Electronic Supplementary Material (ESI) for RSC Advances.

Investigation of Various Fluorescent Protein-DNA Binding Peptides for Effectively Visualizing Large DNA Molecules

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Supporting Information

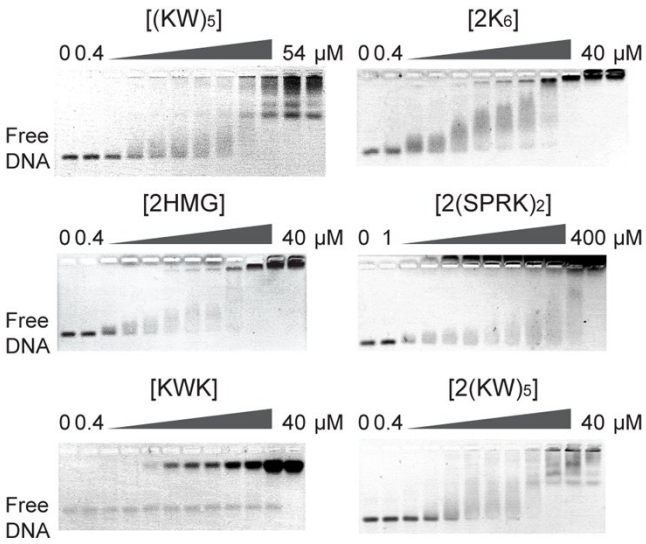

Figure S1. Gel retardation images of FP-DBP. Annotated FP-DBPs were used in gel binding assay. In order to find ranges of bound, concentrations of FP-DBPs vary with each protein. Images were analyzed with ImageJ Gel Analyzer, and bound fractions were calculated using ratio between retarded signals and free DNA.

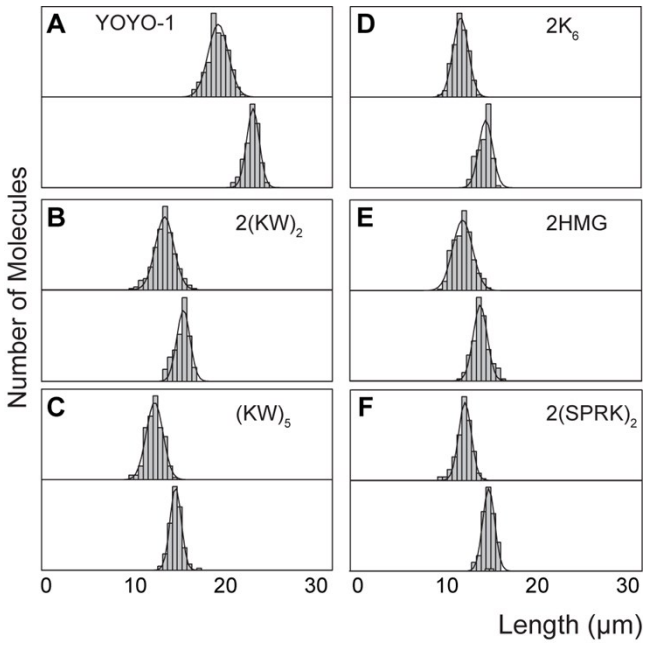

Figure S2. Histograms of stretched λ DNA. Each subset consists of deposited elongated DNA molecules within a microfluidic channel (top) and single-tethered DNA polymer (bottom). FP-DBP stained DNA show nearly consistent stretching and ratio. Annotations are DNA staining molecules, and only DNA binding peptides were noted for FP-DBPs.

Simulation Results

In this simulation, a time-dependent step was used to solve this model. Figure S4 shows the flow velocity distribution, the pressure distribution induced by flow and the displacement of DNA molecule. The displacements of the completely stretched DNA in y direction reached the maximum value of 513 nm at 85 ms. At the same time, the displacements in x direction was 10.6 nm as shown in Figure 5A. Figure 5B shows the stress distribution induced by flow and the resultant force on the DNA molecule in the axial direction. For the completely stretched DNA, the force acting on the DNA was calculated as 0.79 pN.

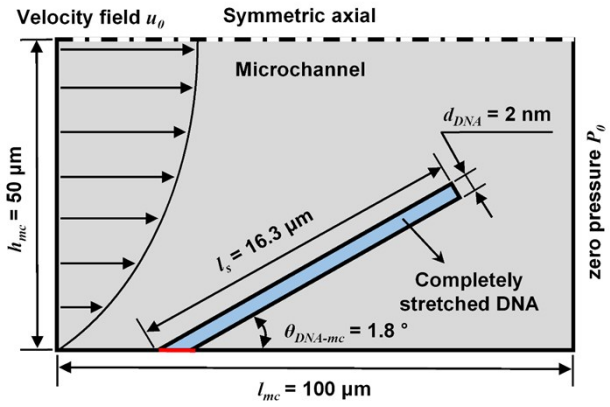

Figure S3. The geometry of the model completely stretched DNA (not in scale). Here, h_{mc}, l_{mc}, l_{DNA}, d_{DNA} and $\theta_{DNA\text{-}mc}$ are the height of half of the microchannel, the length of the microchannel, the full length of the completely stretched DNA molecule, the diameter of the DNA molecule considered as a cylinder, and the angle between the DNA molecule and the bottom of the microchannel, respectively. At the top of the domains, symmetric axial is marked with dot-and-dash lines.

