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تطوير وتحديد خصائص جسيمات زين نانوية مثبتة بالكريموفور لإيصال الدواء عن طريق الفم"

“Development and Characterization of Cremophor-Stabilized Zein Nanoparticles for Oral Drug Delivery

Abstract

This study aimed to prepare and evaluate the capability of zein nanoparticles as oral carriers, and thus the ability of these nanoparticles to improve the dissolution of poorly soluble drugs. Meloxicam was used as a model poorly soluble drug to explore the encapsulation and delivery potential of zein nanoparticles. Nanoparticles were prepared by ultrasonication using cremophor EL as a stabilizer. The effect of pH of the preparation media and the mass ratio between zein and drug on the size and polydispersity index and the encapsulation efficiency were studied. Meloxicam-loaded zein nanoparticles were characterized for particle size distribution, polydispersity index, solid-state properties, and release behavior. The optimal formulation was obtained using zein: MLX, 10:1 prepared at pH 3. The optimized MLX-zein-NPs displayed a size of 299 nm, polydispersity index of 0.133, encapsulation efficiency of 92.9%, and drug loading content of 8.98%. The size of meloxicam nanoparticles incorporated into zein increased and the drug loading decreased with increasing zein content while the encapsulation efficiency were almost the same in a narrow range of 92.9- 94.14%. Both differential scanning calorimetry and powder X-ray diffraction indicated that meloxicam loaded in the zein nanoparticles was in the amorphous state; thus, the drug was encapsulated within the ZPs. From the in vitro release studies, it was observed that meloxicam had a pH-dependent release behavior; MLX was released faster from zein nanoparticles in phosphate buffer (pH 7.5) than in acetate buffer (pH 4.5) and simulated gastric fluid. This study demonstrated the utility of zein nanoparticles to encapsulate poorly soluble active compounds. Thus, it would be a suitable nanocarrier to be used for the oral delivery of these drugs and improve their oral absorption and bioavailability.