Pharm Anal Acta 2015, 6:1
http://dx.doi.org/10.4172/2153-2435.S1.025

OMICS International
Pharmaceuticalconferences.com

5th International Conference and Exhibition on
Pharmaceutics & Novel Drug Delivery Systems
March 16-18, 2015 Crowne Plaza, Dubai, UAE

Lipid complexed nanocrystals - A safe approach in development of stable nanoparticulates (*in-vitro* and *in-vivo*) for effective drug delivery

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Nanoparticulates (NPs) are developed with an aim to improve the solubility, targetability and bioavailability of a drug. Lipid Complexed Nanocrystals (LNCs) are novel and unique nanoparticulates offering high solubility and stability both *in vitro* and *in vivo*, hence making it more sustain to body fluids (electrolytes). *In vitro* instability (particle aggregation) of NPs may decrease its functional behavior *in vivo* leading to decreased bioavailability. Development of functional NCs requires modification of its surface properties in sequence to make them clinically more acceptable. The study aim to develop Glimepiride NCs using PEG 20000 by nanonization (precipitation) and stabilize them (both *in vitro* and *in vivo*) by complexation using Phospholipon 90 G (P 90G). Particle and solid state characterization studies were performed on NCs before and after complexation using photon correlation spectroscopy (PCS) and X-ray diffraction spectrometry (PXRD), differential scanning calorimetry (DSC), scanning electron spectroscopy (SEM) and fourier transform infrared spectroscopy (FTIR). *In vivo* drug targeting efficacy of LNCs was studied on pancreas of Male Wistar rats using HPLC. The particle and solid state characterization results show improved stability (decreased aggregation) with no change in drug properties after complexation. *In vivo* results on optimized LNCs show similar drug concentration in pancreas of rat as that of pure drug. AUC was significantly higher after 1 h signifying better *in vivo* stability. It can be concluded that *in vitro* and *in vivo* stability of NCs could be achieved by a complexation using P90 G. The possible outcome of these studies could result in development and delivery of stable and safe nanoproducts in the treatment of diabetes.

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Proniosomes gel containing Acyclovir as potential carrier for enhanced dermal permeation

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Proniosomes propose a multifaceted vesicle delivery system with potential transfer of drugs via topical route. The primary objective of the current research was to develop proniosome gel containing acyclovir for skin delivery. Various formulations were prepared by coacervation techniques with various combinations of non-ionic surface active agents, phospholipids and cholesterol. A 32 factorial design was designed to investigate the effect of Spans to Tweens (X1) ratios and cholesterol to lecithin (X2) ratios on the dependent variables like vesicle size (Y1), entrapment efficiency (Y2) and drug accumulation in the stratum corneum (Y3). The optimized proniosome formulations were evaluated for entrapment efficiency, surface morphology, drug release, *in vitro* permeation, skin deposition, skin sensitivity and stability studies. In vitro drug release from the optimized formulation was found to be 2.89%, in vitro drug permeation on rabbit skin showed 8.72 µg/cm2/hr and percentage drug accumulation in the stratum corneum was 83.43% after 24 hr. The optimized formulation was stable for three month at controlled room temperature (25^0C and 75% RH). In vitro permeation studies confirmed that the proniosome formulation had accumulated in upper epidermal layers more than conventional acyclovir gel. Based on the promising outcomes, the present investigation concludes that the proniosomes could be a most feasible vesicular delivery system for the effective topical transport of acyclovir.

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