Polymer Chemistry

ARTICLE

Supporting Information

Acid-sensitive poly(β-cyclodextrin)-based multifunctional supramolecular gene vector

Yunti Zhang,[a,b] Qimin Jiang,[a] Marcin Wojnilowicz,[b] Shuaijun Pan,[b] Yi Ju,[b] Wenjie Zhang,[b] Jia Liu,[c] Renxi Zhuo,[a] and Xulin Jiang[a]*

a. Key Laboratory of Biomedical Polymers of Ministry of Education and Department of Chemistry, Wuhan University, Wuhan 430072, P. R. China

b. ARC Centre of Excellence in Convergent Bio-Nano Science and Technology, and the Department of Chemical and Biomolecular Engineering, The University of Melbourne, Parkville, Victoria 3010, Australia

c. Research Center for Tissue Engineering and Regenerative Medicine, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430022, P. R. China

* Corresponding author

Xulin Jiang: xljiang@whu.edu.cn

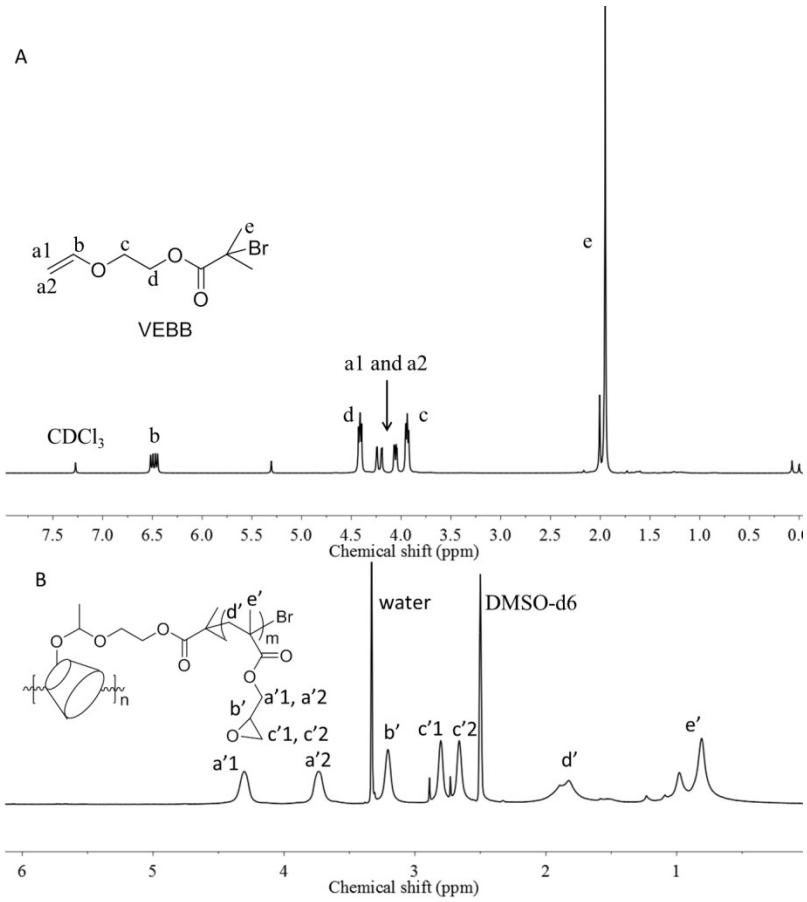

Fig. S1 ^{1}H NMR spectra of VEBB (A) in $CDCl_3$ and PCD-acetal-PGMA (B) in DMSO-d_6.

Calculation of the Modification Degree of VEBB to PCD.

Assuming x mol VEBB successfully grafted for every mole cyclodextrin unit, 70 mol H from the protons of cyclodextrin, based on the ^{1}H NMR spectrum of PCD-acetal-BIB in Fig. 1, there are (70+5x) mol H at (a+c+d+e) and 6x mol H at f. Therefore, x can be calculated by following equation:

