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Bacterial cellulose & Microalgae: Engineered tissue for biomedical applications

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Bacterial cellulose (BC) has been a subject of much recent research, not only for its environmental friendly synthesis (biocompatible and biodegradable), but also for its high potential in areas such as biomedicine. BC possesses a unique and sophisticated 3D porous network with high crystallinity (up to 80%), with high degree of polymerization (up to 8000), high water content capacity (up to 99%), good biocompatibility, high hydrophilicity and no toxicity. The BC synthesis result is an overlapping nanofibrous membrane, whose porosity depends on the different cellulose producing bacteria and the used production conditions, such as the synthesis medium, temperature, pH, stirring or oxygen content, and also but not less important, on the drying technique used. The ambition to bring something new to science and the possibility to improve human lifestyle make our working group to go further and promote an association between BC and microalgae. In order to promote an association between BC and microalgae BC reception capacity of a microalga and the viability of the association itself were studied. Another target of our investigation was to test photosynthetic microalgae with relevant levels of oxygen release. Not only microalgal survival in the membrane was tested, but also the components liberation from the nanocomposites for the treatment of wounds (e.g. oxygen, an important angiogenesis factor). The results were promising and open a new window to BC applications in fields until now not explored.

Recent Publications:

1. Mohammadkazemi F, Faria M., Cordeiro N., (2016) In situ biosynthesis of bacterial nanocellulose-CaCO₃ hybrid bionanocomposite: One-step process. *Materials Science and Engineering C* 65:393-399.
2. Castro C., Cordeiro N., Faria M., Zuluaga R., Putaux JL, Filpponen I., Velez L., Rojas OJ, Gañán PF, (2015) In-situ glyoxalization during biosynthesis of bacterial cellulose. *Carbohydrate Polymers* 126(1):32- 39.
3. Deepa B., Abraham E., Pothan LA, Cordeiro N, Faria M., Thomas S., (2015) Biodegradable Nanocomposite Films Based on Sodium Alginate and Cellulose Nanofibrils. *Materials* 9(1):50.
4. Chang WS, Chen HH, (2014) Physical properties of bacterial cellulose composites for wound dressings. *Food Hydrocolloids* 53:75-83.
5. Schenck TL, Hopfner U, Chávez MN, Machens HG, Somlai-Schweiger I, Giunta RE, Bohne AV, Nickelsen J, Allende ML, Eganã JT, (2014) Photosynthetic biomaterials: A pathway towards autotrophic tissue engineering. *Acta Biomaterialia* 15:39-47

Biography

Nereida Cordeiro is an Associated Professor of Chemistry in the Faculty of Sciences and Engineering of the University of Madeira. She holds a degree in Analytical Chemistry (University of Aveiro) and PhD in Chemistry (University of Aveiro). Her main research interests are in Analytical and Environmental Chemistry, with focus on biomaterials and biotechnology. She authored more than 70 scientific publications in international journals.

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