Folding of Single-stranded Circular DNA into Rigid Rectangular DNA Accelerates its Cellular Uptake

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Supplementary Information

Supplementary Tables

Supplementary Table S1. Sequences of staples.

Name	Sequences (5′ → 3′)
0[68]1[52]	TTTTGGGGTGAACATATTGACTGAGAGATTTA
0[100]1[84]	TAGAATGAGGTTGGCAAGTTAACAGACTTTAC
*0[132]0[101]	TGTTATTGTCTTTTGGGCTTCTATATACATTT
0[164]1[148]	TTCTTTCCCATTTTGTTCTACAAGTCTGTTTC
0[188]1[180]	TAAATCTTGATATTTACTCACTGT
1[53]3[52]	TTATTTATGCTTAATGGAATTATACAGCCAGT
1[85]3[84]	AGGTATCAAAAATACATATGATAAATTAAGAT
1[117]2[101]	AGGTCACTTGTAAAATGCCATATTCAAAAATC
1[149]3[148]	TGAGCTCTTCTAAAAAAGAAAAAGTCTCCATT
1[181]3[180]	CTATCCCCATTTTTTACATATAAATTTTGTGT
2[36]0[29]	TCAGGTCACAGAGAGCTGAACAAAATTCCATACCACATTT
2[68]0[69]	TATGCACATGGGTAGTGTGATAAAAACAGCTT
2[100]1[116]	CTTTAAGGATTCAATTAGTTCTTATTTTTCAT
2[132]0[133]	TTTCCCATTACATATATCAATGGGAATATTTT
2[164]0[165]	CCTGTTTTACTCTATTTTATCAGCGTGGAACA
3[53]5[52]	TCACATGCCTAAACCCTCATGGCTAAGCTCTC
3[85]5[84]	CAGCAGTTGTTTAATGTACTAAGCAAATCAGC
3[117]4[101]	TCTAAAAGTGATGGCATGCTTCTATGTACTAA
3[149]5[148]	TAGACTTAGTCATAAGAAATTTTTCTATGGCC
3[181]5[180]	GTATGGTATAACAATCTTTTCTTTTTTTAAAA
4[36]2[37]	AAGCTCTCCAGATGAAAACCAAGAAATATGTT

4[68]2[69]	TTAATGAACTTAGAGATAATTTTAATCTATCA
4[100]3[116]	GCTCTCATCAACCTGTTGATAGTATATTATTT
4[132]2[133]	TGAAGTCTATTTAAAGTTTTGCCTATCATCAT
4[164]2[165]	GACTTTGATAATTCACTGGAATTTTATATTTC
5[53]7[52]	ATGTTTGAGGTTTCCTAGGTTATCCAGGGCAA
5[85]7[84]	AACTTAAAAAAAGAATATATAAGGCAATCTCT
5[117]6[101]	GTGTTGCACATATTACAATTCTCTAAGTTTTA
5[149]7[148]	TGACTTTTTACTGATTTGTAAGACCAATGATA
5[181]7[180]	ATAAGTCTATCTGTTCAAATTTTTTTCTCATG
6[36]4[37]	TGCTCCTCTCATGTTTCATGTACTAATGTACT
6[68]4[69]	GGTTTTAAACAATAAAATTAATATTCTCATGT
6[100]5[116]	TAAGAAAATAGCCTCTAAGGTTTTTTACTGGG
6[132]4[133]	ATAATCTGAATATTTTCTGTCATTCTCTACAC
6[164]4[165]	TTATTTTTCTTAATGGTTTTTTAAGTGGTTAG
7[53]9[52]	ACTCTCTCAGTCCTCTCACCCACACAGGGTGA
7[85]9[84]	GTCATGGCCCACCTCACTCCACTCAGTCATCC
7[117]8[101]	TATTTCTCCACAGATGTTACTTAGCTGAAGTT
7[149]9[148]	GTTCTCTGGTTTAATTGTCAACTACACATCCC
7[181]9[188]	TGTAATGATGTATTATACTATGCATGGTCAACTTGGCCAT
8[36]6[37]	AGGGTGTTTGCCTGCTGGGTCTCTCTCAGTCC
8[68]6[69]	GCTCATCCCCCCAGGGCTGCTCTCCTTTTAAA
8[100]7[116]	GGTGGAGAAGGGCCACTGGCATCCCCTTTTAA
8[132]6[133]	AATTAAGCTAATTTAGTGTATATGTTCTTTTT
8[164]6[165]	ATGCCAATATTTCTGAGATTGAGTGTCTAGTT
*9[53]8[69]	CATCATCTCTGACCACACCTGCAAAGCATACA

