Research in Pharmaceutical Sciences, 2012;7(5)
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Preparation and characterization of inhalable and targeted nanocomposite particles of doxorubicin for treatment of lung cancer

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Background and Aims: The present study has designed to explore synthesis method of albumin conjugated with haloperidol for drug delivery. Haloperidol is a well known antagonist of sigma receptor talented to target nanocomposites of albumin due to the overexpression of sigma receptors in lung cancerous cells and hence this is well designed drug delivery systems for delivery of doxorubicin as a chemotropic agent in treating lung cancer. The basic motivation for designing this nanocapsule is to obtain high percentage of drug loading within the designed carrier and achieving controlled release of the drug over the physiological pH range. It is estimated that connecting of albumin to the haloperidol can improve drug delivery efficacy due to the specialize attaching of nanocapsules.

Method: In this study, initially, we have synthesized haloperidol succinate in the presence of (10 mol% DMAP) as catalyst in dry toluene under N_2 atmosphere and reflux condition. Purification of the resulting product was carried out by recrystallization and the purified product was characterized using FTIR and ^{1}H NMR (DMSO-d_6 as solvent) methods. Afterward, the haloperidol succinic acid has attached to albumin through activation by EDC/NHS in a mixture of DMSO/H_2O and finally, the purification of the resulting product was carried out by freeze-drying and dialyzing (MW cutoff 12 kDa) against acetate buffer (pH= 5.5-6). The purified product was then characterized using FTIR spectroscopy.

Results: The structure of the haloperidol succinate and synthesized conjugated product was confirmed by FTIR and ^{1}HNMR and according to these results albumin and haloperidol are chemically bonded.

Conclusions: The production of albumin conjugated haloperidol is possible by EDC/NHS chemical reaction and the designed conjugated product is useful for loading by doxorubicin.