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Optimized positively charged self-nanoemulsifying systems of candesartan cilexetil with enhanced bioavailability potential

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Nanostructured drug delivery systems have recently gained higher potential in drug delivery with special on bioavailability enhancement of poorly water soluble drugs. Such systems include liposomes, nanoparticles, nanoemulsions, nanotubes, nanocomposites and many more. Positively charged self-nanoemulsifying drug delivery systems (P-SNEDDS) are newer and innovative drug delivery innovations which have proved significant potential to augment the oral bioavailability of lipophilic drugs. Due to the cationic charge, such systems have enhanced interaction with mucosal surface and subsequently increased cellular uptake of drugs, leading to enhanced dissolution and permeation, bypassing hepatic first-pass effect (HPE) and P-gp efflux.

The current research work entails formulation development and evaluation of P-SNEDDS of candesartan cilexetil, a BCS class II drug exhibiting extensive HPE and low oral bioavailability (15%), using Formulation by Design (FbD). Pseudo-ternary phase diagrams and FT-IR studies facilitated selection of constituents for P-SNEDDS viz., lauroglycol 90 (oil), tween 40 (surfactant), transcutol HP (co-surfactant) and oleylamine (cationic charge inducer). A D-optimal mixture design (three factors and two levels) was employed for optimizing P-SNEDDS employing Design Expert® software. Globule size, percent dissolution efficiency, MDT, amount permeated through intestine and emulsification time were employed as response variables to optimize the formulation. The optimized formulation was studied for *ex vivo* permeability using everted sac technique, *in vivo* pharmacokinetics studies and *in situ* single pass perfusion (SPIP) studies in Wistar rats. The curvilinear 3-D response surface and 2-D contour plots construed remarkable diminution in globule size and consequent improvement in drug release (>90% in 15 min) with decreasing oil and increasing surfactant and co-surfactant levels. Pharmacokinetic and SPIP studies on the optimized positively charged system revealed 3-4 fold bioavailability enhancement vis-à-vis the marketed formulation (CANDESARTM) and significant improvement as compared to conventional SEDDS. In a nutshell, the P-SNEDDS have immense potential to significantly enhance bioavailability of poorly soluble drugs.

Biography

Sarwar Beg is a Doctoral Research Fellow in Pharmaceutics from Panjab University, Chandigarh, India. Currently, he is also a recipient of UGC-Research Fellowship in Science for Meritorious Students (RFSMS), Ministry of HRD, Govt. of India. He worked as a Trainee Research Associate from Ranbaxy Laboratories Limited, India. Also, he has worked as Assistant Professor for one in Roland Institute of Pharmaceutical Sciences, Berhampur, India. His major area of research interests include Self-emulsifying Drug Delivery, Oral Controlled Release Drug Delivery, Nanotechnology Based Drug Delivery using Microspheres, Nanoparticles, Dendrimers, Carbon nanotubes and Nanocomposites. Till date he has more than 20 publications in drug delivery in various high impact International journals, 2 book chapters, 2 Indian patents and attended 5 national and International conferences to his credit.

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Synthesis and characterization of ZnO nanoparticles by simple chemical route

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In the present work, ZnO nanoparticles have been synthesized using simple chemical route. The structural and optical properties of ZnO have been investigated using XRD and UV-Visible absorption spectroscopy, respectively. The results of the XRD and TEM showed that the average particle size of ZnO particles increases with increasing calcinations temperature. Furthermore, the FTIR showed a broad absorption band related to Zn-O vibration band. The band gap of the zinc oxide nanoparticles was estimated from the UV-Vis absorption. It was observed that the band gap of the samples remains almost constant i.e (3.17eV) for different calcination temperature from 700^{o}C to 900^{o}C. ZnO is a wide band gap semiconductor that displays high optical transparency and luminescent properties in the near ultra violet and visible regions. Due to this properties ZnO is a promising material for electronic and optoelectronic applications such as solar cells, gas sensors, heat mirrors, liquid crystal displays, surface acoustic wave devices etc.

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