

LECTURE INVITATION

From Biomaterials Engineering to Immunoengineering

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The lecture will take place on Thursday 28th of March 2024 at 14.00 h in seminar room
Alexander Fleming (0.3) Blok A

Faculty of Pharmaceutical Sciences, Ottergemsesteenweg 460, 9000 Ghent, Belgium.

Registration not required.

Contact

Prof. Koen Raemdonck

ABSTRACT

Polymeric materials play a crucial role in biomedical engineering. Multiscale polymeric biomaterials have been designed to deliver therapeutics and engineer new treatment strategies. We have developed non-covalent self-assembly strategies to construct various polymeric systems to address unmet needs in clinical chemotherapy and immunotherapy. We have engineered Π - Π stacked polymeric micelles for chemo-immunotherapy and vesicles based on polymer-drug conjugates to activate antigen-presenting cells. Recently, we discovered a new mechanism of polymer self-assembly which is triggered and controlled by covalent bonding.

Our research begins with polymer synthesis by controlled/free radical polymerization and prodrug chemistry. Amphiphilic polymers and polymer-drug conjugates are formulated as polymeric micelles and nanovesicles, respectively. The polymeric micelles have shown high stability in the blood circulation and efficient tumor accumulation after i.v. injection. Furthermore, various chemotherapeutic drug-loaded polymeric micelles exhibited potent immunostimulatory effects. The nanovesicles are efficiently recognized and taken up by antigen-presenting cells, followed by enzyme-mediated degradation in endo/lysosomes. The nanovesicles composed of antigens and immune agonists provoke potent and durable immunoactivation and vaccination effects. Covalent polymer self-assembly is performed in full aqueous solutions to yield nano-to-macroscale crosslinked polymeric hydrogels. The hydrogels are used to deliver molecular and cellular therapeutics for cancer therapy. Overall, our work integrates polymer chemistry and materials engineering to innovate multi-scale biomaterials aimed at advancing immunoengineering for translational cancer therapy.

Biography

Dr. Yang Shi is Full Professor and Head of Department of Polymer Therapeutics in the Medical Faculty at RWTH Aachen University. Dr. Shi obtained his PhD degree from Utrecht University in 2014 on polymeric micelles for tumor-targeted drug delivery. Shortly after PhD, he was appointed Associate Professor at South China University of Technology, and in 2016 he started a new position as Group Leader at RWTH Aachen University. His current department is focusing on engineering and understanding polymer-based therapeutic systems for chemotherapy, vaccination



and immunotherapy. He has obtained funding from European Research Council (ERC, Starting Grant; Proof of Concept Grant), German Research Foundation (DFG) and Federal Ministry of Education and Research (BMBF). His work has received numerous recognitions, including Science Award (International Pharma Sciences Foundation/Rottendorf Stiftung), Rising Star Awards from leading publisher groups (American Chemical Society and Springer Nature), Merck Best Talk Award (Controlled Release Society) and Theodore von Kármán Fellow (RWTH and Harvard). He is serving as an Editor for Journal of Controlled Release and Journal of Nanobiotechnology.