

# Biomedical Discussion Group

## Intervertebral disc regenerative medicine: combining micro-scaled delivery systems and endogenous repair



**Friday May 17, 2019**

**2-3 pm, East Campus 4 Boardroom (EC4-2101a)**

### **Dr. Catherine Le Visage**

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**Abstract:** The intervertebral disc (IVD) is a fundamental component of the spine and has a vital contribution to its biomechanics. It plays a major role in the flexibility of the spine by allowing bending, flexion and torsion and is divided in two macroscopically different tissues, the Nucleus

pulposus (NP) in the center and the surrounding Annulus fibrosus (AF). IVD degeneration is the result of complex pathological processes involving alteration of extracellular matrix (ECM) components, the production of pro-inflammatory factors and a dramatic decrease in NP cell density. On the other hand, extensive AF radial tears lead to herniation, defined as the protrusion of the NP outside the IVD, causing a compression of the nerve root in the spinal canal leading to radicular pain.

This talk will present recent bioinspired regenerative approaches that aim to address IVD degeneration and discogenic low back pain. Based on the recent description of a reservoir of IVD progenitor cells, endogenous repair strategies that aim to harness the progenitor regenerative capacity will be discussed. We will present an intradiscal polysaccharide microbead-based delivery system for the sequential release of chemokines and growth factors that could contribute to the recruitment of these progenitors followed by their differentiation into NP cells. We will also highlight the relevance of engineering strategies focused on AF closure and repair. We will share our results regarding the design of an electrospun implant composed of polycaprolactone that mimics the oriented and multi-lamellar fibrous structure of the native AF and its ability to properly close an AF defect in a sheep model.

**Bio:** Catherine Le Visage is a Research Director and the Deputy Director of the Regenerative Medicine and Skeleton (RMeS) laboratory at the University of Nantes, France ([www.rmes.univ-nantes.fr](http://www.rmes.univ-nantes.fr)). She was trained as a Pharmacist, joined the team of Prof. Patrick. Couvreur, at the Institut Galien-Paris Sud, and received her PhD in Pharmaceutical Technologies in 1999. She then performed a post-doctoral training in the Biomedical Engineering Dept. of the Johns Hopkins School of Medicine (Baltimore, USA) in Prof. Kam Leong's laboratory with a focus on focus on thermo-sensitive hydrogels for stem cell delivery. In 2007, she joined the French National Institute of Health and Medical Research to investigate polysaccharide hydrogels as a platform for regenerative medicine. Her most recent works have focused on the development of porous and self-setting hydrogels as i) carriers of cells or bioactive molecules in the context of intervertebral disc disease and osteoarthritis and ii) tools for stem cell-based organogenesis. She has authored 64 publications in ISI-indexed journals (h-index 23) and 11 patents

*Keywords: Low back pain, Disc degenerative disease, Stem cells, Progenitor cells, Biomaterials, chemokines, Growth factors, miRNA, Drug delivery systems, Hydrogel, joint microenvironment, cartilage, intervertebral disc regeneration.*



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