Objective

Cells carry out biochemical and physiological functions in the body by intricately controlling the position and activity of matter at the nanoscale. In contrast, our ability to exert equivalent spatiotemporal control over therapeutic molecules is extremely inadequate. That is the reason why although we have very effective therapeutics, their use is often limited by excess toxicity and adverse effects.

We have recently described an autonomous, logic-guided DNA origami nanorobot, capable of transporting molecular payloads between selected points of origin and target, and demonstrated its selectivity and efficacy in inducing tumor cell apoptosis.

Here, we propose to create nanorobots that can be programmed to exhibit collective behaviours. This will provide unprecedented, nearly absolute spatiotemporal control over many therapeutic molecules simultaneously. Using the molecular equivalents of computer programs, which we describe here, these nanorobots will be able to communicate with each other, coordinate timing of activity, form meta-structures, exhibit quorum-sensing capabilities and emulate logical operations using biological cues as bits.

This proposal describes nanorobot design and control, and shows how the nanorobots can be modified to exhibit improved pharmacokinetic performance with negligible immunogenicity and toxicity. This technology could revolutionize therapeutic paradigms and procedures, along with other aspects of current medicine.
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**To know more**