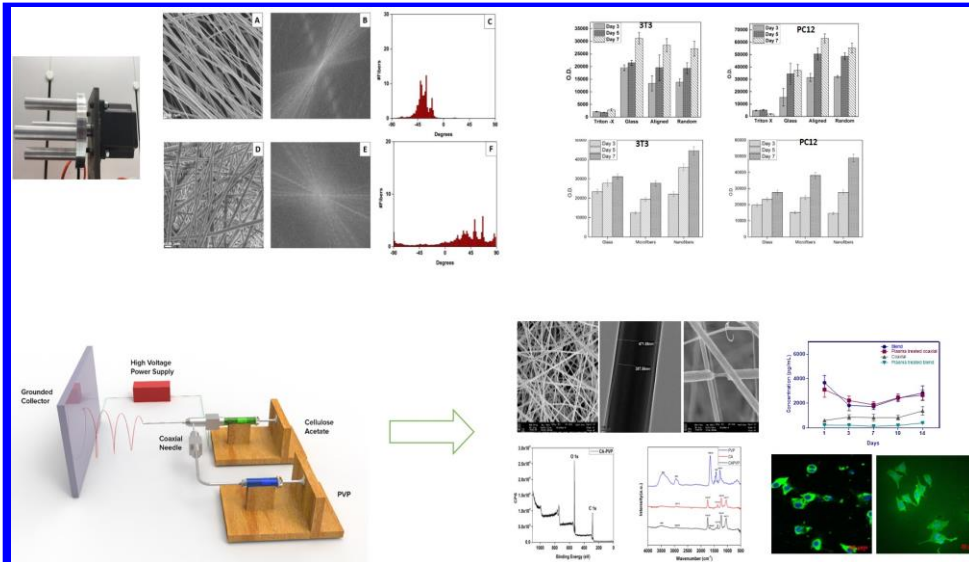


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Nanoengineering

“Electrospun Bioactive Nanofibrous Scaffolds for Sustained Release of Biomolecules”

Major Professor Name: Dr. Shyam Aravamudhan



RESEARCH QUESTIONS / PROBLEMS:

- ❑ Cellulose acetate based scaffold which can mimic the Extracellular matrix(ECM) using electrospinning.
- Viability, proliferation, morphology, and differentiation of 3T3 fibroblast and PC12 cell lines on nanofibers were studied and effect of material properties on cells was observed.
- ❑ A bioactive factor delivery vehicle for sustained release of Nerve Growth Factor (NGF) for neural tissues was fabricated.
- Electrospinning parameters to fabricate nanofibers with uniform core-sheath/core-shell structures using cellulose acetate as sheath and Polyvinylpyrrolidone (PVP) as core were optimized and nanofibers were characterized.
- Release of NGF over time using ELISA and its effect on differentiation of PC12 cells was studied.

METHODS:

- Electrospinning/Coaxial electrospinning
- Cell Viability Assays
- Release study of NGF from Coaxial Nanofibers
- Differentiation of PC12 cells on NGF releasing Coaxial Nanofibers

RESULTS / FINDINGS:

- Aligned and random Nanofibers with uniform morphology were fabricated and characterized.
- Studies showed nanofibers provide a better environment for the cells to attach, migrate and differentiate as compared to flat surface and microfibers.
- Uniform coaxial nanofibers using CA and PVP were fabricated and characterized by SEM, TEM, XPS, FTIR, Freeze drying.
- Effect of process parameters on fiber morphology was studied and relation between fiber size and morphology with process parameters was established.
- NGF was successfully incorporated in coaxial nanofibers and effect of NGF release on PC12 differentiation was studied.

SIGNIFICANCE / IMPLICATIONS:

- The current research shows the importance of using bioactive scaffold in tissue engineering.
- This is the first report on use of bioactive coaxial CA/PVP nanofibers for NGF delivery.
- This same system can be applied to bridge spinal cord injury (SCI).