Novel poly(ε-caprolactone)/gelatin wound dressings prepared by emulsion electrospinning with controlled release capacity of Ketoprofen anti-inflammatory drug

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In the present work, a single and double phase Ketoprofen-loaded mats of ultrathin fibers were developed by electrospinning and their physical properties and drug release capacity were analyzed. The single phase material was prepared by solution electrospinning of poly(ε-caprolactone) (PCL) with Ketoprofen at a weight ratio of 5 wt%. This Ketoprofen-containing PCL solution was also used as the oil phase in an emulsion with gelatin. The resultant stable oil-in-water (O/W) emulsion of PCL-in-gelatin, also containing Ketoprofen at 5 wt%, was electrospun to produce the double phase mat. Cross-linking was performed by means of glutaraldehyde vapor to prevent dissolution of the hydrophilic gelatin phase. The performed characterization indicated that Ketoprofen was successfully embedded in both electrospun mats, i.e. PCL and PCL/gelatin, and both mats showed high hydrophobicity. In vitro release studies interestingly revealed that, in comparison to the single phase PCL electrospun mat, the double phase PCL/gelatin mat significantly hindered Ketoprofen burst release and exhibited a sustained release capacity of the drug for up to 4 days. In addition, the electrospun Ketoprofen-loaded mats showed enhanced attachment and proliferation of L929 mouse fibroblast cells, presenting the double phase mat the highest cell growth yield due to its improved porosity. The here-developed electrospun materials clearly show a great deal of potential as novel wound dressings with an outstanding controlled capacity to release drugs.

References

[1] Basar et al., Materials Science and Engineering: C, 2017 https://doi.org/10.1016/j.msec.2017.08.025