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Multilayer core-sheath nanofiber scaffolds used in the differential release of bioactive molecules

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The core-sheath nanofiber and hydrogel exhibit great potential in drug delivery field. It is desirable to differentially control the release rate of different drugs from the same drug delivery vehicle. Biocompatible and biodegradable materials, polycaprolactone (PCL) nanofibers and alginate hydrogels, play a significant role in both designing controlled release matrix for cell culture and tissue growth. Although prolonged release of bioactive molecules is readily achievable using these polymer materials independently as a matrix, it is not seen how to release various bioactive molecules at a different rate over a different length of time. In this study, we fabricated a multilayer PCL-PEO core-sheath nanofiber scaffold in combination with sandwiched layers of either alginate hydrogel or uniaxial electrospun PCL-gelatin nanofiber layers, and evaluated its controlled release property. Adenosine triphosphate (ATP) or glucose was encapsulated in the PEO core of the core-sheath nanofibers, and the release kinetics was studied. We demonstrated that ATP release from the exposed top layer of the scaffold has higher burst release and shorter release time compared to that from deeper layers in the scaffolds. Such a differential release property of designated layers can be employed to achieve releasing of multiple drugs at different rates over a different length of time.

Biography

Dula Man is an Assistant Professor at Delaware State University. He has completed his PhD in Molecular Biology from the University of Texas at El Paso, and Post-doctorate at University of California Irvine. He has navigated the science fields from molecular biology, biochemistry, structural biology, DNA repair, genome edting to nanomaterial engineering. He has published numerous refereed papers.

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