COATING OF DNA ORIGAMI NANOSTRUCTURES FOR CELLULAR DELIVERY
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Recent progress in structural DNA nanotechnology has opened up numerous opportunities to use well-defined DNA nanostructures in a variety of bioapplications [1,2]. Using customized DNA structures as smart biochemical nanodevices [3] and targeting cells with DNA-based drug-delivery vehicles [4] are arguably some of the most intriguing implementations.

In order to enhance the cellular delivery and to improve the stability of DNA nanostructures in biological environment, we have tested different DNA origami coating strategies. Previously, we have demonstrated how 2D DNA origamis can be encapsulated with virus capsid proteins to increase transfection rates [5]. Recently, we have created polymer-origami- and protein-origami-complexes by combining 3D DNA origamis with cationic block-copolymers [6] and modular protein-dendron conjugates [7]. We have observed that the albumin-dendron–based coating of origamis can improve their transfection to HEK293 cells, increase the stability against endonucleases and attenuate activation of immune cells.

In addition, we have studied how active enzymes could be delivered into HEK293 cells in vitro when they are attached to a tubular DNA origami [8,9]. We employed bioluminescent enzymes as a cargo and monitored the activity of these delivered enzymes from a cell lysate [9]. The results show that the enzymes stay intact and retain activity in the transfection process. Owing to the modularity of DNA origami, these proposed techniques could become highly applicable for advanced drug delivery and therapeutics.

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References:


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