MII Seminar Series

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Prof. Ronit Bitton

"Hierarchical Structure of Multicomponent Polysaccharide-Based ECM Mimetics"

Abstract:

The challenge in the development of surrogate extracellular matrices (ECMs) is to design and prepare synthetic materials capable of influencing cell differentiation, proliferation, survival, and migration through both biochemical interactions and mechanical cues. Current studies of engineered synthetic ECMs revealed that molecular features such as peptides, proteins and bio-interactive polymers incorporated within insoluble scaffolds play a dual role in cell interaction. The functional moieties act *directly* on cells while also modifying the hierarchical structural organization and mechanical properties of the resulting material, thus affecting the cellular response *indirectly*. While the former has been investigated extensively, studies of these structural effects induced by introducing bioactive molecular features are less conclusive.

Polysaccharides such as alginate, hyaluronic acid and chitosan have been utilized in the fields of regenerative medicine and tissue engineering as ECM mimetic. A common modification to improve survival and cell organization in these scaffolds is to covalently attach a peptide containing a bio-active epitope to the polysaccharide's backbone.

The aim of this research is to seek possible relationships between the structure on the nano-scale of modified polysaccharides in solution and the macroscopic properties of polysaccharides gels.

Thorough characterization of the polysaccharides (both natural and modified) in aqueous solutions using rheology, zeta potential, and small angle X-ray scattering (SAXS) revealed that the modifications affect the structural features of the polymer chain, the spatial arrangement of the polymer networks, and the bulk structural properties of the gels. These results suggest that elucidating the key factors involved in the structure-property relationships of these moleculess will improve our ability to design and prepare tailor-made scaffolds for a variety of applications.

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Bio:

Ronit Bitton received her B.Sc. in Chemical Engineering in 1997 from the Techion- Israel Institute of Technology. She obtained her M.Sc. (2003) and her Ph.D. (2007) in Biotechnology also from the Techion. After a postdoctorate in the group of Sam Stupp at Northwestern University she joined the department of Chemical Engineering at the Ben-Gurion University of the Negev. She is a member of the Ilse Katz Institute for Nanoscale Science and Technology. Her research focuses on experimental investigation of hierarchical (nano-, micro-) structure and properties of complex materials of interest in regenerative medicine. Materials of interest include hydrogels from polysaccharides and dynamic self-assembling peptides.

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