

Enhanced anti-mammary gland cancer activities of tamoxifen-loaded erythropoietin-coated drug delivery system

ABSTRACT

Nanomedicine is an emerging area in the medical field, particularly in the treatment of cancers. Nanostructured lipid carrier (NLC) was shown to be a good nanoparticulated carrier for the delivery of tamoxifen (TAM). In this study, the tamoxifen-loaded erythropoietin-coated nanostructured lipid carriers (EPO-TAMNLC) were developed to enhance the anti-cancer properties and targetability of TAM, using EPO as the homing ligand for EPO receptors (EpoRs) on breast cancer tissue cells. Tamoxifen-loaded NLC (TAMNLC) was used for comparison. The LA7 cells and LA7 cell-induced rat mammary gland tumor were used as models in the study. Immunocytochemistry staining showed that LA7 cells express estrogen receptors (ERs) and EpoRs. EPO-TAMNLC and TAMNLC significantly ($p < 0.05$) inhibited proliferation of LA7 in dose- and time-dependent manner. EPO-TAMNLC induced apoptosis and G_0/G_1 cell cycle arrest of LA7 cells. Both drug delivery systems showed anti-mammary gland tumor properties. At an intravenous dose of 5 mg kg^{-1} body weight, EPO-TAMNLC and TAMNLC were not toxic to rats, suggesting that both are safe therapeutic compounds. In conclusion, EPO-TAMNLC is not only a unique drug delivery system because of the dual drug-loading feature, but also potentially highly specific in the targeting of breast cancer tissues positive for ERs and EpoRs. The incorporation of TAM into NLC with and without EPO coat had significantly ($p < 0.05$) improved specificity and safety of the drug carriers in the treatment of mammary gland tumors.