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"DYNAMIC AND FUNCTIONAL NANOARCHITECTURES FROM DNA AND SUPER-CHARGED POLYPEPTIDES"

Prof. Dr. Andreas Herrmann

DWI, Aachen

Tuesday, March 12, 2019, **13:00 pm**

INM, Leibniz-Saal, Campus D2 5

Host: Prof. Dr. Aránzazu del Campo

DNA is a superb material for the fabrication of nanostructures. Defined objects can be achieved by folding DNA in the desired shape,[1] by attaching it to inorganic particles[2] or by generating DNA amphiphiles that self-assemble into nanostructures driven by microphase separation.[3] Single-stranded, soft matter DNA nanoparticles from the latter class of materials can be efficiently functionalized by hybridization. When equipped with targeting units by Watson-Crick base pairing and incorporation of a hydrophobic drug into the interior, they kill cancer cells in vitro.[4] Similarly, they were loaded with antibiotics by hybridizing them with drug-binding aptamers. These DNA based carriers adhere strongly to the ocular surface and were successfully employed for ophthalmic drug delivery in vivo.[5] Beside micelle systems, our group incorporated DNA amphiphiles into the phospholipid bilayer of vesicles. DNA specific aggregation, fusion and payload release from these nanocontainers were demonstrated.[6] In addition, DNA encoded vesicles were guided to the cell membranes of zebra fish[7] while together with cationic surfactants DNA formed layered membrane-like structures representing the first thermotropic biomacromolecular liquid crystals.[8]

While nucleic acids are intrinsically negatively charged, introduction of several charges in proteins requires genetic engineering. Our group developed supercharged polypeptides (SUPs) that are based on the elastin motif (VPGXG)n with X being glutamic acid or lysine resulting in unfolded protein poyelectrolytes with high charge density. Like DNA, they form thermotropic liquid crystals when complexed with surfactants.[9] When SUPs are combined with RNA they form coacervates, which adopt self-dividing fibrils once they are introduced into the dissipative environment of tubulin-like structures.[10] When positive SUPs interact with saliva conditioning films they stabilize mucin architectures to potentially improve biolubrication in patients with Sjögren's syndrome.[11] Moreover, they were fused with fluorescent proteins allowing to fabricate sensor arrays. With such fluorescent scaffolds it was possible to classify a large number of whiskeys according to age, blending status and origin.[12]

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You are invited to have coffee with the speaker 15 minutes before the talk starts.

KONTAKT

INM – Leibniz-Institut
für Neue Materialien gGmbH
Campus D2 2
66123 Saarbrücken
www.leibniz-inm.de

Christine Hartmann
Event Manager
christine.hartmann@leibniz-inm.de
Tel: 0681-9300-244
Fax: 0681-9300-233