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Design and optimization of *in situ* gelling mucoadhesive eye drops containing dexamethasone

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Many factors limit the bioavailability of topical ocular formulations, such as blinking, tear dilution, and the structure of the tear film and the ocular surface [1]. Bioavailability can be improved by increasing the residence time on the eye surface and the penetration of the active pharmaceutical ingredient. This study aimed to formulate *in situ* gelling mucoadhesive ophthalmic formulations [2]. To increase the residence time, the formulations were based on a thermosensitive polymer (Poloxamer 407 (P407)) and were combined with two types of mucoadhesive polymers. Dexamethasone (DXM) was solubilized by complexation with hydroxypropyl-β-cyclodextrin (HPBCD). The effect of the composition on the gel structure, mucoadhesion, dissolution, and permeability was investigated using 3^3 full factorial design. These parameters of the gels were measured by rheological studies, tensile test, dialysis membrane diffusion, and *in vitro* permeability assay. The dissolution and permeability of the gels were also compared with DXM suspension and CD-DXM solution. P407 strongly determined gelation; however, the mucoadhesive polymers also influenced it. Mucoadhesion increased with the polymer concentration. The first phase of drug release was similar to that of the CD-DXM solution, then it became prolonged. The permeability of DXM was significantly improved.

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