ZINC OXIDE NANOSTRUCTURES UTILIZATION IN DRUG DELIVERY NANOSYSTEMS

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Abstract - This study delves into the significant role of zinc oxide nanostructures, including zero-dimensional (0D) nanoparticles and one-dimensional (1D) nanostructures, in the field of nanotechnology-based drug delivery systems. The focus here is on their exceptional potential in cancer therapy, where they serve not only as carriers for pharmaceutical agents but also as entities capable of selectively triggering apoptosis in cancer cells through the controlled generation of reactive oxygen species (ROS). Recent research has also highlighted the wide-ranging applications of ZnO nanostructures in DNA manipulation, bioimaging, and agricultural defense. Furthermore, this research demonstrates how the integration of these nanostructures into polymeric nanocomposites improves solubility and biocompatibility. It uncovers the crucial role of polymers in this symbiotic system, influencing release selectivity and facilitating targeted interactions with tissues. Specifically engineered polymeric nanocomposites show promise for targeted drug delivery in cancer treatment, exhibiting an affinity for specific cell receptors and enhanced cellular uptake within the size range of 100 – 200nm. In summary, this investigation underscores the remarkable potential of zinc oxide nanostructures in the emerging field of nanotechnology-driven drug delivery systems, especially in the context of cancer treatment.

Keywords: *zinc oxide, drug delivery, zinc oxide nanoparticles, nanocomposites, nanodelivery system.*