Electronic Supplementary Material (ESI) for Lab on a Chip.

Supplementary information for:

Highly efficient mRNA delivery with nonlinear microfluidic cell stretching for cellular engineering

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Supplementary Figure

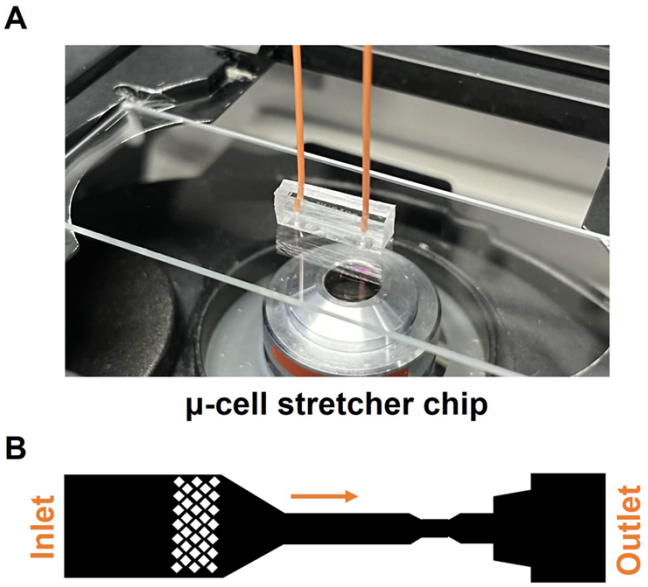


Figure S1. Platform layout. (A) Photograph of the delivery chip device at the microscopic stage. (B) Mock CAD design of the μ-cell stretcher.

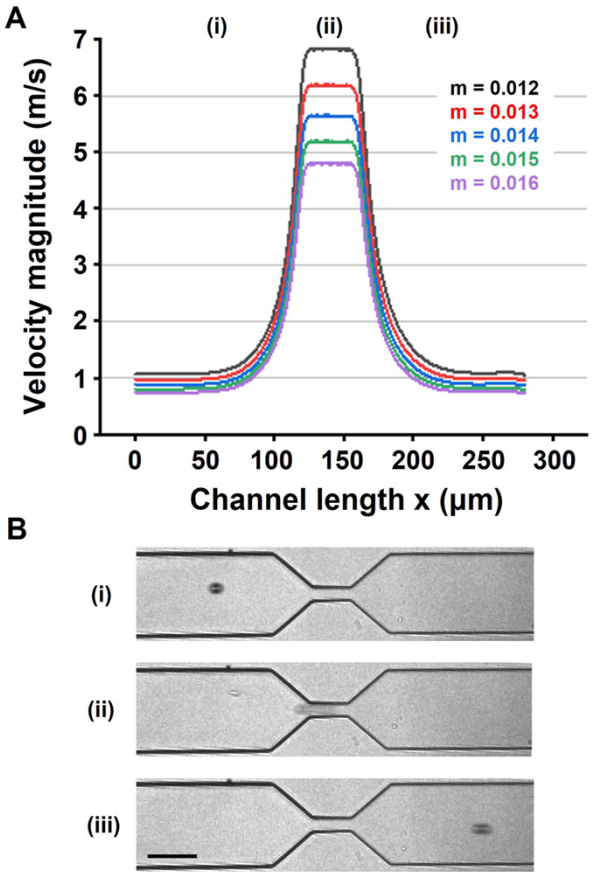


Figure S2. Velocity profile near the deformation region. (A) Velocity profiles for five different *m* (fluid consistency coefficient) values obtained using the finite element analysis (FEA) software package COMSOL Multiphysics 6.0. (B) High-speed microscope images showing 9.9 µm microspheres flow inside a microchannel. The scale bar represents 50 µm.

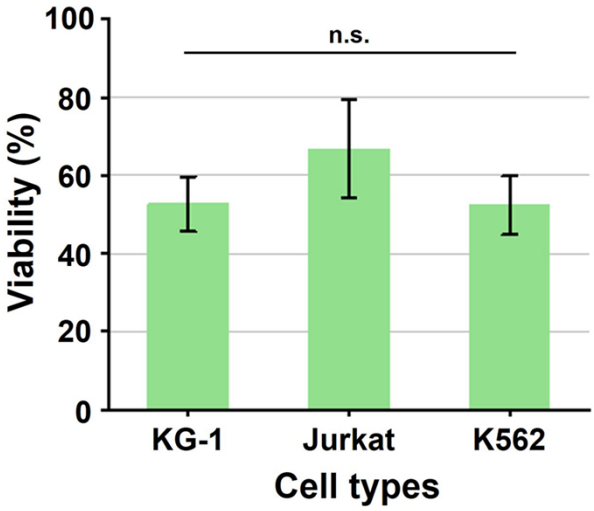


Figure S3. Viability of 3–5 kDa FITC-dextran delivery for three different immune cell lines. All the error bars indicate the mean ± standard error of the mean (SEM) (*N* = 3). n.s. indicates no significant difference, calculated using one-way ANOVA with Tukey's method.

