J Nanomed Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C1-068

Preparation and characterization of a biodegradable mPEG-PCL micelle as a controlled release formulation for Curcumin-docetaxel for treatment of atherosclerosis

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Purpose: In Atherosclerosis, vessels wall getting narrow and stiff. It is referring to buildup LDL (low density lipoprotein) and as a result, blood and nutrition cannot pass through artery. Also, endothelial cells are injured, and smooth muscle cells immigrate into the Intima. Therefore, anticancer drugs would be appropriate choice for treatment. Curcumin and Docetaxel showed anti-inflammatory and anti-proliferative effects respectively. But their clinical application has been limited due to the fact that hydrophobicity and poor bioavailability. For this reason, a potent mPEG-PCL micelle system was synthesized and release profile of Curcumin and Docetaxel from drug- loaded micelles was characterized.

Methods: In this study, monomethoxypoly (ethylene glycol)-poly (ε-caprolactone) (mPEG-PCL) copolymer through ring opening polymerization was synthesized. Core-shell micelles were created self- assembly in aqueous solution. Then Curcumin and Docetaxel were loaded by nano precipitation method which lead to creation of Curcumin-Docetaxel /loaded mPEG-PCL (Cu-Do/ mPEG-PCL). The Curcumin-Docetaxel/loaded mPEG-PCL were characterized in vitro through H1NMR, FT-IR and GPC technique. Further characterization by DLS and AFM has been done.

Result: H1NMR, FT-IR and GPC information confirm the successful formation of mPEG-PCL copolymer. FM analysis showed the spherical shapes of CUDO/mPEG-PCL micelle with size of 52.6nm. The encapsulation efficiency of CuDo is 48% with drug loading percentage of 15%. In vitro release of Cu-Do micelles strongly revealed the behavior of release which followed by zero order delivery profile.

Conclusion: A Data analysis result indicates the successful formation of CuDo/mPEG-PCL micelle. As a result, Cu-Do/mPEG-PCL micelle is an appropriate and effective system for treatment of Atherosclerosis.

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