

Co-delivery of Curcumin and Imatinib by Nanostructured Lipid Carriers in the Treatment of Lymphoma

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Abstract:

The purpose of this study was to encapsulate curcumin and imatinib in nanostructures and target them with HDL for scavenger receptor type B-1, a high-affinity HDL receptor expressed by lymphoma cells.

Introduction:

Among numerous drug-delivery approaches, high-density lipoprotein (HDL) nanocarriers have proven particularly applicable for delivering highly hydrophobic drugs by their high affinity to SR-B1.

In this study, we have investigated the enhancement of the therapeutic impact of curcumin, a naturally occurring polyphenol substance extracted from the roots of *Curcuma Longa* that has been extensively studied for its broad-spectrum anticancer effects by co-delivery with imatinib. The potential benefits of curcumin are, however, limited due to its poor water solubility and rapid degradation which results in low bioavailability on administration. The drug of choice in lymphoma is imatinib.

Methods and Results:

Curcumin and imatinib nanostructured lipid carriers (NLCs) were prepared by dissolving 10 mg of lecithin, 2 mg of stearyl amine, 25% of oleic acid and 7.5 mg of curcumin or 2.5 mg of imatinib in 2 ml of ethanol (mixed with 100 μ l acetone or 100 μ l chloroform) and then added to 20 ml of stirring deionized water including 0.5 % of Tween 80 at room temperature and was left for 3 hours for solvent evaporation. The NLCs were conjugated to HDL by EDC chemistry and then tested by MTT assay for their cytotoxicity on two types of lymphoma cells including; Ramus as B cell lymphoma expressing SR-B1 receptors and Jurkat as T cell lymphoma without SR-B1 receptors. The results showed the best designed nanoparticles had the particle size of 182 nm, zeta potential of -3 mV, curcumin and imatinib loading efficiency of 100 % and 98 %, respectively. They released imatinib and curcumin within 24 and 48 hours, respectively. The NLCs caused more significant cytotoxicity than each separate drug encapsulated in NLCs or free drugs.

Conclusions: Co-delivery of curcumin and imatinib in NLCs targeted by HDL may be more useful than imatinib alone in the treatment of B cell lymphoma.

Key words: Ramus cells, Jurkat cells, Nanostructured lipid carriers, Lymphoma.