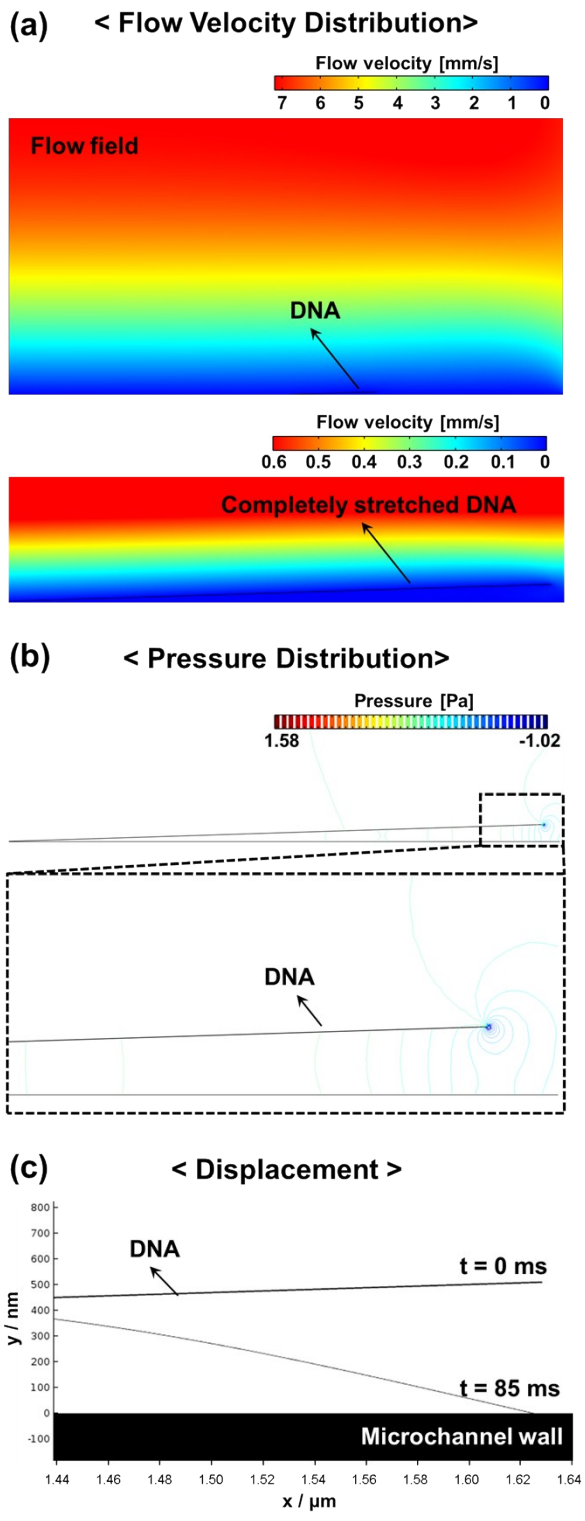

Figure S4. (a) The flow field and the flow velocity distribution around the DNA molecule. (b) The pressure distribution around the DNA molecule. (c) The displacement of the DNA molecule.

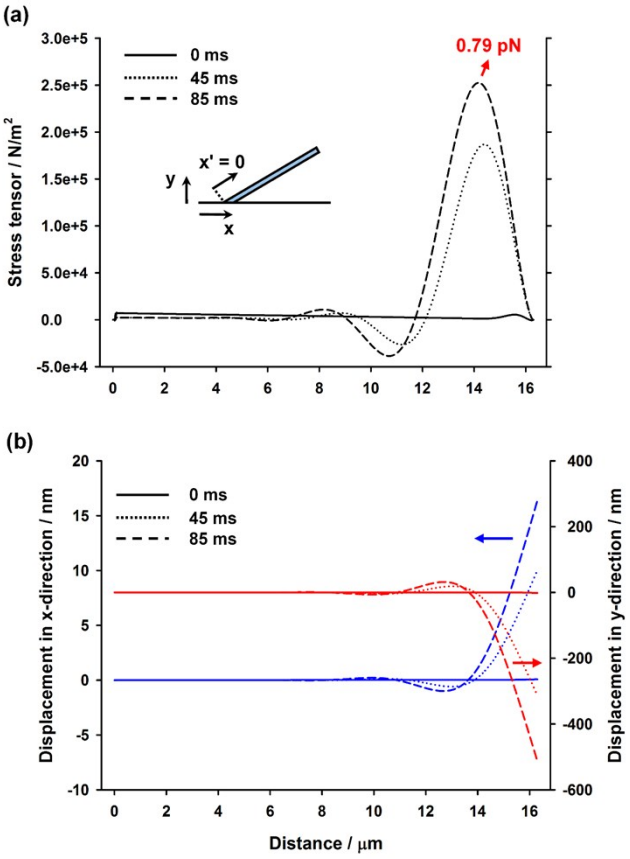

Figure S5. (a) The stress tensor on the DNA molecule and the force in the axial direction. It also shows the x-, y-direction, and the zero point of distance x'. (b) Displacement of the DNA in the x and y direction.

Table S1. The parameters of material properties used in the model.

Interface	Property	Value	Unit
Single-phase flow	Density	10^3	kg/m^3
	Dynamic viscosity	10^{-3}	Pa·s
Solid mechanics	Young's modulus	2×10^9 *	Pa
	Poisson's ratio	0.4 *	1
	Density	1.7×10^3 *	kg/m^3

* Refer to [1-3]

Reference

1. H. Teng, *Multi-scale multi-level homogenization for simulation of DNA molecules*, ProQuest, 2008.
2. M. A. Smialek, N. C. Jones, S. V. Hoffmann and N. J. Mason, *Phys. Rev. E*, 2013, **87**.
3. K. S. Bloom, *Chromosoma*, 2008, **117**, 103-110.