

Functionalization of ZnO nanoparticles by 3-mercaptopropionic acid for aqueous curcumin delivery: Synthesis, characterization and anticancer assessment

M Reza Khorramizadeh¹, Seyed-Behnam Ghaffari², Mohammad-Hossein Sarrafzadeh², Zahra Fakhroueian² and Shadab Shahriari¹

¹Tehran University of Medical Sciences, Iran

²University of Tehran, Iran

Inherent biocompatibility and stability of zinc oxide nanoparticles (ZnO-NPs) and their biomedical potentials make them an emerging candidate for drug delivery. The aim of this study was to develop and assess a simple procedure for surface functionalization of ZnO-NPs by 3-mercaptopropionic acid (MPA) for water-soluble curcumin delivery. Carboxyl-terminated ZnO nanoparticles were successfully made using ZnCl₂ and NaOH in the presence of MPA. The functional groups were activated by 1, 1'-Carbonyldiimidazole (CDI) and the curcumin bonding was carried out at room temperature for 24 h. The core-shell nanocomposite had a significant better solubility versus free curcumin, as characterized by XRD, FTIR, UV-Vis spectrophotometry, DLS, and TEM, $p < 0.005$. In addition, MTT cytotoxicity assessment on MDA-MB-231 breast cancer cells revealed a drop of IC₅₀ values

from 5 µg/mL to 3.3 µg/mL for free curcumin and ZnO-MPA-curcumin complex, respectively. This result showed an augmented cancer-inhibitory effect of nanoconjugate complex. In conclusion, the presented improved solubility and elevated functionality of novel ZnO-MPA-curcumin nanoformula is promising, and could be considered for new therapeutic endeavors.

Speaker Biography

M Reza Khorramizadeh, is a full Professor at Tehran University of Medical Sciences (TUMS), directs Biosensor Research Center and newly instituted Zebra Fish Core Lab at Endocrinology and Metabolic Molecular-Cellular Sciences Institute. Concurrently, he is a 2nd affiliation to the Dept. of Medical Biotechnology, School of Advanced Technology in Medicine, TUMS.

e: khoramza@tums.ac.ir

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