Supplementary information for

**Great surprise, but make sense: disulfide modified self-assembly lipopeptides with arginine-rich periphery achieves excellent gene transfection efficiency at relatively low nitrogen to phosphorus ratios**

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**Figure S1.** Synthesis of non-disulfide modified lipopeptides with arginine-rich periphery (RL).
Figure S2. Chemical characterization ($^1$H-NMR spectrum and ESI-MS) of RLS and RL. (A) $^1$H-NMR of RLS. (B) MS (ESI) of RLS: [M+H$^+$] =1249.9. (C) $^1$H-NMR of RL. (D) MS (ESI) of RL: [M+H$^+$] =1214.9.
Figure S3. The color variance of RLS in Ellman’s assay and NTSB assay.
Figure S4. TEM images of RLS lipoplexes at N/P ratios of 5 (A) and 10 (B).
Figure S5. Fluorescence microscopy images of cells with EGFP transfection at different N/P ratios of 5-80 in HeLa cell line. The scale bar was 200 µm.
Figure S6. (A) HepG2 cells were treated with two different concentration of GSH for 2.5 h before EGFP transfection. HepG2 cells without incubation of GSH were as control. (B) Semi-quantitative evaluation of RLS/EGFP complexes in HepG2 cells with incubation of GSH by Image Pro 6.0.
**Figure S7.** The colocalization ratio of red fluorescence of Cy5-labeled DNA with the green fluorescence of LysoSensor Yellow/Blue DND-160 after cells were treated with different complexes for 2 h and 4 h. *p < 0.05.
<table>
<thead>
<tr>
<th>Samples</th>
<th>Thiol/disulfide bonds (μmol/mg cationic lipid)</th>
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<tbody>
<tr>
<td></td>
<td>Theoretical values</td>
<td>Measured values</td>
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<tr>
<td>compound 7</td>
<td>11.7/5.85</td>
<td>10.5/5.85</td>
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<tr>
<td>RLS</td>
<td>3.68/1.84</td>
<td>3.62/1.82</td>
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