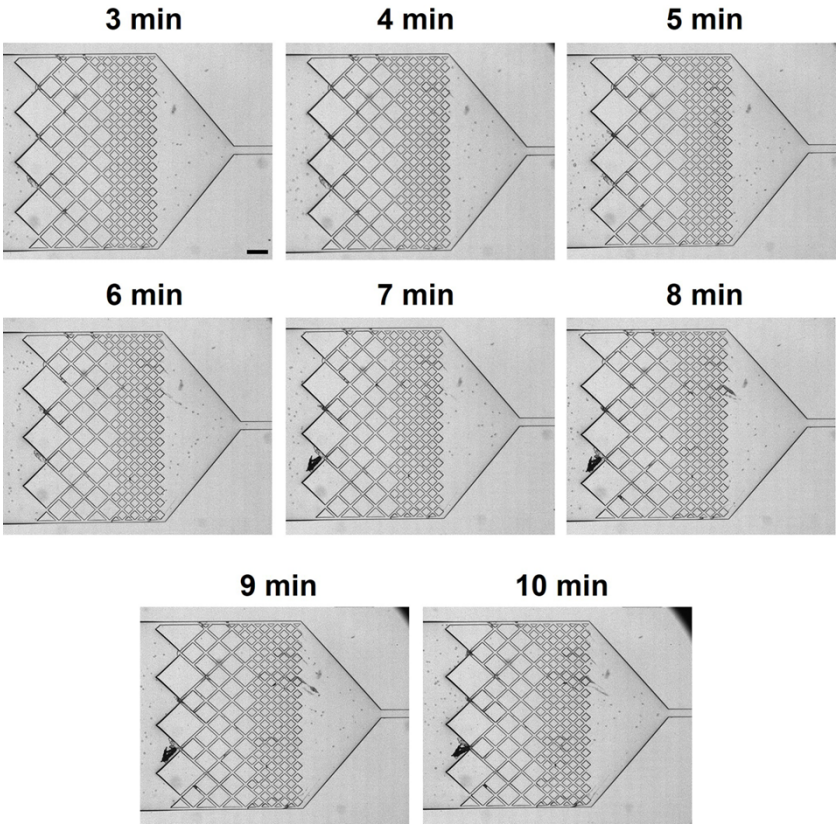


Figure S4. Microscope images near the inlet filter region. K562 cells with a concentration of 5×10^5 cells/mL were flowed, and images were taken at different time points. The scale bar represents 200 µm.

