



**I. FLASH: Fluorescently Labeled Sensitive Hydrogel to monitor bioscaffolds degradation during neocartilage generation**

**II. Biofabrication of human articular cartilage: a path towards the development of a clinical treatment**



Carmine Onofrillo, Serena Duchi University of Melbourne, Australia and CNR-ISOF

**Abstract I.** The application of hydrogel-based 3D bioscaffold is continuously growing in the cartilage regeneration field. Multiple parameters need to be taken in account to achieve a positive rate of chondrogenesis. In particular, the characterization of the behavior of a bioscaffold under dependency or independency of biological contributions play a pivotal role for the future clinical applications. Permeability, stiffness, and degradation rate of deliverable materials are all important features and require multiple analysis approaches. Here we propose the application of FLASH: a methodology that gives the ability to characterize, in a real time and contact less manner, the behavior of a 3D bioscaffold to predict neocartilage generation.

**Abstract II.** 3D bioprinting is an exciting technology to deliver tissue-engineered bioscaffolds in cartilage damaged tissue and prevent the development of osteoarthritis. While total joint replacement remains a viable option, limited preventative treatments are available. This project aims to develop an in situ 3D bioprinting therapy to treat cartilage injuries by enabling surgeons to print stem cells into the defect site. It uses the autologous adipose derived mesenchymal stem cells, embedded in photo-crosslinkable hydrogels, to create hyaline cartilage and to promote cartilage repair. Our team has advanced the technical, biomaterial and cellular requirements to make the in situ bioprinting of cartilage a reality, and has now completed in vitro and in vivo studies toward commercial development and clinical translation.

*Dr. Carmine Onofrillo received his academic education from the University of Bologna, awarding a bachelor's degree in biology, a master's degree in molecular biology and a PhD in oncology and experimental pathology. He moved in Melbourne in 2016 to work in the field of advanced tissue engineering in the cartilage regeneration team led by Prof. Peter Choong and A/Prof. Claudia Di Bella. His studies are focused on the induction and characterization of stem cells differentiation in 3D bioscaffold.*

*Dr. Serena Duchi is a cellular biologist with special interest in osteochondral tissue engineering. She obtained her PhD in Cell, Molecular and Industrial Biology in 2009. She specialized in the treatment of musculoskeletal tumors at the Rizzoli Orthopaedics Institute in collaboration with ISOF-CNR, leading projects focused on mesenchymal stem cells for drug delivery (SNAPSHOT) and regenerative medicine for osteochondral diseases treatments. She moved to Melbourne in April 2016 as an academic research fellow. She is author of more than 50 publications with more than 1000 citations.*

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