

Tissue regeneration using anti-inflammatory nanomolecules

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Anyone who has suffered an injury can probably remember the after-effects, including pain, swelling or redness. These are signs that the body is fighting back against the injury. When tissue in the body is damaged, biological programs are activated to aid in tissue regeneration. An inflammatory response acts as a protective mechanism to enable repair and regeneration, helping the body to heal after injuries such as wounds and burns. However, the same mechanism may interfere with healing in situations in which foreign material is introduced, for example when synthetics are grafted to skin for dermal repair. In such cases, the inflammation may lead to tissue fibrosis, which creates an obstacle to proper physiological function.

The research group of Arun Sharma, PhD has been working on innovative approaches to tissue regeneration in order to improve the lives of patients with urinary bladder dysfunction. Among their breakthroughs was a medical model for regenerating bladders using stem cells harvested from a donor's own bone marrow, [reported](#) in the *Proceedings of the National Academy of Sciences* in 2013.

More recently, the team has developed a system that may protect against the [inflammatory reaction](#) that can negatively impact [tissue growth](#), development and function. Self-assembling peptide amphiphiles (PAs) are biocompatible and biodegradable nanomaterials that have demonstrated utility in a wide range of settings and applications. Using an established urinary bladder augmentation model, the Sharma Group treated a highly pro-inflammatory biologic scaffold used in a wide array

of settings with anti-inflammatory peptide amphiphiles (AIF-PAs). When compared with control PAs, the treated scaffold showed regenerative capacity while modulating the innate [inflammatory response](#), resulting in superior bladder function.

This work is published in the journal *Biomaterials*. Says Sharma, "Our findings are very relevant not just for bladder regeneration but for other types of [tissue regeneration](#) where foreign materials are utilized for structural support. I also envision the potential utility of these nanomolecules for the treatment of a wide range of dysfunctional inflammatory based conditions."

More information: Bury MI, Fuller NJ, Meisner JW, Hofer MD, Webber MJ, Chow LW, Prasad S, Thaker H, Yue X, Menon VS, Diaz EC, Stupp SI, Cheng EY, Sharma AK. The promotion of functional urinary bladder regeneration using anti-inflammatory nanofibers. *Biomaterials*. Available online 18 August 2014.
[www.sciencedirect.com/science/ ... ii/S0142961214008667](http://www.sciencedirect.com/science/.../S0142961214008667)

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