$$\frac{6x}{70+5x} = \frac{f}{a+c+d+e}$$

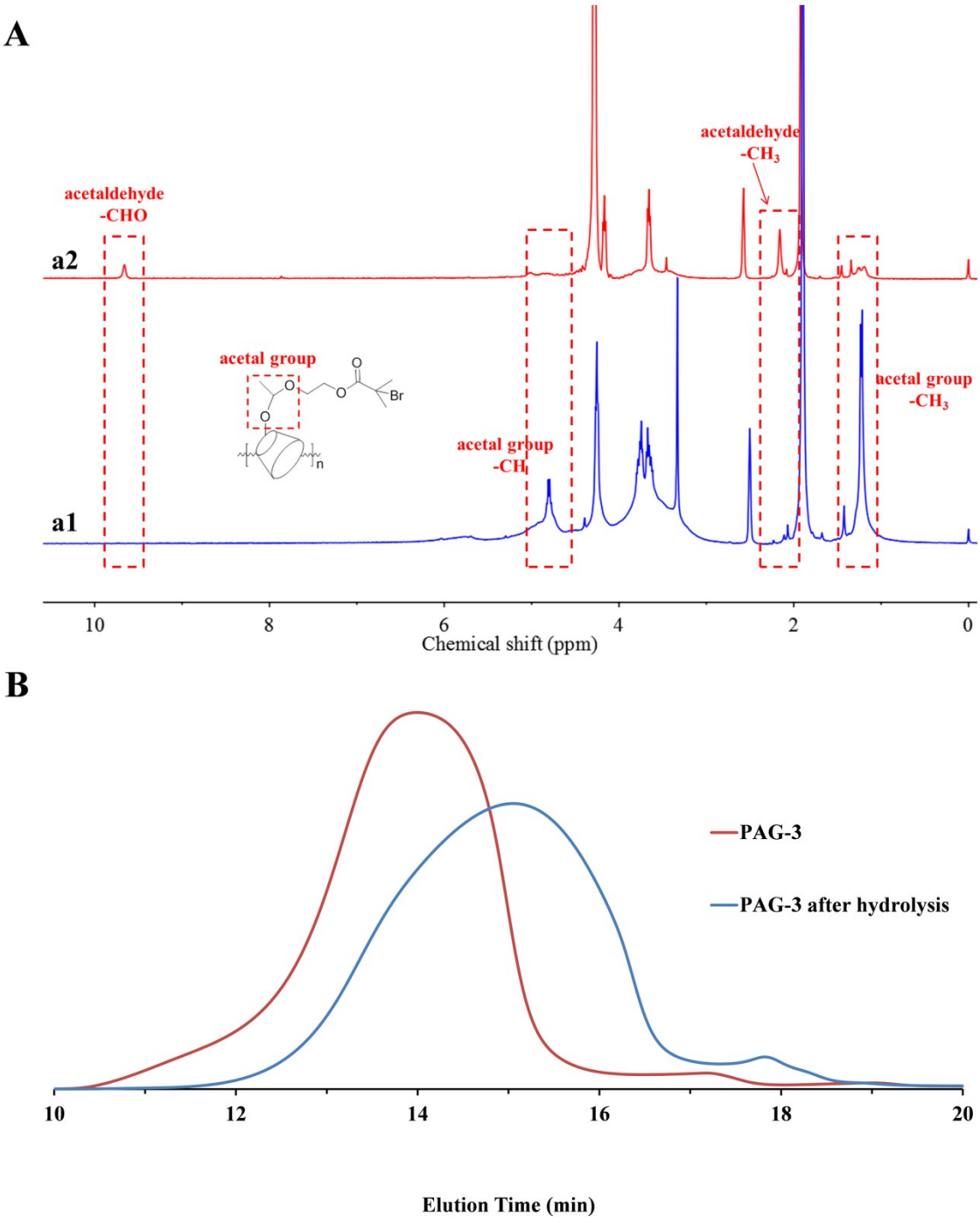

Fig. S2 (A) Typical ^{1}H NMR spectra of PCD-acetal-BIB (a1) before and (a2) after incubated in pH 5 cosolvent mixture of DMSO-d_6 and D_2O containing trace amounts of DCl and (B) SEC-RI traces of PAG-3 before (red line) and after (blue line) incubated in pH 5.0 acetate buffer solution.