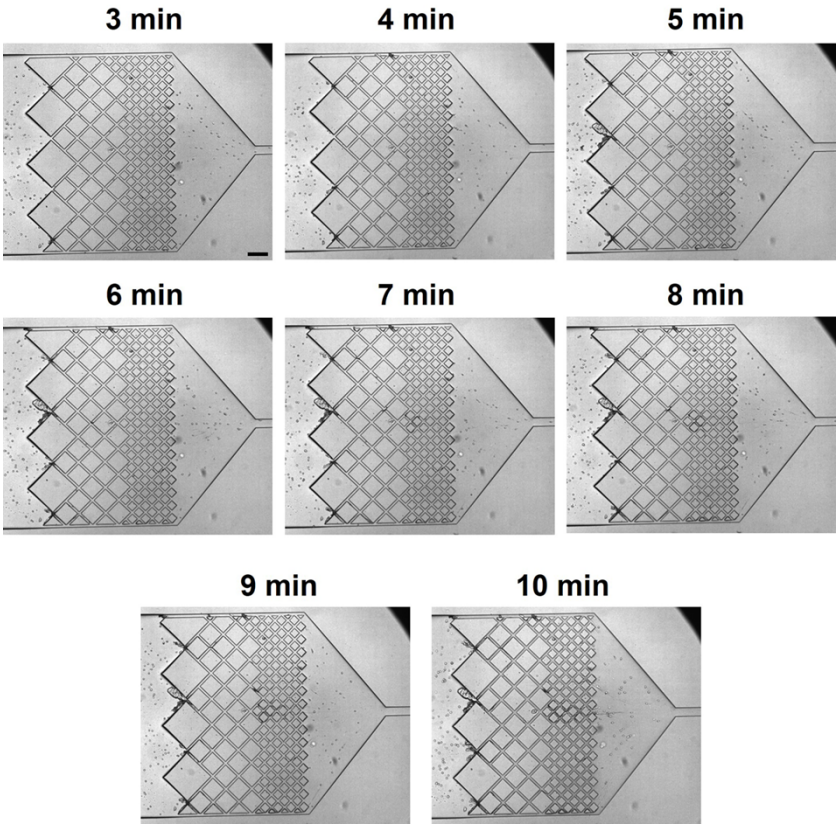


Figure S5. Microscope images near the inlet filter region. K562 cells with a concentration of 1×10^6 cells/mL were flowed, and images were taken at different time points. The scale bar represents 200 µm.

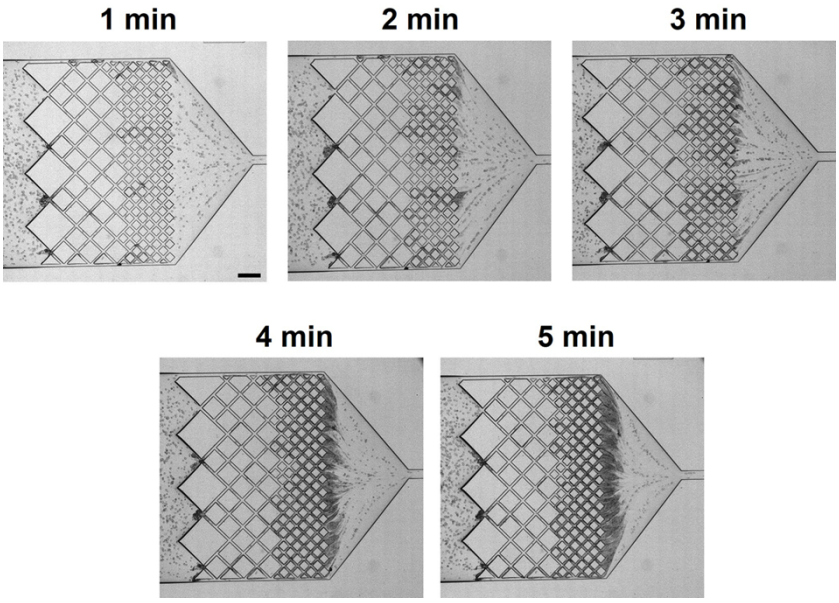


Figure S6. Microscope images near the inlet filter region. K562 cells with a concentration of 5×10^6 cells/mL were flowed, and images were taken at different time points. The scale bar represents 200 μm.

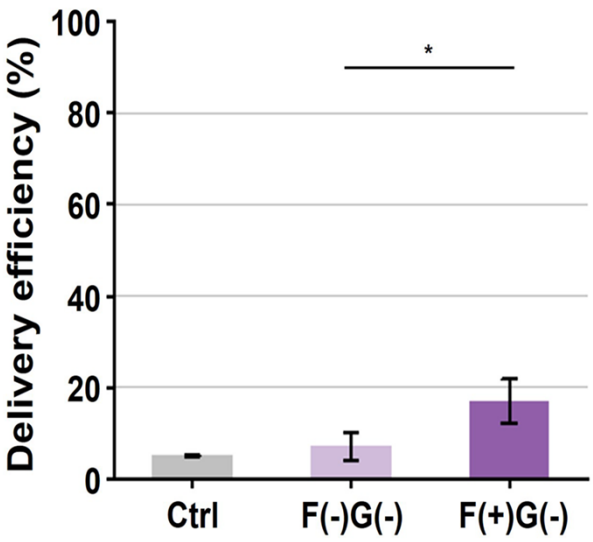


Figure S7. Delivery efficiency for 3–5 kDa FITC-dextran delivery into K562 cells with or without mechanical filters (F) and constriction gap (G). All the error bars indicate mean ± standard error of the mean (SEM) (*N* = 3–4). * indicates a *P*-value below 0.05, calculated using one-way ANOVA with Tukey's method.

