Evaluation of anti-inflammatory potential and pharmacokinetic property of dietary supplements

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Curcumin (Cur), a dietary polyphenol, is the active constituent from the rhizome of *Curcuma longa*, commonly known as turmeric. It has been reported to have anti-inflammatory potential with inhibition of a wide range of inflammatory and signaling molecules. Although Cur is considered as a therapeutic candidate for the treatment of inflammatory diseases, a drawback for clinical application of Cur is its poor solubility in water, which would result in low oral bioavailability. The main purpose of this investigation are (1) to clarify the effect of Cur on cigarette smoke extract (CSE)-induced cytotoxicity in rat alveolar L2 cells, and (2) to develop novel pharmaceutical formulations of Cur and evaluate their pharmacokinetic properties in rats. Exposure of CSE at a concentration of 10% to L2 cells for 1 h induced significant cytotoxicity and apoptotic death as assessed by nitric oxide (NO) level, lactate dehydrogenase (LDH) release, and TUNEL method. However, concomitant exposure of Cur (10 μM) and CSE in L2 cells resulted in marked attenuation of both NO level and LDH release, suggesting potent cytoprotective action against cigarette smoke related toxicities. We also developed novel pharmaceutical formulation of Cur, including nanocrystal dispersion (NC), self-emulsifying drug delivery system (SEDDS) and amorphous solid dispersion (AM). These formulations of Cur were administered orally to fasted rats at a dose of 20 mg/kg, and then plasma concentrations of Cur were determined with use of UPLC/MS. The area under the concentration－time curve (AUC) and mean maximum plasma concentrations of Cur in NC, SEDDS, and AM group were significantly higher as compared to both parameters in Cur powder group. Moreover, prolonged half lives after oral administration were observed in AM and NC formulations. Taken together, these formulation strategies would be efficacious to enhance the oral absorption and bioavailability of Cur. In conclusion, we demonstrated the therapeutic potential of Cur and its soluble formulations for the treatment of inflammatory lung diseases related to cigarette smoking.