PhD Thesis: Bacterial Cellulose Scaffolds for Epithelia Therapies

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Nanoparticles and Nanocomposites Group website: www.icmab.es/nn

Project: Rising the Impact of Selected Engineered Bacterial Cellulose composites (RISE-BC) - ***RTI2018-096273-B-I00***

Cellulose constitutes an almost inexhaustible biopolymer, being the most abundant renewable natural polysaccharide produced in the biosphere. Cellulose, with a complex hierarchical structure, and more recently nanocellulose, are being actively revisited when designing new functional (bio)nanocomposites. Although cellulose is predominantly obtained from plants, it can also be synthesized by bacteria, algae and fungi. In particular, bacterial cellulose (BC) produced by microbes has the same molecular formula as vegetal cellulose but in contrast is a purer chiral biopolymer that exhibits a higher degree of polymerization and crystallinity. BC also has high porosity, transparency and water holding capacity. Moreover, a very unique characteristic of BC is the possibility to impact on its micro(nano)structuration and shape during its production. Thus, the biosynthesis of cellulose offers to materials scientists a model biopolymer to study structure, topography and new bottom up approaches to fabricate nanocomposites.

Bacterial cellulose have a high biological compatibility in serum, with proteins, and with cells, which allows evaluating its use for biomedical applications. In specific, most epithelial tissue regeneration therapies are based on collagen; although collagen exhibits moderate immunogenicity, high batch-to-batch variability and its mechanical properties and degradation kinetics do not always meet the clinical requirements. BC could play a relevant role in epithelium repair and regeneration (i.e., dermal, eye surface, oral mucosa among others) to overcome those drawbacks. A more complete report on epithelial tissue repair and BC can be found in our recent mini-review.

The PhD thesis will aim at developing complex BC scaffolds for dermal cell cultures and combining BC with therapeutic agents.

The PhD candidate will work on a biomaterials/biotechnology project and he/she will use the BC scaffolds to evaluate proliferation of cells in tridimensional substrates, add therapeutical agents (growth factors and proteins) and evaluate their effects.

We are looking for a PhD candidate with a strong background in biomedicine, highly motivated and interested in multidisciplinar projects. We will require previous experience in cell culture and biochemical techniques.

Interested candidates should email alaromaine@icmab.es with the message header: RISE-PhD, including in a single document a motivation letter, a CV and two reference letters. **Deadline: 15th October 2019.**

References

Opportunities of Bacterial Cellulose to Treat Epithelial Tissues I. Anton-Sales, U. Beekmann, A. Laromaine*, A. Roig* and D. Kralisch *Current Drug Targets*, 2019, 20, 8, 808-822.

Nanocellulose films with multiple functional nanoparticles in confined spatial distribution S.Roig-Sanchez, E.Jungstedt, I.Anton-Sales, D. C. Malaspina, J.Faraudo, L. A. Berglund, A.Laromaine, A.Roig *Nanoscale Horiz*., 2019, 4, 634-641.