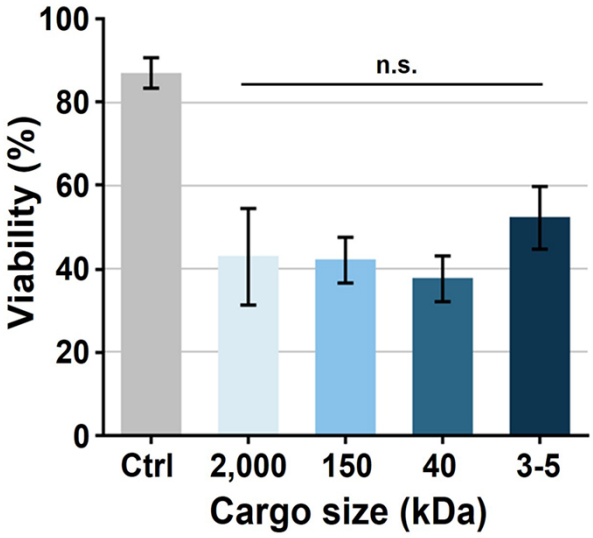


Figure S8. K562 cell viability for different FITC-dextran delivery sizes. All the error bars indicate the mean ± standard error of the mean (SEM) (*N* = 3). n.s. indicates no significant difference, calculated using one-way ANOVA with Tukey's method.

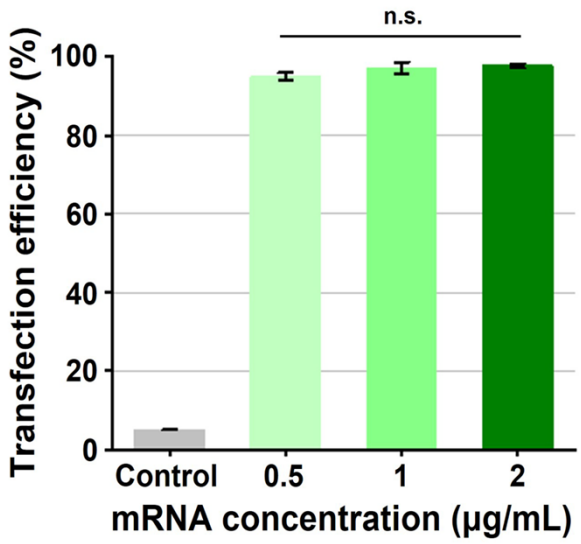


Figure S9. Transfection efficiency of K562 cells showing EGFP expression with different mRNA concentrations. All the error bars indicate the mean ± standard error of the mean (SEM) (*N* = 3). n.s. indicates no significant difference, calculated using one-way ANOVA with Tukey's method.

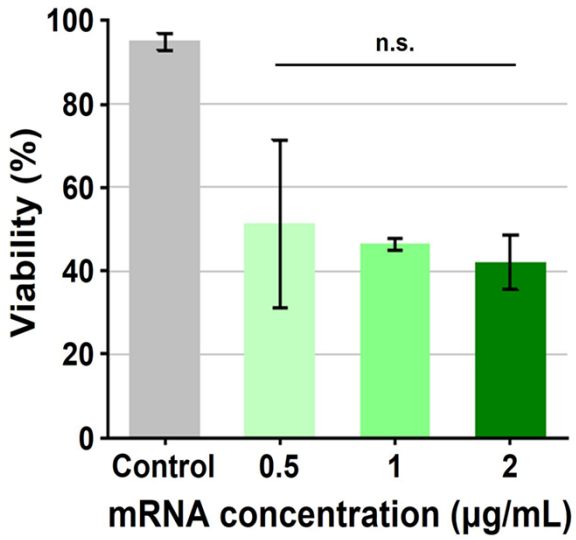
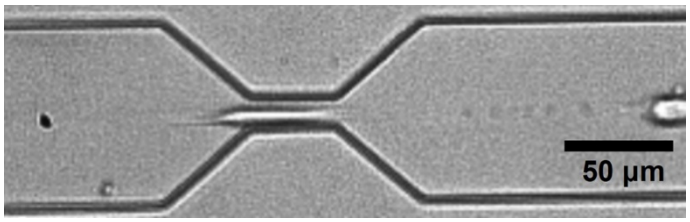
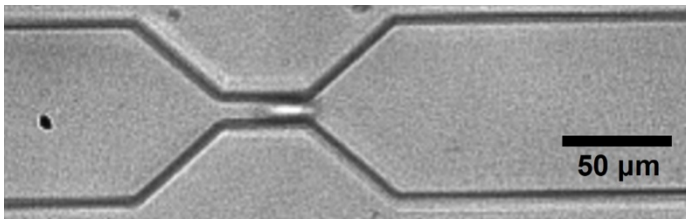


Figure S10. Cell viability of K562 cells tested under different mRNA concentrations. All the error bars indicate the mean ± standard error of the mean (SEM) (*N* = 3). n.s. indicates no significant difference, calculated using one-way ANOVA with Tukey's method.



Movie S1. High-speed microscope video of K562 cell deformation in 0.85% methylcellulose solutions.



Movie S2. High-speed microscope video of K562 cell deformation in media.