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A release study of capsaicinoids from nanocapsules before and after the incorporation in hydrogels

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Abstract – Capsaicinoids were co-nanoencapsulated by the precipitation of preformed polymer and, then, incorporated in hydrogels. The release profiles demonstrated a prolonged release of the nanoencapsulated capsaicinoids when compared with the control. Considering the nanoparticles, the capsaicin was released faster than the dihydrocapsaicin what indicates that the last is probably placed more internally in the nanocapsules. The incorporation of the nanocapsules in hydroxyethyl cellulose and chitosan gels did not influence the release of the capsaicinoids from the nanocapsules.

The capsaicinoids are the substances responsible for the burning sensation caused by the chilly peppers. Capsaicin and dihydrocapsaicin, together, represent around 90% of the capsaicinoids. Capsaicin has been applied topically since it causes desensibilization of the sensory neurons through depletion of the P substance and, so, it provides an analgesic effect [1]. Since the skin irritation and the necessary repeated application are the main causes of treatment abandon, a controlled release might be desirable. In this way, the aim of this work was to study the release of the co-nanoencapsulated capsaicinoids in comparison with the non encapsulated substances. The nanocapsules were incorporated in hydrogels (hydroxyethyl cellulose 2% and chitosan 2%) and the in vitro release profiles were evaluated

The nanocapsule suspension was prepared by the nanoprecipitation of the pre-formed polymer [2]. Eudragit-RS® and capric/caprylic triglycerides were used as the wall and core material, respectively. The nanocapsule suspension was characterized (Table 1). The hydrogels containing nanocapsules were obtained through manual mixing of the polymer, Milli-Q® water and nanocapsule suspension. Lactic acid was added to the polymer when preparing the chitosan gel. For the release study, the samples were placed in dialysis bags and these were placed in beakers containing the release medium (Tween® 80 and NaCl 0.9%). At pre-determined time intervals, the amounts of capsaicinoids outside the bags were determined by a previously validated HPLC method. All the experiments were performed in triplicate.

The release profiles demonstrated a prolonged release of the nanoencapsulated capsaicinoids when compared with the control [hydroalcoholic solution (70:30 v/v) of the capsaicinoids] (Fig. 1). Considering the nanoparticles, the capsaicin was released faster than the dihydrocapsaicin which is known to be more lipofilic, indicating that the last is probably placed more internally in the nanocapsules. The incorporation of the nanocapsule suspension in hydroxyethyl cellulose and chitosan gels did not influence the release of the capsaicinoids from the nanocapsules, what is probably due to the low consistence of the hydrogels (Fig. 2).

Table 1: Nanocapsules properties (CP: capsaicin; DH: dihydrocapsaicin).

Average diameter (nm)	PDI	Zeta potential (mV)	pH	Drug content (%)	Drug entrapment (%)
152,94 ± 7,49	0,099 ± 0,006	9,62 ± 1,48	5,78 ± 0,095	97,65 ± 2,27 - CP 102,95 ± 5,58 - DH	99,78 ± 0,055 - CP 99,92 ± 0,012 - DH

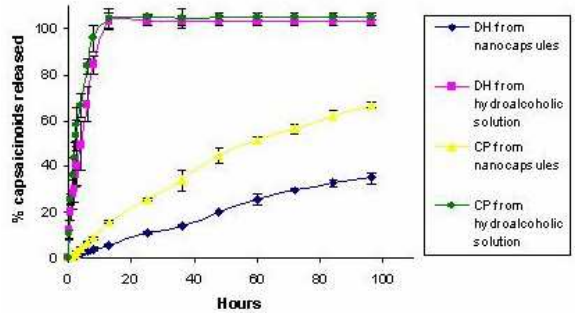

Figure 1: Release profile of capsaicinoids (CP: capsaicin; DH: dihydrocapsaicin).

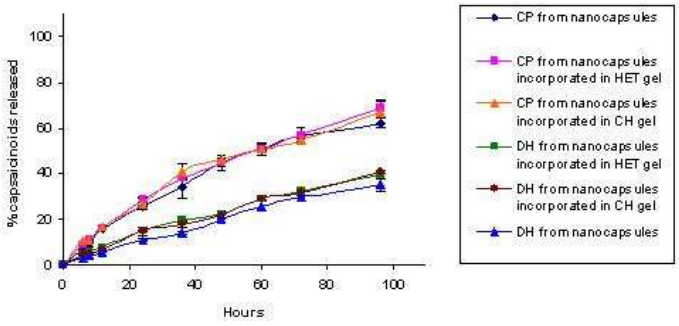

Figure 2: Release profile of capsaicinoids from nanocapsules incorporated in hydrogels (HET: hydroxylethyl cellulose; CH: chitosan).

References

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