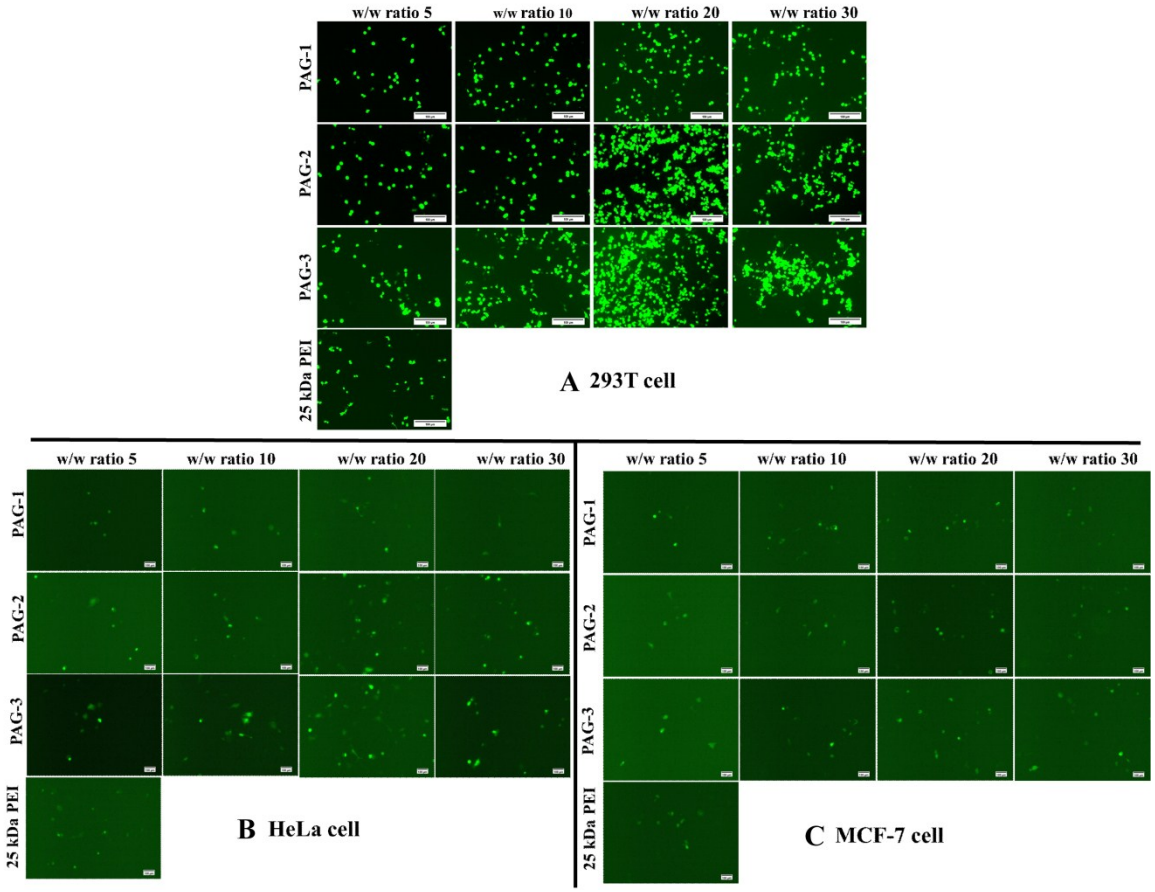

Fig. S3 The photos of EGFP expression mediated by PAG/pDNA polyplexes prepared using different weight ratios ranging from 5 to 30 in 293T (A), HeLa (B) and MCF-7 (C) cell lines. 25 kDa PEI at N/P ratio of 10 was used as control. The scale bar is 100 μm.

