ENGINEERED POLYMER-PEPTIDE FOR TREATMENT OF LOWER BACK PAIN CAUSED BY CHRONIC BACK PAIN

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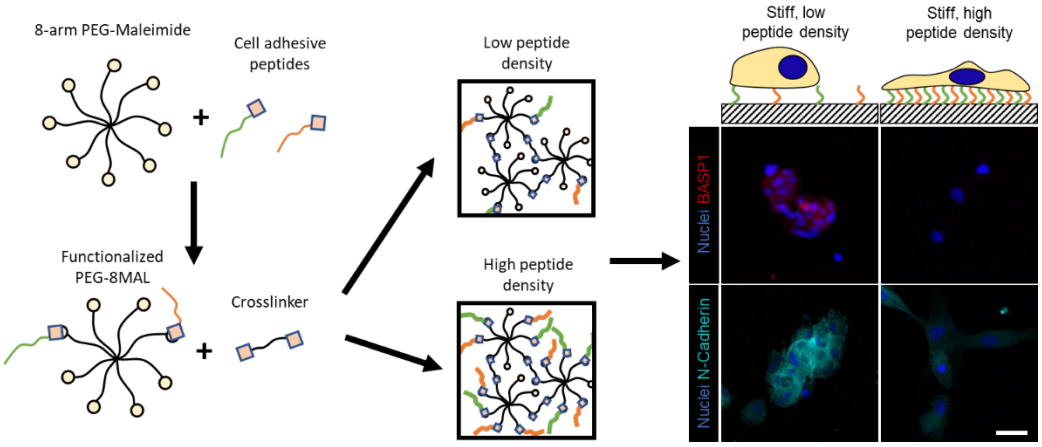
Value Proposition: *Tissue engineering scaffold for cell differentiation and delivery to intervertebral disc for treating back pain.*

Technology Description

Researchers at Washington University in St. Louis have developed an engineered peptide-functionalized polymer that can support healthy nucleus pulposus (NP) cells to make cell-polymer culture constructs *in vitro*, or to deliver cells to the intervertebral disc for repair purposes. Severe low back pain and disability can result from intervertebral disc (IVD) degeneration caused by cell phenotype changes in the nucleus pulposus (NP) region. While autologous stem cells have be used to treat lower back pain, currently there are no tools to control differentiation of these cells toward targeted and biosynthetically active NP cells.

This polymer could be used for a variety of tissue engineering applications such as coating tissue culture surfaces, making cell-polymer culture constructs in vitro, and delivering cells [induced pluripotent stem cells (iPSC) or adult NP cells] to the IVD to treat back pain caused by IVD degeneration.



Creation of a polymer-peptide hydrogel scaffold with tunable stiffness and adhesive group presentation to mimic healthy NP cell environment

Stage of Research

The inventors conducted in vitro proof-of-concept studies with primary human cells from pathogenic NP tissues. They identified an optimal formulation of hydrogel stiffness and peptide concentration. (Publication)

Publications

Barcellona, M. N., Speer, J. E., Fearing, B. V., Jing, L., Pathak, A., Gupta, M. C., ... & Setton, L. A. (2020). Control of adhesive

ligand density for modulation of nucleus pulposus cell phenotype. *Biomaterials,* 120057.

Applications

- Tissue Engineering
- Treatment of back pain caused by IVD

Key Advantages

- Promotes cell attachment and differentiation toward a juvenile NP phenotype
- Tunable stiffness in the range of 5 to 50 KPa to support the load-bearing function of IVD
- Controllable reaction kinetics enables a range of cell phenotype changes
- Materials-based approach to restore the mechanical properties of the disc as well as cellular bioactivity

Patents

Patent application filed

Related Web Links – Lori Setton Profile; Setton Lab