*9[85]9[116]	TCCACAAAATCTCTGGAGAACCCCAACCTGTC
9[117]8[133]	AGTCCAGAACTCAACAGCTCCAGCCCTGTTTT
*9[149]8[165]	TGGCTGTGAGCACTGGGACAGCACGATATACT
9[29] 8[37]	GGACTGCTGAGATGAACCCAAGCC

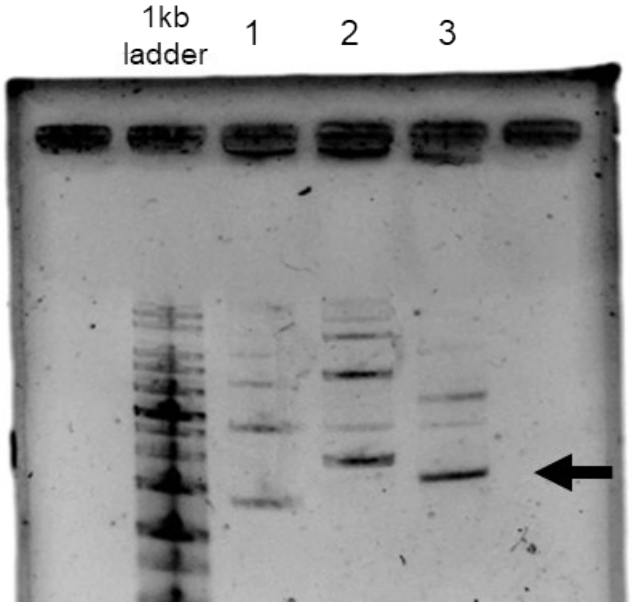
All ODNs have a phosphodiester backbone. Modification with Alexa Fluor 488 at the 5′-end is indicated by asterisk (*).

Supplementary Table S2. DNA nanostructures with excluded staples.

Nanostructure	Staples excluded
RecDNA	None
Δ6c	1[85]3[84], 3[85]5[84], 4[132]2[133], 5[85]7[84], 6[132]4[133], 8[132]6[133]
Δ12c	1[85]3[84], 1[149]3[148], 3[85]5[84], 3[149]5[148], 4[68]2[69], 4[132]2[133], 5[85]7[84], 5[149]7[148], 6[68]4[69], 6[132]4[133], 8[68]6[69], 8[132]6[133]
Δ18c	1[53]3[52], 1[85]3[84], 1[149]3[148], 3[53]5[52], 3[85]5[84], 3[149]5[148], 4[68]2[69], 4[132]2[133], 4[164]2[165], 5[53]7[52], 5[85]7[84], 5[149]7[148], 6[68]4[69], 6[132]4[133], 6[164]4[165], 8[68]6[69], 8[132]6[133], 8[164]6[165]
Δ24	1[53]3[52], 1[85]3[84], 1[149]3[148], 1[181]3[180], 3[53]5[52], 3[85]5[84], 3[149]5[148], 3[181]5[180], 4[36]2[37], 4[68]2[69], 4[132]2[133], 4[164]2[165], 5[53]7[52], 5[85]7[84], 5[149]7[148], 5[181]7[180], 6[36]4[37], 6[68]4[69], 6[132]4[133], 6[164]4[165], 8[36]6[37], 8[68]6[69], 8[132]6[133], 8[164]6[165]
Δ6p	1[181]3[180], 3[181]5[180], 4[36]2[37], 5[181]7[180], 6[36]4[37], 8[36]6[37],
Δ12p	1[53]3[52], 1[181]3[180], 3[53]5[52], 3[181]5[180], 4[36]2[37], 4[164]2[165], 5[53]7[52], 5[181]7[180], 6[36]4[37], 6[164]4[165], 8[36]6[37], 8[164]6[165]
Δ18p	1[53]3[52], 1[149]3[148], 1[181]3[180], 3[53]5[52], 3[149]5[148], 3[181]5[180], 4[36]2[37], 4[68]2[69], 4[164]2[165], 5[53]7[52], 5[149]7[148], 5[181]7[180], 6[36]4[37], 6[68]4[69], 6[164]4[165], 8[36]6[37], 8[68]6[69], 8[164]6[165]
Scaf4	Except for 0[132]0[101], 9[53]8[69], 9[85]9[116], 9[149]8[165]