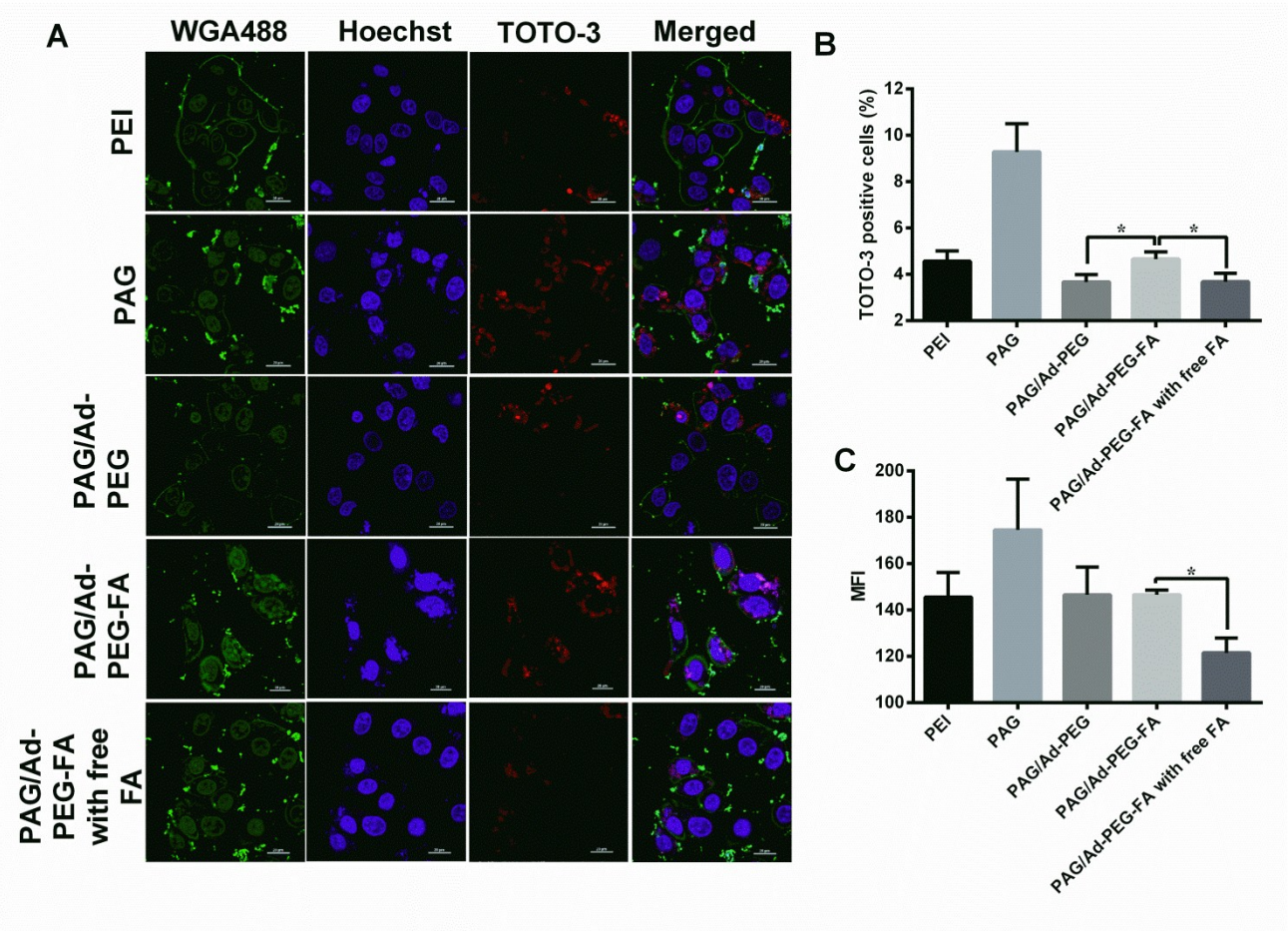

Fig. S4 Confocal laser scanning images (A) and the quantification of flow cytometry (B: percentage and C: mean fluorescent intensity (MFI) of TOTO-3 positive cells) of FR positive MCF-7 cells after being incubated with polyplexes prepared with the TOTO-3-stained plasmid DNA (red) for 4 h in the medium without or with free folate (1 mM). The nuclei was stained by Hoechst 33342 (blue) and the cell membrane was stained by wheat germ agglutinin 488 (WGA-488, green) (*$p<0.05$, student's t-tests). The scale bar is 20 μm.

