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Current Date/Time: 4/7/2015 10:45:03 AM

Coupling Thedes - Therapeutic Deep Eutectic Solvents And Supercritical Fluid Technology For The Development Of Controlled Delivery Systems

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Abstract:

Deep eutectic solvents (DES) can be formed by bioactive compounds or pharmaceutical ingredients. A therapeutic DES (THEDES) based on ibuprofen, a non-steroidal anti-inflammatory drug, and menthol was synthesized. A controlled drug delivery system was developed by impregnating a starch:poly-ε-caprolactone polymeric blend (SPCL 30:70) with the menthol:ibuprofen THEDES in different ratios (10 and 20 wt %), by supercritical fluid sintering at 20 MPa and 50 oC. The morphological characterization of SPCL matrices impregnated with THEDES was performed by scanning electron microscopy (SEM) and micro-computed tomography (micro-CT) and drug release studies were carried out at 37°C, in phosphate buffered saline (PBS). The results obtained have shown that the solubility profiles of ibuprofen in PBS are similar in powder form and in THEDES. Nonetheless, when incorporated in a polymeric matrix, ibuprofen in the THEDES form has a faster release profile. The drug release in this system is mostly governed by diffusion, as expected due to the hydrophobic nature of the polymer used as carrier. The outcomes of this work demonstrate the improved performance of THEDES based pharmaceutical formulations and the feasibility to couple with green production technologies to develop enhanced biomaterials for therapeutic applications.

Author Disclosure Information: I.M. Aroso: None. R. Craveiro: None. Â. Rocha: None. M. Dionisio: None. S. Barreiros: None. R.L. Reis: None. A. Paiva: None. A. Duarte: None.

Category (Complete): 1.8 Green technologies for the preparation of enhanced biomaterials for tissue engineering and regenerative medicine

Keyword(s) (Complete): Biomaterial ; Materials Science ; Biomedical Engineering

Presentation Preference (Complete): Oral

Publication (Complete):

I do not wish to have my abstract published in the *Tissue Engineering, Part A*. : True

Status: Complete

[Tissue Engineering and Regenerative Medicine International Society - World Congress](#)

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