

4th International Conference and Exhibition on Pharmaceutics & Novel Drug Delivery Systems

March 24-26, 2014 Hilton San Antonio Airport, San Antonio, USA



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Ultra-small nanoparticles of pegylated deoxycholic acid conjugated polyhydroxybutyrate block copolymers for targeted delivery of therapeutics

We have employed the solvent-diffusion and solvent evaporation technique to produce, for the first time, ultra-small nanoparticles (NPs) (<10 nm size) of PEGylated deoxycholic acid conjugated polyhydroxybutyrate block copolymers (DOCA-PHB-PEG) by trans-esterification reaction. These devices were capable of encapsulating hydrophobic (e.g., 5-fluorouracil) and hydrophilic (e.g., insulin) drugs and delivering these to the colon after suitably coating with Eudragit S100. Cellular uptake of these NPs after attachment of fluorophore was demonstrated in order to enable a better understanding of the effect of ultra-small size on the NP transport to the cells with low cytotoxicity as demonstrated by the hyperspectral imaging and confocal live cell imaging, both of which revealed that FITC-insulin labeled NPs showed higher time-dependant cellular uptake. *In vitro* release kinetics of insulin from these devices in pH 1.2 media for 2 h, followed by pH 7.4 up to 24 h was investigated. The *in vivo* pharmacokinetic (PK) and pharmacodynamic (PD) studies in streptozotocin induced diabetic rat model revealed their controlled release characteristics. These enteric coated NP formulations were capable of maintaining the blood glucose levels for up to 24 h and are proved to be suitable for transmucosal delivery of insulin and/or anticancer drugs to the colon. The advantages of these NPs are that they exhibit excellent potential in delivering intra-cellular therapeutics. Our recent data will be discussed with specific examples of the steps involved in the preparation of NPs and understanding their delivery profiles for 5-fluorouracil and insulin to the colon.

Biography

Professor Tejraj M. Aminabhavi did Ph.D. from University of Texas-Austin, USA. He is Associate Editor, Chemical Engineering Journal, Elsevier and International Advisory Board Member for Journal of Applied Polymer Science (USA) & Polymer Plastics Technology and Engineering (USA). Tejraj is AICTE Emeritus Professor and Research Director for Soniya College of Pharmacy, India.

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