Research in Pharmaceutical Sciences, 2012;7(5)
School of Pharmacy and Pharmaceutical Sciences
Isfahan University of Medical Sciences

Polymeric magnetic nanoparticles for co-administeration of paclitaxel and verapamil to cancer cells

F. Ahmadi[1,*], S. Mehrvarz[2], A. Zargari Samadnejad[2], S. Alipour[1]

[1]Department of Pharmaceutics, Faculty of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran
[2]Student Research Committee and Department of Pharmaceutics, Faculty of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran

Background and Aims: There has been considerable interest in developing magnetic nanoparticles as localized drug delivery carriers. Paclitaxel (PTX) is an effective chemotherapeutic agent which is used for various cancers. PTX is a substrate of cell efflux pumps and some tumors show resistance to PTX due to multi drug resistance (MDR) phenotype. Verapamil is a calcium channel blocker able to reverse the resistance caused by P-glycoprotein (P-gp). Development of a drug delivery system capable of co-administration of paclitaxel and a P-gp inhibitor to cancer cells would be valuable for overcoming drug resistance.
Methods: PLGA-magnetic nanoparticles (MNP) were prepared using magnetic nanoparticles and PLGA for the purpose of magnetic drug delivery. Magnetic nanoparticles of magnetite were prepared by chemical co-precipitation of ferric and ferrous chloride salts in a strong basic solution (ammonium hydroxide). PLGA-MNP containing paclitaxel and verapamil were prepared by a modified O/W emulsion solvent evaporation technique. The morphology, size, drug loading efficiency and drug release from the particles were investigated. Cell culture studies in resistant and susceptible cell lines are under development.
Results: Magnetic nanoparticles before encapsulation in PLGA particles were less than 100 nm in size. All MNPs were almost spherical in shape and were found to have a mean diameter within the range of 400-800 nm. Drug encapsulation efficiency of magnetic-nanoparticles was 63% for 2min sonication. MNPs were responsive to external magnetic field.
Conclusions: Magnetic-PLGA nanoparticles developed in this study may be used as a potential delivery system for reversion of MDR in cells resistant to PTX.

Keywords: Magnetic nanopaticles; Paclitaxel; Verapamil