סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת ביוטכנולוגיה ומזון

מרצה: דומניקו דאטרי

מנחה: פרופ' מרסל מחלוף

נושא הסמינר בעברית:

פיתוח מערכת מבוססת וסיקולות ננומטריות ממברנות של תאי גזע מזנכימליים לצורך הובלה מוכוונת של תרופות לרקמת סחוס לטיפול בדלקת מפרקים ניוונית

נושא הסמינר באנגלית:

Developing the Nano-Ghost system as a targeted delivery system to the cartilage tissue for the treatment of osteoarthritis

Abstract: **** Lecture will be held in English****

Osteoarthritis (OA) is a chronic degenerative disorder characterized by cartilage loss and bone overgrowth. The World Health Organization estimates that 9.6% of men and 18.0% of women aged over 60 years have symptomatic osteoarthritis with 80% of those people suffering from limitation in movement. Recently, micro and nanoparticles have been studied for many reasons and vast efforts have been invested in developing nanoparticles-based therapeutics. The most studied nanoparticles (NPs) have a polymeric origin although, recently, the use of cell-membrane based NPs is arising. Goal of those NPs is mainly to deliver cargo and explain their natural function derived from their membrane characteristics. In our laboratory we developed a novel kind of membrane-based nanoparticles, termed Nano-Ghosts (NGs), which are produced from the cytoplasmic membrane of Mesenchymal stem cells (MSCs). MSCs play a key role in modulating inflammation and wound healing, and they are known to home to inflammatory sites. The homing process is regulated by composition, orientation, and functions associated with MSCs' membrane, which is retained by our nanoparticles. NGs lack all the internal machinery of a cell, therefore they do not respond to external stimuli and they are not susceptible to host induced changes. These reasons allow NGs to be a safer and more stable drug delivery system compared to cell-based therapy. In addition, due to their origin, they are considered to have immunomodulatory capacity and to be immune evasive.

The aim of this study was to modify and optimize the NGs production process in order to target OA while delivering therapeutic peptides. NGs were produced and characterized for their physical and biological characteristics and, as previously published, they were found to be spherical particles with 200 nm diameter. Importantly, the NGs conserved the markers of MSCs and their capabilities of targeting inflammation. Different approaches to load a cargo were studied and the characterization of the NGs after the loading was performed. Biological studied were performed on loaded NGs and free cargo to compare the delivery efficacy of the particles. NGs ability to target inflammation in vitro, ex vivo and in vivo were assessed and the particles showed to target inflamed OA tissue more efficiently than healthy tissues. The interactions between NGs, cartilage cells and cartilage tissues were investigated and their capability to reduce inflammation was studied at protein and mRNA level. NGs showed immunomodulatory activity while they efficiently delivered the loaded cargo. Finally, in vivo studies were carried out to study NGs ability to target cartilage and deliver the cargo while acting as an immunomodulatory drug. Studies revealed that NGs can efficiently deliver a cargo while preserving cartilage from degradation and preventing the formation of extra bone tissue in osteoarthritic mice .

In conclusion, NGs system is a versatile nano-carrier system, capable of therapeutics loading, with targeting capabilities towards healthy and inflamed cartilage cells, in vitro and in vivo. In addition, NGs showed to immunomodulate inflammatory response in vitro and slow down OA process in vivo. Our results, along with previously published data regarding the NGs abilities, clearly points out the NGs system as a promising nano-carrier platform and as immunomodulatory drug themselves for several diseases from tumors to myocardial infarction and osteoarthritis .

יום ד' 13.11.2019, כיתה 300, 14:00 – 15:00