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Development, optimization and characterization of sulforaphane conjugated gold nanoparticles for anticancer drug delivery

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Statement of Problem: Gold nanoparticles are known to be passively up taken by cancer cells and that leads to cytotoxic effect on them and sulforaphane has been found to be effective in cancer treatment thus the conjugated particles are expected to have enhanced anticancer effect without affecting the normal cells.

Methodology & Theoretical Orientation: Sulforaphane was extracted from commercially available broccoli and broccoli sprouts. The gold nanoparticles were conjugated with sulforaphane and optimized using design expert software version 9.0.1. Simulations were performed using simulation software Quntumwise. Particle size distribution and zeta potential were measured by dynamic light scattering (DLS) technique. The in vitro release study of the gold nanoparticle conjugates of SFN and SFN suspension was performed. Surface morphology and size of the formulation was performed by TEM and SEM. FTIR Studies helped in determining the bonding. The stability studies of the nanoparticle were carried out as per the guidelines given in the ICH Q1A (R2). *In vivo, ex vivo* gut permeation studies, confocal imaging of gut sample was performed so as to check the bioavailability and permeability of the formulation. An MTT assay was used to assess the cytotoxicity was done on Caco-2 cells (ATCC, USA grown in Dabur Research Foundation, Sahibabad) and other carcinoma cell lines.

Findings: DSC data confirms that drug has been incorporated with gold nanoparticles. Confocal studies reveal that the extent of permeation of sulforaphane conjugated gold nanoparticles i.e., SGnp has shown an increase in permeation. Particle size measurement of simple gold NP before loading drug was measured and confirmed on TEM also. FTIR Data reveals linking between drug and gold nanoparticles. In vitro drug release kinetics showed that both formulations showed release profile showing first order release. Stability studies revealed stable formulations. MTT assays reveal that the formulations have cytotoxicity of more than 70% at 48 hours. The pharmacokinetic data revealed that the SGnp enhanced oral bioavailability as compared to plain sulforaphane.

Conclusion & Significance: It can thus be concluded that gold nanoparticles gives an added advantage of greater stability, more cytotoxicity towards cancer cells and enhanced permeation through GIT.

Biography

Kriti Soni is presently working on development of an anticancer treatment as a PhD Research Scholar in the Department of Pharmaceutics, Faculty of Pharmacy, Jamia Hamdard. She has done MPharm and has qualified UGC-NET in 2012 with 29th rank all India. She has been awarded with the Best Poster Award for her research titled: Lipid drug conjugated nanoparticles for oral delivery of an anti-folate drug at the 5th International Conference and Exhibition on Pharmaceutics and Novel Drug Delivery Systems at Dubai, UAE.

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