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Abstract

Miconazole Nanoemulsions to Treat Melanoma: A Study of Formulation Development, Droplet Size and Solubility †

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Abstract: Melanoma is one of the most dangerous skin cancers, with a high mortality rate and an incidence that has increased radically in the past few years. This has led to a huge demand for new more effective forms of treatment. Nanoemulsions have been investigated as potential drug delivery vehicles to target cancer cells, since they are a promising alternative to increase the solubility and the skin permeation and retention of hydrophobic drugs. The purpose of this work was to incorporate miconazole, a hydrophobic antifungal drug with potential anticancer activity, into an oil-in-water (O/W) nanoemulsion for topical administration for the treatment of melanoma. Seventeen O/W nanoemulsions were prepared via spontaneous emulsification. The preconcentrate was composed of Plurol®Diisostearique, Transcutol®HP and Kolliphor®RH 40, while the aqueous phase was water. A visual examination was performed to confirm the absence of phase separation and heterogeneity. Analysis using dynamic light scattering (Zetasizer Nano ZS apparatus, Malvern, UK) followed to determine the droplet size and polydispersity index (PDI). Nanoemulsions with a PDI below 0.300 and a droplet size between 100 and 200 nm were selected for solubility assays. After drug incorporation, at 5 mg/mL, only one out of the seventeen nanoemulsions showed characteristics within the intended parameters. In conclusion, this study showed that the incorporation of miconazole in nanoemulsions allows us to greatly increase its solubility when compared to water (up to 6550 times). Future studies will include the determination of viscosity, stability, in vitro drug release, ex vivo drug permeation and in vitro cytotoxicity in melanoma cells.

Keywords: melanoma; nanoemulsion; miconazole; droplet size; polydispersity index

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