Research Group for 3D Printing and Biofabrication
Head Prof A. Ovsianikov

PhD position in material science and physico-chemistry

The project

Bacteria within a biofilm are up to 1,000-fold more resistant to antibiotics and are inherently insensitive to the host immune response. This is particularly relevant for patients affected by Cystic Fibrosis (CF), also called mucoviscidosis. Indeed, once *Pseudomonas aeruginosa* colonizes the lungs, it can acquire a mucoid phenotype, which renders infections insensitive to antibiotics.

Our preliminary data show that antibiotherapy directly impacts on extrapolymeric substances (EPS) properties [1], and our hypothesis is that those environmental factors have a pernicious role on bacteria embedded in such structure, rendering them even less permissive to antibiotherapy.

Our goal

We want to recreate *in vitro* 3D models of CF-biofilm mimicking the clinical situation, and to study how the EPS microenvironment evolves during antibiotherapies.

The main aims of the 4 years PhD position are (1) to establish a relevant *in vitro* model of CF-biofilm, (2) to elucidate the physico-chemical interaction of the EPS and (3) to test how we can restore antibiotics efficacy using High-throughput screening tool.

No study reports on the physico-chemical characteristics of EPS and how the micro-environment can be modulated by external compounds, such as antibiotics or other adjuvants.

Your tasks

- ➔ Synthesize and characterize extrapolymeric (EPS) substances.
- ➔ Formulate Bioinks
- ➔ Investigate physico-chemical interactions between EPS and drugs.
- ➔ Screen adjuvants to counter EPS remodelling.

Your profile

Applicant should have experience in material science, polymer science, physico-chemistry or biophysics. Experience in bioink formulation, rheology and 3D bioprinting would be an advantage. We seek highly motivated students, with team-oriented mindset and interested in multi-disciplinary projects.

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What we offer

The project is truly interdisciplinary with strong collaboration across scientific disciplines.

The main coordinator of this project is Dr. Guillaume Olivier (TU Wien). The main activity will be conducted at the TU Wien, in the 3D Printing and Biofabrication Group of the Institute of Materials Science and Technology, Vienna (Head Prof. A Ovsianikov, PhD co-supervisor). This project is in close collaboration with the Institute for Biologically Inspired Materials (BIMat) at the University of Natural Resources and Life Sciences, Vienna with Prof E. Reimuhlt, and around 30% of the activities will be conducted in this lab.

The Ovsianikov group has full access to various 3D printing / bioprinting techniques (extrusion, digital light processing, stereolithography, multi-photon lithography), equipment to perform ink/hydrogel characterization (rheometry, AFM, $_1$H-NMR, FT-IR, DSC and TGA etc), cell culture and characterization (including ELISA, RT-PCR etc), SEM, optical and confocal microscopy.

The Reimhult group offers the complete infrastructure, including microbiology laboratories (including bioreactor, HPLC, FPLC, columns for EPS purification, RNA isolation and PCR for gene expression), wide-field and electron microscopes (holographic microscope, SEM, TEM and recently developed DDM to measure locally mechanical properties of hydrogel) and biopolymer characterization equipments (including $_1$H-NMR, FT-IR, GPC, DSC and TGA). ITC, DSC, TGA, FT-IR and confocal microscopy available at the core facilities “Biomolecular & Cellular Analysis”, “Extremophile Center” and “VIBT Imaging Center”.

The PhD candidate will be registered at the TU Wien, full-time position (30hrs/week)

For further information, you are welcome to contact Dr. Olivier Guillaume
E-mail: olivier.guillaume@tuwien.ac.at
Website: https://wwwt.tuwien.ac.at/ovsianikov/

If you are interested, please send CV, motivation letter and referee contacts directly to Dr. Guillaume by the **2nd of May 2020**.

Literature

[1]: Heriot M. et al, Interaction of Gentamicin Sulfate With Alginate and Consequences on the Physico-Chemical Properties of Alginate-Containing Biofilms (2019) Int J Biol Macromol.

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