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The role of PEG ratio on pharmacokinetic of drug loaded in PLGA-PEG nanoparticles

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Background and Aims: The objective of this study was to evaluate the pharmacokinetic of a potent anticancer drug of 9-nitrocamptothecin (9-NC) incorporated into polymeric nanoparticles (NP) with different polymers of PLGA, PLGA-PEG and PLGA-folate compare to free drug after intravenous (i.v.) injection to rat.
Methods: For pharmacokinetic study, after preparation of nanoparticles by nanoprecipitation method and characterization of them, were injected intravenously to 24 healthy Wistar rats. The animals were divided to four groups: a) receiving 9-NC loaded in PLGA-NPs b) loaded in 5% PEGed-PLGA NPs c)10% PEGed-PLGA NPs d)25% PEGed-PLGA NPs, and control group (n=6) with a dose of 2 mg/kg. Blood sample were taken in predetermined time intervals from the rat's eyes after injection of formulations and the concentration of 9-NC as the lactone and total forms in plasma, was determined using developed reverse HPLC method.
Results: Invivo studies showed that nanoparticle encapsulation markedly increased the plasma concentration of both lactone and total forms of 9-NC compared to free drug. The values of mean residence time (MRT) and elimination half life (T1/2) were also significantly higher for PEG coated nanoparticles than other nanoparticles and free drug. The prepared nanoparticles could stabilized 9-NC in lactone form and enhance the efficacy of this drug more than free drug solution.
Conclusions: These results show that a rational modification in the composition and structure of the nanoparticles increase the prospects of their usefulness for delivery and transports of anticancer drug.

Keywords: Pharmacokinetic; 9-Nitrocamptothecin; PLGA-PEG; Nanoparticles