

Biomaterials

Type of position

Degree-seeking PhD position (48 mon)

Main supervisor

Thomas Crouzier

KTH School

BIO

Co-supervisor(s)**KTH Department**

Glycoscience

Main email contact

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Specific subject area(s)

Biomaterials, biopolymers, hydrogels, cell-material interactions, bioactive materials, glycoproteins, extracellular matrix, surface science

Title of project

Mucin based materials for immunomodulation

Earliest start date

01/09/2017

Project website if available

<http://biopolymersforlife.org>

Short description of the project

Our group exploits the functionalities of biopolymers to engineer the next generation of advanced biomaterials. In this PhD thesis project, you will create new biomaterials based on mucins biopolymers and test their ability to direct the fate of immune cells.

Mucins are family of large glycoprotein polymers expressed by virtually every cell type. A sub-family of mucins is secreted in the extracellular space and entangles into a hydrogel called mucus. Mucus covers our epithelium and protects us from dehydration, and infections. However recently, mucins have also been shown to directly signal to the immune system, lowering their activation state to allow beneficial commensal bacteria to colonize our gut with minimal inflammation reaction.

This new discovery in mucin biology is a unique opportunity for biomaterial designers to create new mucin-based biomaterials that mimic the immune modulatory effects of our native mucus. By using purified mucins and chemical modifications, you will create new mucin-based materials, test cell-materials interactions, and investigate the origin of mucin materials bioactivity.

Biopolymer biomedical engineering

Type of position

Degree-seeking PhD position (48 mon)

Main supervisor

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BIO

Co-supervisor(s)**KTH Department**

Glycoscience

Main email contact

crouzier@kth.se

Specific subject area(s)

biopolymers, mucus, mucins, biohydrogel, mucosal health, mammalian cell model, biophysics

Title of project

Super mucus: engineering reinforced mucus barrier

Earliest start date

01/09/2017

Project website if available

<http://biopolymersforlife.org>

Short description of the project

Our group works on the mucus gel that covers our wet epithelium, including our eyes, nose, lungs, digestive tracts, and the female reproductive tract. Mucus is essential to protect these surfaces from dehydration, shear stresses and infections by the millions of viruses and bacteria that they come in contact with every day. In this PhD thesis project, you will be developing new strategies to reinforce mucus' protective properties.

Mucosal care is increasingly attracting the attention of the healthcare industry. However we have yet to see the mucosal-equivalent of bandages and hydrating creams that we so commonly use on our skin. You will develop new ways to provide relief for the millions suffering from deficiencies in their mucus layers. Instead of developing drugs acting on mucus-producing cells, you will imagine simpler and safer treatments that directly repair the mucus layer.

You will work with mucus-secreting in vitro cell models to test the effect of topical additives. For instance these may include other biomolecules or particles. Then you will test the effect on the ability of mucus to protect from viruses, bacteria, and toxins. The results will be a better understanding of this complex natural system, and biomedical innovations that could lead to new industrial partnerships.