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Programmable materials for mechanobiology

Human tissues are materials responsive to mechanical and chemical stimuli for a diverse array of functionalities. We have been developing tissue-mimicking materials that can respond to numerous biological and physical stimuli. This presentation will introduce how to develop programmable aptamer-functionalized hydrogels and how the functionalities of these hydrogels are specifically regulated with high fidelity at the DNA and protein levels. Our data have shown that aptamers could be effectively incorporated into hydrogels and that the incorporation of aptamers into hydrogels did not compromise the capability of aptamers in recognizing target molecules and the mechanical properties of the hydrogels. Importantly, the incorporated aptamers were able to hold protein drugs with high binding strength and specificity. By rationally designing aptamer sequences, different release kinetics could be achieved. We believe that these programmable hydrogels hold great potential for a variety of biomedical applications ranging from drug delivery to regenerative medicine.

Biography

Dr. Wang got his B.S. degree in Environmental Chemistry at Jilin University in 1995. He switched the major to Chemical Engineering and got his M.S. degree in 1998 from Dalian Institute of Chemical Physics, the Chinese Academy of Sciences under the supervision of Prof. Xiaojun Ma. He pursued his Ph.D. education in Biomedical Engineering at Duke University between 2000 and 2004, studying drug and gene delivery with Drs. Fan Yuan and Chuan-Yuan Li. Afterwards, Dr. Wang worked with Drs. Bruce Sullenger and Eli Gilboa at Duke University Medical Center before taking a faculty position at the University of Connecticut in August 2006. He received a CAREER Award and a CREATIV Award from NSF in 2010 and 2012, respectively. Dr. Wang was promoted to associate professor (with tenure) in August 2011 and he moved from UConn to Penn State in January 2013 (with tenure).

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