Development and Characterization of Florfenicol-Loaded BSA Nanoparticles as Controlled Release Carrier

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Florfenicol (FLO) is a broad-spectrum fluorinated antibiotic used for the treatment of bacterial diseases such as bovine respiratory disease (BRD) in cattle. FLO is a poorly soluble drug in aqueous solution, and its encapsulation in various nanovehicles has been reported to be less than 30%. In this context, the use of bovine serum albumin (BSA) as a nanocarrier for FLO is an interesting approach. BSA is a biocompatible, biodegradable, nontoxic, and nonimmunogenic natural protein, allowing the vehiculization of hydrophilic and hydrophobic drugs with a well-tolerated administration. The present work focuses on the fabrication and characterization of florfenicol-loaded BSA (FLO-BSA NPs), incorporation efficiency, and in vitro release pattern. FLO-BSA NPs nanoparticles were successfully obtained by a simple, low-cost and in a few steps method. The physicochemical properties of the obtained nanoparticles such as size (~ 120 nm), polydispersity index (0.04), and zeta potential (approximately ? 40 mV) suggest a high colloidal stability and suitable characteristics for drug delivery. The drug loading reveals a high incorporation of florfenicol in the nanoparticles, in which 33.6 molecules of FLO are encapsulated per each molecule of BSA. The in vitro release profile exhibits an initial stage characterized by the burst effect and then a prolonged release of FLO from the albumin matrix, which is compatible with the Higuchi model and which follows a Fickian diffusion. The results together suggest a suitable tool for future investigations in drug delivery field in order to use this nanomaterial in food, pharmaceutical, and veterinary industry.