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Advanced bioplymeric electrospun nanoscale fibers for controlled drug delivery

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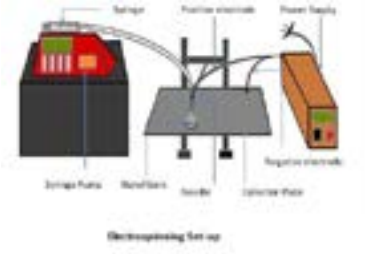
Advanced biocompatible polymers and co-polymers have been successfully implemented to generate electrospun nanofibers for variety of biological and biomedical applications. This work focused on generating a biopolymeric drug delivery system using (Poly-Lactic- co-Glycolic Acid (PLGA). Controlled drug elution targets a specific location to avoid overdosing and thereby reducing the side effects of the drug. In this study, we prepared a local anesthetic (Lidocaine) as well as an antibiotic (Chloramphenicol) loaded PLGA nanofibers using electrospinning technique and evaluated the drug release activity at a stable rate. Electrospinning is performed by applying a large positive voltage (several kV) to a metal syringe tip, which dispenses a polymer solution. The potential field draws a fiber from the end of the tip and deposits a randomly oriented and non- woven mat of polymeric fiber on a grounded metal collector plate. Depending on spinning parameters, fibers ranging from as small as 100 nm to as large as several micrometers can be achieved. We can alter the fiber diameter to control the rate of delivery. Fibers of lager diameter will have smaller surface area to volume ratios and should therefore release drug molecules compounds at a slower rate, but for a longer period of time. Conversely, smaller diameter fibers could release drug molecules at a faster rate, which could be beneficial for initial treatment. Structural and optical properties of such drug loaded fibers confirmed the presence of drug molecules. Systematic drug elution experiments using UV- spectrophotometry were performed to observe possible indication in the absorbance change as the drug elutes from the nanofibers over the period of time. Drug loaded biopolymeric nanofibers also showed limited cytotoxicity on fibroblasts with viability greater than 96%. Such drug-loaded biopolymeric nanofibers can be applied via different routes, such as implantation, injection, and/or oral administration for a wide range of medical treatments.



Biography

JAnand Gadre graduated with his BS in Applied Physics from the University of Mumbai, MS Degree at the Institute of Science, Mumbai and his doctorate (Ph.D.) from the Institute of Chemical Technology (ICT), Mumbai, (India). Anand joined University of Maryland (USA) as a Postdoctoral Research Associate and further continued working in Georgetown University at Washington DC. Anand was then appointed as an Assistant Professor of Nanobioscience at the College of Nanoscale Science and Engineering in the State University of New York at Albany and later was promoted as an Associate Professor of Nanobioscience with tenure. While working at CNSE, Anand also achieved his Master in Business Management (MBA) degree from the State University of New York at Albany. Since 2011, Anand has been working as Director of the Stem Cell Instrumentation Foundry (SCIF) at the University of California, Merced where he is currently administering core research facilities and pursuing his research in the areas of Nanobiotechnology.

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