

Solubility and Permeability Enhancement of active compounds: Therapeutic Deep Eutectic Systems as New Vehicles for Drug Delivery

Ana Rita C. Duarte^{1,2*}, Susana Barreiros³, Ana A. Matias⁴, Rui L. Reis^{1,2}, Alexandre Paiva³,

¹ 3B's Research Group- Biomaterials, Biodegradable and Biomimetic, University of Minho, Headquarters of the European Institute of Excellence on Tissue Engineering and Regenerative Medicine, Avepark 4805-017 Barco, Guimarães, Portugal

² ICVS/3B's PT Government Associated Laboratory, Braga/Guimarães, Portugal

³ LAQV-REQUIMTE, Departamento de Química, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, 2829-516 Caparica, Portugal

⁴ Food & Health Unit, Nutraceuticals & Delivery Lab, Instituto de Biologia Experimental e Tecnológica, Oeiras, Portugal,

*Corresponding author: aduarte@dep.uminho.pt

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Abstract

Therapeutic deep eutectic systems (THEDES) are here proposed as a new class of pharmaceutical active ingredient (API) whose distinctive characteristic is the fact that they are liquid at room temperature. Eutectic systems have been described in the pharmaceutical sciences as an alternative formulation able to enhance bioavailability of the API. THEDES are constituted by one active agent and a cofomer or two active agents, which when combined at a particular molar ratio become liquid at room temperature. In this work, we explore the preparation of the THEDES menthol-ibuprofen. The solubility and dissolution profile in phosphate buffer solution (pH 7.4) was performed at 37 °C and compared with those of the pure API. Furthermore, the in vitro permeability of the liquid THEDES and the API in powder form, was evaluated using a Franz diffusion cell and caco-2 cells as model of human intestinal epithelium. The solubility of the API's when in the THEDES system improved as much as up to 12 fold. Furthermore, for this system the permeability was calculated to be 14×10^{-5} cm/s representing a 3 fold increase in comparison with the pure API. The results indicate that both solubilization and permeability were greatly enhanced when the API is complexed in the THEDES liquid form. The results obtained demonstrate the potential of THEDES to overcome the drawbacks of poorly water soluble molecules and increase bioavailability of the APIs and the possibility to develop new delivery systems.