Pharmaceutical nanotechnology approach to improve the aqueous solubility and antioxidant properties of curcumin

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Statement of the Problem: Over the years, curcumin has been demonstrated to exhibit potent pharmacological effects such as in the treatment of cancers, diabetes, obesity, Alzheimer's disease and inflammatory disorders. However, this polyphenolic phytochemical suffers from the extremely low absorption rate *in vivo* which has restricted its oral bioavailability. The low bioavailability of curcumin has been attributed to the problems of low aqueous solubility, poor dispersibility and extensive first pass metabolism. Nano-pharmaceutics approach has been applied to help solve the bioavailability problems of curcumin and to enhance its antioxidant activity.

Methodology & Theoretical Orientation: Ethylcellulose coated curcumin nanoparticles were prepared by following nanoprecipitation method. The surface morphology of the nanoparticle, its size distribution and zeta potential were analyzed along with drug release mechanism and antioxidant activities.

Findings: The z-average diameter (d) was found to be 472 nm and the particles were found to possess a negative zeta-potential. There was a significant improvement in the aqueous dispersibility of curcumin with the nano-formulation. Release of curcumin follows Fickian diffusion and was sustained for over 12 hours. Antioxidant activity and inhibition of lipid peroxidation was also improved by the nanoparticulate formulation.

Conclusion & Significance: The solubility of poorly aqueous soluble curcumin was significantly increased by the nanoparticulate formulation and the colloidal dispersion also improves the curcumin's antioxidant activity as well as the inhibition of lipid peroxidation inhibition.