

## INM COLLOQUIUM

### “DYNAMIC AND FUNCTIONAL NANOARCHITECTURES FROM DNA AND SUPER-CHARGED POLYPEPTIDES”

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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)<sub>n</sub> with X being glutamic acid or lysine resulting in unfolded protein polyelectrolytes 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.

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