materials-driven regeneration

- Wednesday April 13th, 2022 -

- 4:00pm (CET) -

MDR colloquium April 2022

Online – TEAMS meeting

The Research Center for Materials-Driven Regeneration (MDR) is proud to present a series of lectures (monthly). The MDR Gravitation program is a partnership between Eindhoven University of Technology, Maastricht University and Utrecht University, University Medical Center Utrecht and the Hubrecht Institute. MDR brings together materials scientists, cell biologists, tissue engineers and medical scientists to jointly work on the regeneration of tissue and organ function with intelligent, life-like materials.

Improving Expansion and Differentiation of Kidney Tubuloids

Kidney tubuloids are cystic 3D structures comprised of cells belonging to the main epithelial tubular segments found in the adult kidney. Because of their ease of expansion from patient material and their maturity, they constitute one of the most promising models to study renal diseases and to investigate and aid the process of kidney regeneration. However, some important issues remain to be tackled in order to improve this model. One of these issues is the sub-optimal re-differentiation capacity of tubuloids. Although many functional markers are present upon induction of differentiation, some major ones are still missing. Another issue is their limited expansion: renal tubuloids can only be cultured for up to 13 passages. This culture period is an improvement compared to the culture of cells in 2D, but it is still limiting. The ultimate goal is the application of tubuloids in devices for functional evaluation, drug development, and renal replacement therapy. Therefore, having a well-differentiated cell model that can be expanded for a long period of time is crucial.

Carla Pou Casellas

University Medical Center Utrecht / Hubrecht Institute

Inorganic nanoparticles for the development of new generations of biomaterials

Inorganic nanomaterials such as mesoporous silica, calcium phosphate and gold nanoparticles have unique physical properties and, in addition, are highly modifiable, making them versatile platforms for a range of medical applications including within regenerative medicine. In this talk I will highlight some of the ways these inorganic nanoparticles can be used to enhance regenerative strategies. For example, inorganic nanoparticles can be used as building blocks to create new types of nanocomposite biomaterials that have important properties for tissue regeneration such as self-healing, cell responsiveness, injectability, controllable drug delivery and moldable properties. Moreover, inorganic nanoparticles can also be used as instructive coatings or as 2D biointerfaces to study the effect of surface chemistry, nanotopography, biochemical cue and ligand presentation on stem cell behavior. Finally, inorganic nanoparticles can be designed as multimodal imaging probes capable of tracking stem cells in the body while providing functional information at the (sub)cellular level. Such tools enable critical information about the mechanisms of stem cell therapy and tissue regeneration.

In summary, with this talk I aim to give you a flavor of this rapidly evolving field using inorganic nanoparticles for the development of new generations of biomaterials with changeable features at the nanoscale.

Dr. Sabine van Rijt

MERLN Institute for Technology-Inspired Regenerative Medicine

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