A 'nano-robot' built entirely from DNA to explore cell processes

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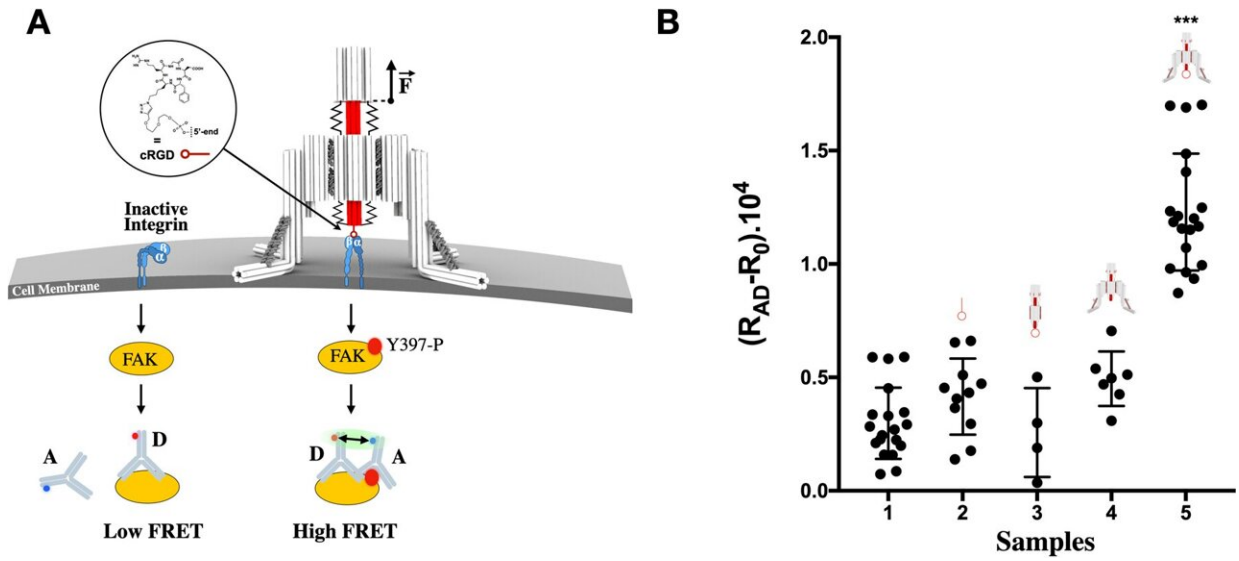

Autonomous DNA Nano-winch activation of integrin signaling. A The transmembrane receptor integrin (blue) exists as a compact αβ heterodimer. Integrins transmit applied mechanical stresses, between 1 and 15 pN, and recruits additional proteins to assemble focal adhesions including Focal Adhesion Kinase (FAK), which becomes phosphorylated at residue Y397 after mechanical stimulation of integrin. Addition of two antibodies with donor, D, and acceptor, A, labels allows detection of phosphorylated FAK in a LRET assay. Both antibodies bind to phosphorylated FAK (Y397-P) eliciting a detectable high LRET signal, whereas only a single antibody binds in the absence of phosphorylation yielding a low LRET signal. B MCF-7 cells in suspension were 1, left untreated control, 2, incubated with RGD conjugated oligonucleotide, 3, incubated with cRGD functionalized Piston-cylinder origami, 4, incubated with non-functionalized Nano-winches, 5, incubated with cRGD functionalized Nano-winch. Cells were then lysed and FAK phosphorylation. The background signal,

R_0, of antibodies alone was subtracted from the signal of lysed cells in experimental and control conditions calculated from ratios of acceptor and donor fluorescence intensities, R_{AD}. Results are the average of at least three independent experiments. Error bars represent the standard deviation, statistical significance was determined by one-way analysis of variance with comparison to the untreated control (***P