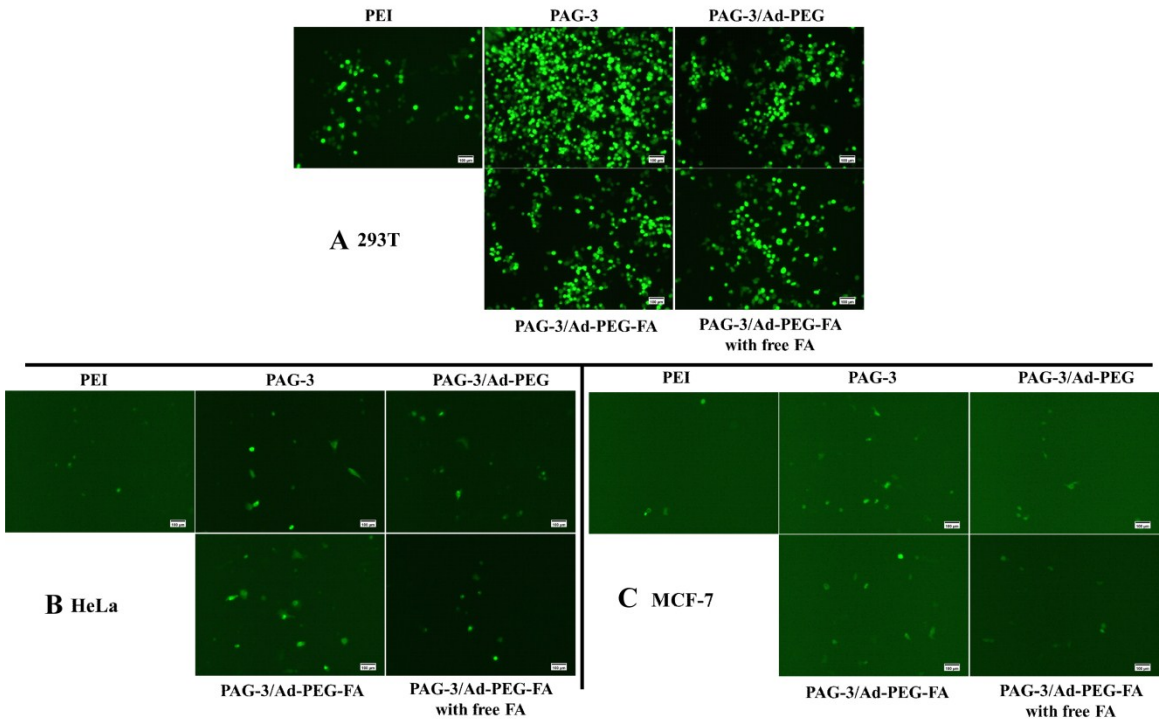

Fig. S5 Image of EGFP expression of PAG-3, PAG-3/Ad-PEG-OH, and PAG-3/Ad-PEG-FA based polyplexes at the w/w ratio of 20 in 293T (A, low expression of folate receptors), HeLa (B, high expression of folate receptors) and MCF-7 (C, high expression of folate receptors) cells. The scale bar is 100 μm.

