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Evaluation of combined thermoresponsive ophthalmic gels

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The poor bioavailability of conventional eye drops is a well-known problem. Bioavailability could be improved by increasing the residence time on the eye surface and enhancing the permeability of the API [1].

Our aim was to formulate and evaluate *in situ* gelling mucoadhesive eye drops. To increase residence time, the eye drops were based on a thermoresponsive polymer, Poloxamer 407 which was combined with a hyaluronate derivative to further enhance mucoadhesion. Dexamethasone (DXM) was solubilized by hydroxypropyl-β-cyclodextrin (CD).

The gelation and the gel structure were investigated using rheological methods, and the mucoadhesion was studied with a texture analyzer. Drug release and permeability of the DXM suspension, the solution of the CD-DXM inclusion complex, and the *in situ* gelling formulation were compared by applying multiple models (i.e., corneal PAMPA, *ex vivo* porcine eye, and human corneal epithelial (HCE-T) cell line). The cytotoxicity of the API, the CD-DXM complex, and the gel was also investigated using the HCE-T cell line.

Gelation occurred at body temperature within a few minutes, which is ideal for ophthalmic application. With the polymer combination, suitable mucoadhesive properties were achieved. A significantly higher amount of drug was released from the gel compared to the DXM suspension. Furthermore, the gel structure provided sustained drug release. The permeability of the API was different using the different models; nonetheless, the effect of both polymers and the CD on permeability was measurable. Treatment of the HCE-T cell line with the formulations did not reduce cell viability, and no morphological changes were detected in the intercellular connections.

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References:

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