Is Capsaicin Dissolved or Dispersed in its Creams?

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ABSTRACT

Capsaicin is a member of Capsaicinoids, which are isolated from the fruits of *Capsicum* species, widely known as hot chili peppers[1]. Application of Capsaicin in the body leads to modulation of the nociception of pain and triggers an irritating burning sensation in the area of it is applied. Therapeutically, Capsaicin is used as a topical analgesic in formulations, such as lotions, patches and creams, in which the concentration of the active pharmaceutical ingredient (API) is rather low[2].

The aim of this study was to investigate if Capsaicin was dissolved or dispersed in commercially available creams, in which the concentration of the API was only 0.025% or 0.075%, i.e. well below the limit of detection of non-chromatographic analytical techniques.

For this purpose, the X-ray powder diffractogram and the Raman spectrum of pure Capsaicin, as well as the respective XRD patterns and Raman spectra of the as received creams and their placebos were recorded. The size and morphology of the undissolved particles of the creams were observed using different modes of Optical Microscope. As expected, Capsaicin API was not detected in the creams due to the very low API concentration.

In an effort to investigate whether Capsaicin was not detectable because of its rather low concentration in the final products or because is dissolved in the creams, creams of Capsaicin in variable final concentrations (0.075%-0.350%) were prepared step by step and the API was "monitored" after each step of the process by using X-ray Powder Diffraction (XRPD), Raman spectroscopy and Optical Microscopy. The first part of the process was the preparation of a Capsaicin Premix, a mixture of Capsaicin with Isopropyl Myristate after heating at 70^{o}C, in which the API was dissolved. Premixes of 2.5%w/w, 3.5%w/w, 5%w/w and 10%w/w in Capsaicin were produced, corresponding to API concentrations in the final products of 0.075%, 0.100%, 0.150% and 0.300%, respectively. X-ray Powder Diffraction (XRPD), Raman Spectroscopy and Optical Microscopy were used for the analysis of the above premixes. The API remained dissolved in the 2.5%w/w Capsaicin Premix after 24h, which was left to cool down at ambient temperature, while re-crystallization was observed at higher Capsaicin Premix concentrations. The newly formed crystals were larger than the initial ones and their morphology differed significantly.

Therefore, the solubility of Capsaicin in Isopropyl Myristate was determined to be approximately 2.5%w/w (0.075% in final product), i.e. Capsaicin is dissolved in the commercially available 0.075% and 0.025% creams. Moreover, the new morphology of the crystals observed after re-crystallization is an indication of a new Capsaicin form or a solvate, which is under investigation.

REFERENCES

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