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Formulation of sustained release sodium alginate beads loaded with antidiabetic drug containing polymeric micelles

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Polymeric micelles offer multiple beneficial properties such as the increase in drug release and permeability as key factors determining drug bioavailability. However certain therapies do not require all these benefits. Antidiabetic drugs are usually administered in extended-release formulations meaning that the drug release must be controlled to avoid burst-like effect. A solution to this technological requirement could be the application of sodium alginate beads which would prolong the drug release whist retaining the enhanced permeability effect of polymeric micelles.

The aim of this current study was to develop a sodium alginate bead formulation containing metformin as hydrophilic drug embedded in the biopolymeric matrix and pioglitazone which would be encapsulated inside the polymeric micellar core.

At first, Quality by Design based risk assessment procedures were performed on multiple level, regarding the polymeric micelle optimization and the sodium alginate bead formulation process. The optimization was performed at multiple levels via factorial designs corresponding to the crucial steps of the preparation method. The polymeric micelles were characterized via dynamic light scattering and the encapsulation efficiency was evaluated. The swelling and drug release profile were investigated regarding the sodium alginate beads.

The polymeric micelles are in the appropriate colloidal size range in monodisperse distribution with high encapsulation efficiency above 80%. Based on the factorial design, the optimal composition regarding the sodium alginate beads were found with high swelling ratio and an extended drug release up to 24 hours.

In conclusion, the sodium alginate bead formulation loaded with polymeric micelles could be an effective and value-added alternative of currently commercialized extended-release tablets.

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