Avviso di Seminario

28 giugno 2017 – ore 12

Presso il Diparitmento di Fisica e Astronomia (Viale Berti Pichat 6/2) – Aula 2

Flexible and Soft Bioelectronics for the Biotic/Abiotic Interface

Damia Mawad

School of Materials Science and Engineering, UNSW Sydney, NSW 2052, Australia

Damaged electroresponsive tissues such as spinal cord injuries and myocardium infarctions malfunction due to disruption in the bioelectric signal propagating along the tissue. Flexible and soft organic bioelectronics are being explored as biomaterial-based approaches applied on the biotic/abiotic interface to electro-couple with the tissue and restore the electric signal.1,2 However, the clinical application of organic conducting polymers (CPs) has been mainly hindered by their short term operational lifetime in physiological conditions and their hydrophobicity that impedes nutrient transfer needed for cell survival. Furthermore, fixing these flexible bioelectronics on soft tissue can be challenging and requires invasive suturing techniques. Our research is to develop novel bioelectronics with tailored chemistries that address the aforementioned limitations. We show that by modifying the chemistry of CPs, these macromolecules could be fine-tuned into functional materials opening the way for the development of novel bioelectronics capable of electro-coupling with biological tissues. We also investigate minimally invasive techniques to anchor soft biomaterials onto tissue eliminating the need for sutures.3

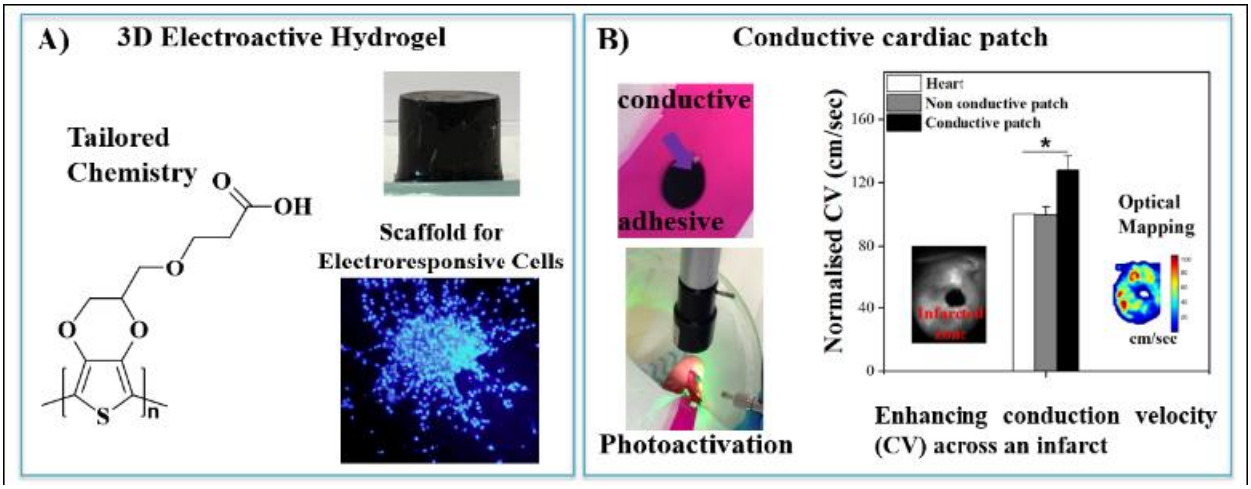

Figure 1: Soft and flexible bioelectronics. **A)** An electroconductive hydrogel that promotes cell adhesion and proliferation.4,5 **B)** A conductive patch that could be adhered to the beating heart with visible light and electro-couple with damaged tissue enhancing its conduction velocity.6

References

[1] J. Janata, M. Josowicz. *Nat. Mat.* **2003**, *2*, 19.
[2] J.G. Hardy, J.Y. Lee, C.E. Schmidt. *Curr. Opin. Biotechnol.* **2013**, *24*, 847.
[3] S.J. Frost, D. Mawad, M. Higgins, *et al. NPG Asia Materials*. **2016**, 8:e280.
[4] D. Mawad, A. Artzy-Schnirman, J. Tonkin, *et al. Chem. Mater.* **2016**, 28, 6080.
[5] D. Mawad, E. Stewart, D.L. Officer, *et al. Adv. Funct. Mater.* **2012**, 22, 2692.
[6] D. Mawad, C. Mansfield, A. Lauto, *et al. Sci. Adv.* **2016**, 2:e1601007.

Short Biography

Dr Damia Mawad is a lecturer at the School of Materials Science and Engineering, UNSW Australia. She is leading a research group specialized in biomedical research with emphasis on innovations in the fabrication design of newly synthesized conjugated polymers. The research group is multidisciplinary combining basic science (chemistry, physics) with advanced engineering (processing and fabrication) for the development of functional organic electronic materials. Before her current appointment, she was a Marie Curie International Incoming Fellow in Imperial College London, UK. She has significant international research experience and actively collaborates with renowned research groups in multidisciplinary fields. One of her main investigations is development of electroactive and conductive scaffolds for biomedical applications with emphasis on material chemistry and design strategies that transition from a monomer to a polymer to 3D construct.

Docente di riferimento: Prof. Beatrice Fraboni (beatrice.fraboni@unibo.it)