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Formulation and Evaluation of Curcumin-Zn (II) Microparticulate Drug Delivery System for Antimalarial Activity

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Abstract : Objective: Studies have shown that a new combination therapy with Artemisinin derivatives and curcumin is unique, with potential advantages over known ACTs. In present study an attempt was made to prepare microparticulate drug delivery system of Curcumin-Zn complex and evaluate it in combination with artemether for antimalarial activity. Material and method: Curcumin Zn complex was prepared and encapsulated using sodium alginate. Microparticles thus obtained are further coated with various enteric polymers at different coating thickness to control the release. Microparticles are evaluated for encapsulation efficiency, drug loading and in vitro drug release. Roentgenographic Studies was conducted in rabbits with BaSO 4 tagged formulation. Optimized formulation was screened for antimalarial activity using P. berghei-infected mice survival test and % paracetemia inhibition, alone (three oral dose of 5mg/day) and in combination with arthemether (i.p. 500, 1000 and 1500µg). Curcumin-Zn(II) was estimated in serum after oral administration to rats by using spectroflurometry. Result: Microparticles coated with Cellulose acetate phthalate showed most satisfactory and controlled release with 479 min time for 60% drug release. X-ray images taken at different time intervals confirmed the retention of formulation in GI tract. Estimation of curcumin in serum by spectroflurometry showed that drug concentration is maintained in the blood for longer time with tmax of 6 hours. The survival time (40 days post treatment) of mice infected with P. berghei was compared to survival after treatment with either Curcumin-Zn(II) microparticles artemether combination, curcumin-Zn complex and artemether. Oral administration of Curcumin-Zn(II)-artemether prolonged the survival of P.berghei-infected mice. All the mice treated with Curcumin-Zn(II) microparticles (5mg/day) artemether (1000µg) survived for more than 40 days and recovered with no detectable parasitemia. Administration of Curcumin-Zn(II) artemether combination reduced the parasitemia in mice by more than 90% compared to that in control mice for the first 3 days after treatment. Conclusion: Antimalarial activity of the curcumin Zn-artemether combination was more pronounced than mono therapy. A single dose of 1000µg of artemether in curcumin-Zn combination gives complete protection in P. berghei-infected mice. This may reduce the chances of drug resistance in malaria management.

Keywords : formulation, microparticulate drug delivery, antimalarial, pharmaceutics
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