlighted the potential for applying Zn/ZnO nanoparticles in photodynamic therapy that would lead to wider medical applications to improve the efficiency of cancer treatment and its biological aspect study.

Keywords: ZnO nanoparticles; photodynamic therapy; photosensitizer; hepatocellular model; bio toxicity