

Biological-Basis For Designing Biomaterials For The Injured And Degenerated Host

Abhay Pandit

CÚRAM, Center for Research in Medical Devices, National University of Ireland, Galway Ireland

Biomaterials are no longer considered innate structures and using functionalisation strategies to modulate a desired response whether it is a host or implant is currently an important focus in current research paradigms. Fundamentally, a thorough understanding of the host response will enable us to design proper functionalisation strategies. The input from the host response needs to be weighed in depending on the host disease condition. In addition, biomaterials themselves provide immense therapeutic benefits which need to be accounted for when using functionalisation strategies. Strategies such as enzymatic and hyperbranched linking systems, where we have been able to link biomolecules to different structural moieties. The programmed assembly of biomolecules into higher-order self-organized systems is central to innumerable biological processes and development of the next generation of functionalized scaffolds. Recent design efforts have utilized a developmental biology approach toward both understanding and engineering supramolecular protein assemblies. Structural moieties have taken a variety of different forms such as nanofibers and nanoparticulate. This approach has resulted in functionalisation of micro and nanoparticles with biomolecules that include designed peptide motifs, growth factors and a multitude of gene vector systems. In addition, nature itself has abundant structural complexity that can be harnessed for targeted clinical applications. This talk will elucidate some of these ongoing strategies in our laboratory that pertain to intervertebral disc.