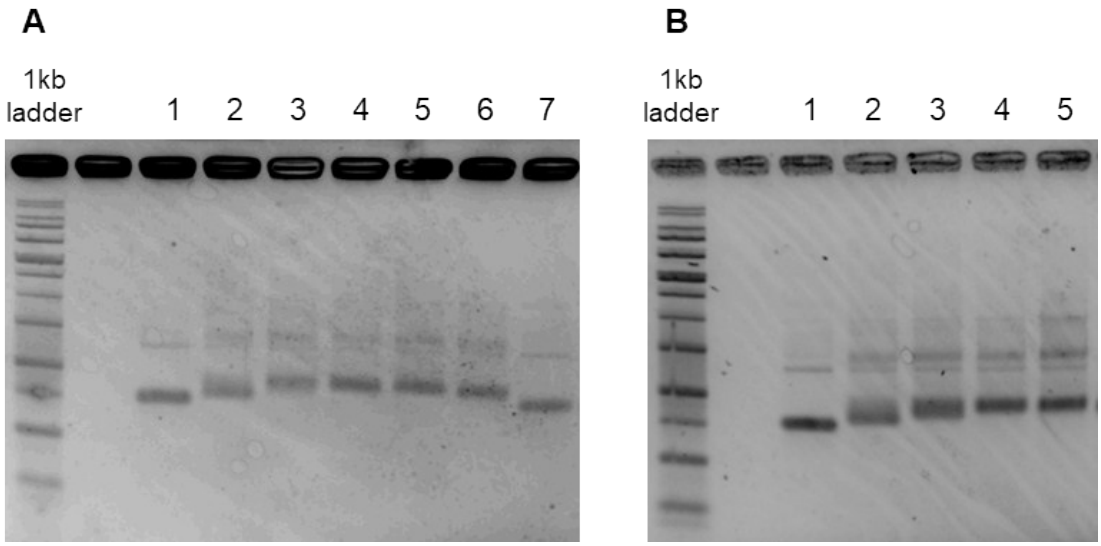
Supplementary Figures

Supplementary Figure S1



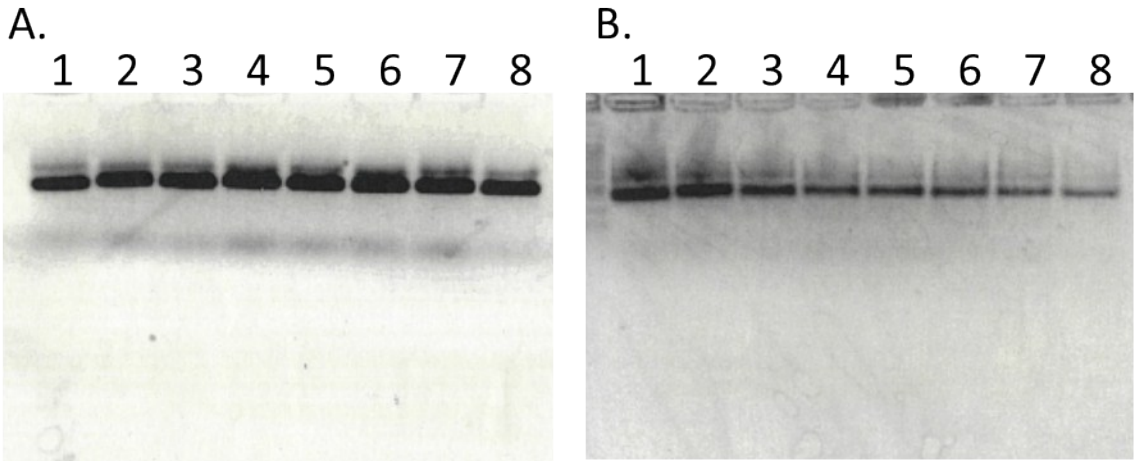
Supplementary Figure S1. Agarose gel electrophoresis analysis of scaffold preparation. Lane 1, double strand circular DNA; lane 2, nicked double strand circular DNA; lane 3, scaffold. Arrow indicates scaffold.

Supplementary Figure S2



Supplementary Figure S2. Agarose gel electrophoresis analysis of DNA nanostructures. A, lane1, scaffold; lane2, RecDNA; lane3, Δ6c; lane4, Δ12c; lane5, Δ18c; lane6, Δ24; lane7, Scaf4. B, lane1, scaffold; lane2, RecDNA; lane3, Δ6p; lane4, Δ12p; lane5, Δ18p.

Supplementary Figure S3



Supplementary Figure S3. Agarose gel electrophoresis analysis of DNA nanostructures. The fluorescence intensity of the bands of Alexa Fluor 488-labaled DNA nanostructures (A) and of EtBr staining of DNA (B). Lane1, RecDNA; lane2, Δ6c; lane3, Δ6p; lane4, Δ12c; lane5, Δ12p; lane6, Δ18c; lane7, Δ18p; lane8, Δ24.