

Drug-eluting structures for various tissue regeneration applications

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Introduction: Bioresorbable drug-eluting fibers can be used in various tissue regeneration applications. However, the key problem remains: How can bioactive molecules be incorporated in thin delicate structures that construct devices and scaffolds, without having an adverse effect on their mechanical properties or on the agent's activity. We have recently developed and studied a novel class of bioresorbable, composite (core/shell) fiber structures which successfully overcome these challenges, opening the way for major advances in clinical applications.

Methods: Our composite fiber structures combine a dense bioresorbable core, and a porous PDLGA shell prepared using the "water-in-oil" emulsion freeze-drying technique. The effects of the emulsion formulation on the microstructure and on the release profile were studied. The microstructure was studied using SEM and the drug release profiles were determined using HPLC.

Results and conclusion: When water-soluble drugs such as the antibiotic agent gentamicin are incorporated in the fiber, it is important to choose formulation parameters that will enable desired drug release kinetics. Our results showed that a relative high polymer content, initial molecular weight of the host polymer and high organic:aqueous phase ratio enable "structuring" the system towards desired antibiotic release profile. Such antibiotic-eluting fibers can be used as basic elements of wound dressings or meshes for hernia repair, and also to treat periodontal diseases and other health problems. Fibers loaded with growth factors were developed and studied. Such fibers are designed to be used as basic elements of scaffolds for various tissue regeneration applications. Animal study results showed very promising results.

Biography

Zilberman holds an appointment of Associate Professor with tenure at the Department of Biomedical Engineering of Tel Aviv University. She received her B.Sc. in Chemical Engineering (Cum Laude) and her M.Sc. and Ph.D. in Materials Engineering from the Technion in Israel. She then worked as a post-doctoral fellow at the University of Texas Southwestern Medical Center at Dallas. Prof. Zilberman has published more than 70 peer reviewed articles in the top biomaterials and tissue engineering journals, contributed more than 130 presentations (including invited talks and plenary lectures) and serves on the editorial board of several Biomaterials journals.

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