Development of Baicalin-loaded chitosan/cyclodextrin nanoparticles for the treatment of bacterial infections

Federica DE GAETANO - Dipartimento di Scienze chimiche, biologiche, farmaceutiche e ambientali, Università degli Studi di Messina, Italy

Giuseppe PALADINI - Dipartimento di Scienze Matematiche e Informatiche, Scienze Fisiche e Scienze della Terra, Università degli Studi di Messina, Italy

The increasing prevalence of antibiotic resistance poses a significant challenge in the medical field, making it increasingly difficult to treat bacterial infections. Therefore, current research focuses on the study of novel formulations containing natural antibacterial agents/antibiofilms. In this study, we synthesized chitosan-based nanoparticles using a sulfonated β-cyclodextrin (CS/SBE-β-CD NPs) as a cross-linking and solubilizing agent for baicalin (BA). BA has poor solubility and low permeability, posing significant problems to its administration and reducing its bioavailability in therapeutic applications. The presence of CD allows the incorporation of BA into a hydrophilic system. The CS/SBE-β-CD NPs were prepared using the ionotropic gelation method, exploiting the interaction between the positive charges of CS and the negative charges of SBE-β-CD, which serves as polyanion. The successful preparation of the BA-loaded CS/SBE-β-CD NPs was confirmed through detailed technological characterization, including zeta potential measurements, particle size distribution (PDI) analysis, and size. For the optimized formulation of BA-CS-NPs, key parameters, including encapsulation efficiency, drug release profiles, and release kinetics, were systematically evaluated.