Combating Diseases with Peptide – Synthetic Polymer Conjugates

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Peptides and proteins often combine unique self-assembly properties with very specific biological activities. From a therapeutic point of view, peptides and proteins are of interest, not only because of the possibilities to act as inhibitors or antagonists of biological processes (i.e. to act as therapeutics), but also because they provide opportunities e.g. for targeted delivery or to guide intracellular trafficking. Judiciously combining biologically active peptides or proteins with synthetic polymers provides opportunities to overcome problems related to the limited stability and plasma half life of peptides and proteins, to enhance the efficacy of polymer-drug conjugates and to augment the activity of peptide based therapeutics.[1-4] This presentation will consist of three parts which will successively discuss: (i) non-covalent polymer – drug conjugates in which the peptide-based linker not only acts to bind and release cargo but is also involved in directing intracellular trafficking;[5,6] (ii) polymer-modified HIV fusion inhibitors that show increased stabilities as compared to the unmodified peptides while maintaining activity[7] and (iii) multivalent HIV entry inhibitors based on side-chain peptide – polymer conjugates which allow to augment the activity of the peptide.[8] In all three cases, precision polymer synthesis is essential in the successful design of the final conjugates. Amongst others, the examples will highlight the importance of controlling molecular weight, the site of polymer – peptide conjugation as well as polymer architecture on the final properties and activities of the peptide – polymer conjugates.

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He studied chemical technology at the University of Twente (Enschede, The Netherlands) from 1989 to 1993 and received his Ph.D. in 1997 from the University of Ulm (Germany) after working with Martin Möller. After postdoctoral research with David N. Reinhoudt (University of Twente) and Samuel I. Stupp (University of Illinois at Urbana–Champaign, USA), he joined the Max Planck Institute for Polymer Research (Mainz, Germany) in early 1999 as a project leader in the group of Klaus Müllen. In November 2002, he was appointed to the faculty of EPFL.

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Harm-Anton Klok is recipient of the 2007 Arthur K. Doolittle Award of the American Chemical Society and is Associate Editor of the American Chemical Society journal *Biomacromolecules*. He serves on the editorial advisory board of *European Polymer Journal*, *Journal of Polymer Science A: Polymer Chemistry*, *Macromolecules* and *ACS Macro Letters*. Harm-Anton Klok was a Visiting Professor at the University of Bordeaux (France) in 2010, the University of Massachusetts / Amherst (USA) in 2012, has been nominated as Chair Professor, College of Chemistry, Chemical Engineering and Materials Science, Soochow University (Suzhou, China) in 2011 and was awarded a Chinese Academy of Sciences visiting professorship for senior international scientists (Institute of Chemistry, Chinese Academy of Sciences, Beijing) for 2012 - 2013.