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Preparation and investigation of meloxicam potassium containing cyclodextrin nanoparticles intended for nasal application

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Nasal delivery of different active pharmaceutical ingredients (APIs) may provide a non-invasive, painless way to treat not just local pathological conditions but to induce systemic or central nervous system effects. However, the selection of appropriate excipients is essential for satisfying nasal absorption of the APIs. For example, mucoadhesive hydrophilic polymers can increase the contact time of the drug with the nasal mucosa, and cyclodextrins may enhance the permeation of the APIs resulting in higher bioavailability.

The aim of our work was to prepare nasally applicable nanospheres containing meloxicam potassium (MELP) – a non-steroidal anti-inflammatory drug – by spray drying using 2 types of cyclodextrins (hydroxypropyl-β-cyclodextrin, α-cyclodextrin) and polymers (hyaluronic acid, poly(vinylalcohol)) as excipients. Physico-chemical characterization, mucoadhesivity test, *in vitro* and *ex vivo* biopharmaceutical investigations were carried out.

Mucoadhesive, spherical nanoparticles containing amorphous MELP were successfully prepared and the formation of API-cyclodextrin complexes were confirmed by thermoanalytical and Fourier-transform infrared spectroscopic measurements. Based on the results of *in vitro* and *ex vivo* permeation studies, the highest amount of MELP diffused from the α-cyclodextrin based poly(vinylalcohol) containing sample. The prepared formulations may be suitable for delivering MELP to the systemic circulation through the nasal route and relieve pain rapidly after further optimization.

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