DNA Origami for Biomedical Engineering

Veikko Linko[a,b]

[a] *Institute of Technology, University of Tartu, Tartu, Estonia*
[b] *Biohybrid Materials, Department of Bioproducts and Biosystems, Aalto University, Espoo, Finland*

Email: veikko.pentti.linko@ut.ee; veikko.linko@aalto.fi *Webpage:* https://users.aalto.fi/linkov1

Sub-nanometer-precise DNA origami structures may serve as versatile high-resolution templates for engineering inorganic materials[1] and as components for bridging molecular and macroscopic scales.[2] In biomedical settings, DNA origami can be integrated into robotic devices,[3,4] gene-editing tools,[5] delivery vehicles,[6] sensors,[7,8] and diagnostic platforms.[9] However, under physiological conditions these structures may suffer from poor stability due to low-cation-induced denaturation and enzymatic degradation. Here, I present some of our very recent results dealing with these topics:

(1) How elemental structural features may govern environment-dependent stability (Fig. 1, left).[10-12]

(2) How DNA origami superstructure can be harnessed in rational design of drug release profiles (Fig. 1, middle).[13]

(3) How static[14-16] and stimuli-responsive[17] coatings can protect DNA origami (Fig. 1, right).

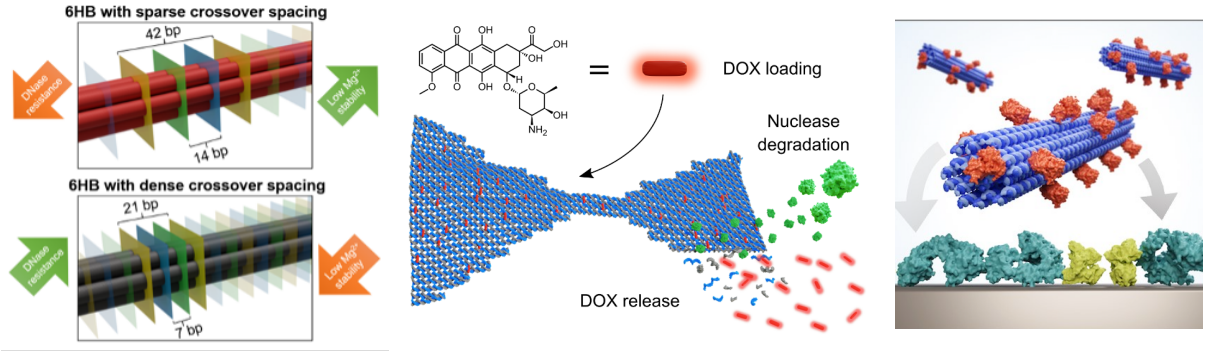

Figure 1. *Left:* Stability of a DNA origami bundle depends on its internal design. *Middle:* Drug is released from DNA origami upon superstructure-dependent nuclease digestion. *Right:* Antibody-equipped DNA origami rods can target antigens.

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