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Improved nutraceutical properties of R- α -lipoic acid via liposomal formulation

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Purpose: R-α-Lipoic acid (RLA) and its reduced form, dihydrolipoic acid (DHLA), are antioxidant acts as a free radical scavenger. In spite of the promising nutraceutical functions, water solubility and gastric stability of RLA is poor. The present study aimed to develop RLA-loaded liposome (LIP/RLA) to improve its nutraceutical properties.

Methods: The prepared LIP/RLA was physicochemically characterized using transmission electron microscopy (TEM), dynamic light scattering (DLS), and *in vitro* stability test under gastrointestinal conditions. Pharmacokinetic behaviors of orally administered LIP/RLA were evaluated in rats. The hepatoprotective effects of LIP/RLA were assessed in acute hepatic injured rat model induced by carbon tetrachloride (CCl_4).

Results: Uniform liposomes of LIP/RLA were observed by TEM, and the mean particle size was calculated to be ca. 150 nm from the data of DLS. The LIP/RLA significantly prevented the degradation of RLA under acidic condition (pH1.2) and simulated gastric fluid (pH1.5). After oral administration of LIP/RLA (10 mg-RLA/kg, *p.o.*) in rats, the systemic exposures of RLA and DHLA increased by 2.8- and 5.8-fold, respectively. The improved dissolution behavior and gastrointestinal stability of RLA could contribute to increasing the systemic exposure of RLA and DHLA after oral administration. In a hepatic injured rat model, orally-dosed LIP-RLA (3 mg-RLA/kg) resulted in 78.7% and 86.4% reductions of plasma alanine aminotransferase, and aspartate aminotransferase, respectively; however, RLA was found to be less effective.

Conclusion: On the basis of these findings, the LIP/RLA might be a promising dosage option to improve the nutraceutical properties of RLA.