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Development of daunorubicin-loaded casein nanoparticles as a potential drug delivery system for the treatment of ALL

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The aim of this study was to develop nanosized-casein carriers by the method of spray drying and to evaluate their potential as a tool for delivery of daunorubicin in the treatment of acute lymphocytic leukaemia (ALL). Full 3^2 factorial design was applied to evaluate the optimal production parameters (concentration of the polymer and the crosslinker) for the preparation of blank casein nanoparticles. Nine batches of unloaded particles were developed and characterized in terms of particle size, size distribution, surface morphology and compatibility between the drug and the polymer. Based on an optimized "placebo" model of casein nanostructures, four batches of daunorubicin-loaded particles were synthesized at varied drug-polymer ratios. The obtained structures have average particle size within the range 127 to 167 nm, and encapsulation efficiency was between 42.8% and 61.8%. Delayed drug release was demonstrated, which correlates with the results of the cytotoxicity study on lymphoblast cells.

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