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Curcumin in Combination With Anti-Cancer Drugs: A Nanomedicine Review

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Abstract

A huge surge of research is being conducted on combination therapy with anticancer compounds formulated in the form of nanoparticles (NPs). Numerous advantages like dose minimalization and synergism, reversal of multi drug resistance (MDRs), enhanced efficacy have emerged with nanoencapsulation of chemotherapeutic agents with chemo-sensitizing agent like curcumin. Within last couple of years various nano-sized formulations have been designed and tested both in vitro with cell lines for different types of cancers and in vivo with cancer types and drug resistance models. Despite the combinatorial models being advanced, translation to human trials has not been as smooth as one would have hoped, with as few as twenty ongoing clinical trials with curcumin combination, with less than 1/10th being nano-particulate formulations. Mass production of nano-formulation based on their physico-chemical and pharmacokinetics deficits poses as major hurdle up the ladder. Combination of these nano-sized dosage with poorly bioavailable drugs, unspecific target binding ability and naturally unstable curcumin further complicates the formulation aspects. Emphasis is now therefore being laid on altering natural forms of curcumin and usage of formulations like prodrug or coating of curcumin to overcome stability issues and focus more on enhancing the pharmaceutical and therapeutic ability of the nano-composites. Current studies and futuristic outlook in this direction are discussed in the review, which can serve as the basis for upcoming research which could boost commercial translational of improved nano-sized curcumin combination chemotherapy.

Keywords: Cancer; Combination therapy; Curcumin; Drug delivery; Nano-formulations.

Graphical abstract

