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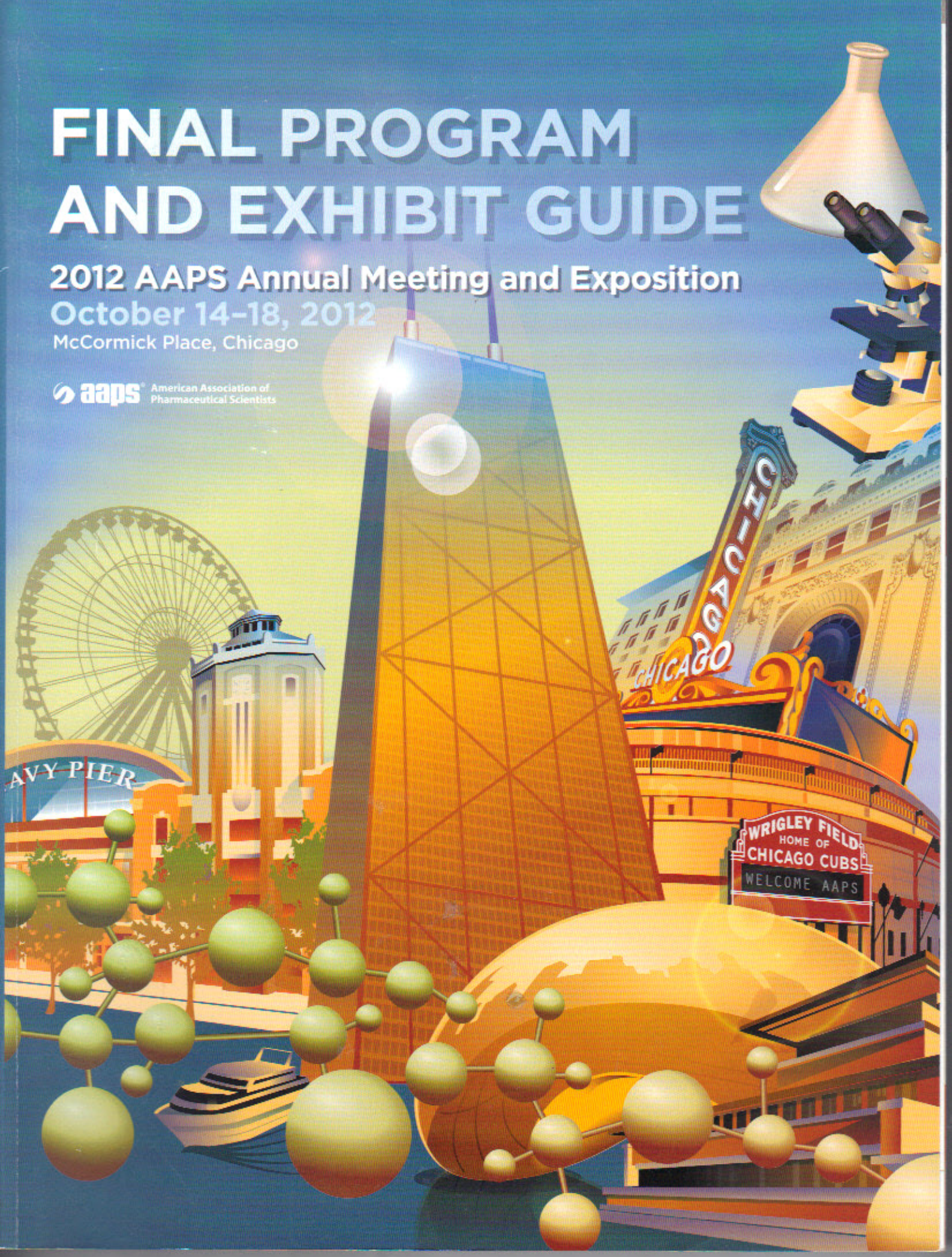

Preparation and Characterization of Novel Docetaxel-loaded Nanoparticles for Breast Cancer Therapy

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Purpose

The aim of the study was to prepare, optimize and carry out in-vitro release studies of docetaxel loaded nanoparticles and to evaluate the effect of different formulation variables on particle size distribution.

Methods

The docetaxel-loaded polylactic acid-co-glycolic acid (PLGA 50:50) nanoparticles were prepared by conventional emulsion solvent evaporation method. The drug-polymer solution was sonicated with demineralized water containing poloxamer 407 and sodium lauryl sulphate. The nanoparticle was filtered using 0.45μm filter and the organic solvent was evaporated by simple magnetic stirring. The effect of different formulation variables such as concentration of surfactants, filtration and evaporation, drug/polymer ratio, phase ratio and polymer concentration on particle size and size distribution were determined. HPLC method was used to determine drug entrapment and drug loading. In-vitro release study was carried out by using dialysis membrane. Xenograft nude mouse was used to see the effect of the nanoparticles for tumour growth delay.

Results

The optimised formulation consisted of drug/polymer ratio (w/w) 1:5, dissolved in 2.5 g of ethyl acetate. Lowest particle size was obtained with poloxamer 407 and sodium lauryl sulphate in the weight ratio 0.5:1. Decrease in particle size but increase in polydispersity index was observed after evaporation of the organic solvent. The lower particle size was obtained at drug/polymer ratio 1:5 and phase ratio 1:10. Increase in polymer concentration resulted in increase in the particle size but decrease in the polydispersity index. The optimised formulation of docetaxel-loaded PLGA nanosystem had particle size and polydispersity index of 104.2±1.45 and 0.206±0.006, respectively. In addition, the drug loading efficacy and loading capacity were 84.28±0.69 % and 16.86±0.14 %, respectively. In vitro release studies showed about 30% drug release in 60 hrs. Docetacel nanoparticles significantly reduced tumor weight, but did not cause significant body weight loss in Xenograft nude mouse model.

Conclusion

The combination of anionic and a nonionic surfactant in one nanosystem could be useful in formulating docetaxel-loaded PLGA nanoparticles for cancer chemotherapy.