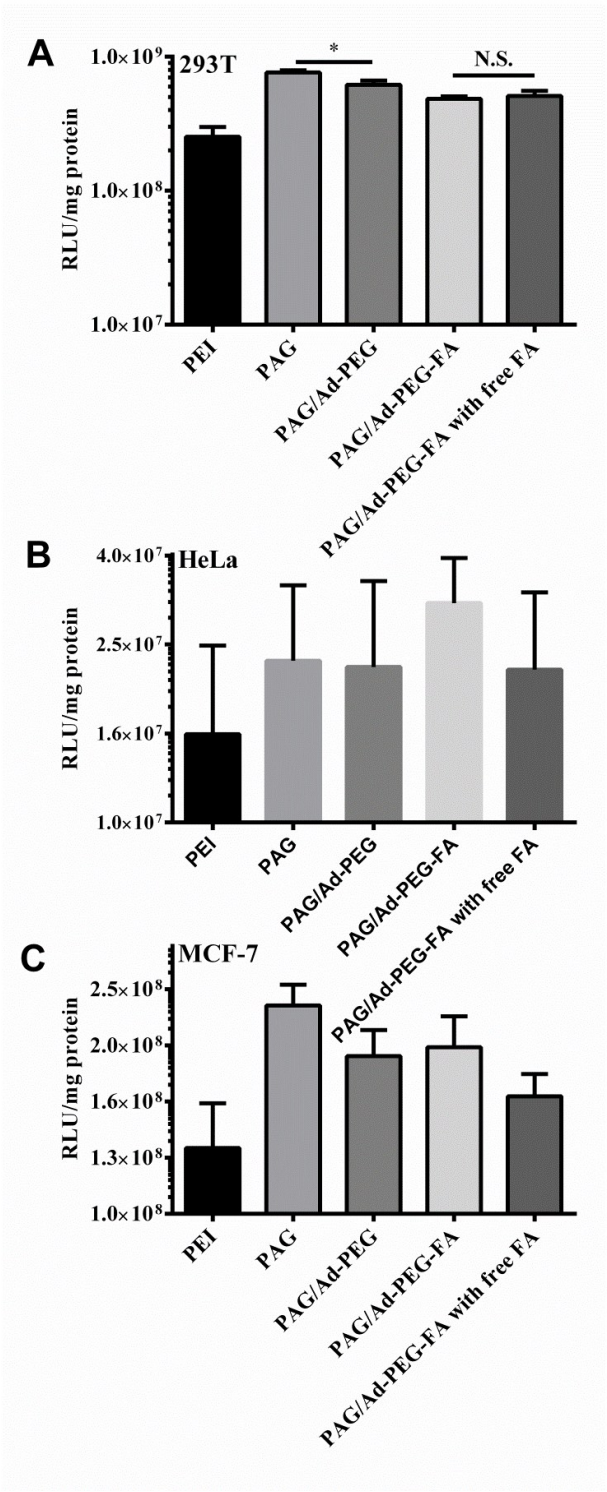

Fig. S6 Quantification of luciferase transfection activity of PAG-3, PAG-3/Ad-PEG-OH, and PAG-3/Ad-PEG-FA based polyplexes at the w/w ratio of 20 in 293T (low expression of folate receptors), HeLa (high expression of folate receptors) and MCF-7 (high expression of folate receptors) cell lines (*$p < 0.05$, N.S., not significant, student's t-tests). Data are shown as mean ± SD (n = 3).

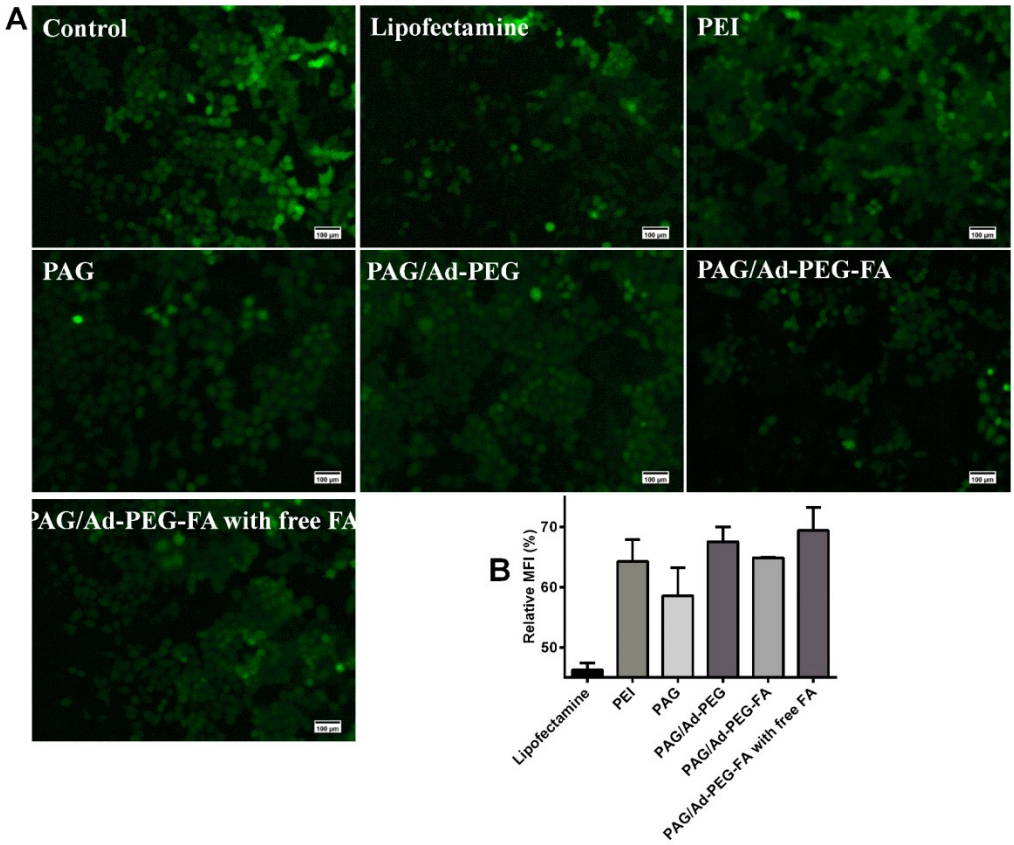

Fig. S7 siRNA transfection efficiency of supramolecular polyplexes. EGFP fluorescence images (A) of the HeLa_EGFP cells treated with PAG-3/siRNA based polyplexes prepared at the w/w ratio of 20. The scale bar is 100 μm. Relative mean EGFP fluorescence intensity (B) of the HeLa cells treated with PAG-3/siRNA based polyplexes determined by flow cytometry.