Electronic Supplementary Material (ESI) for Nanoscale.

Untying a Nanoscale Knotted Polymer Structure to Linear Chains for Efficient Gene Delivery In Vitro and to the Brain

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Supplementary Information

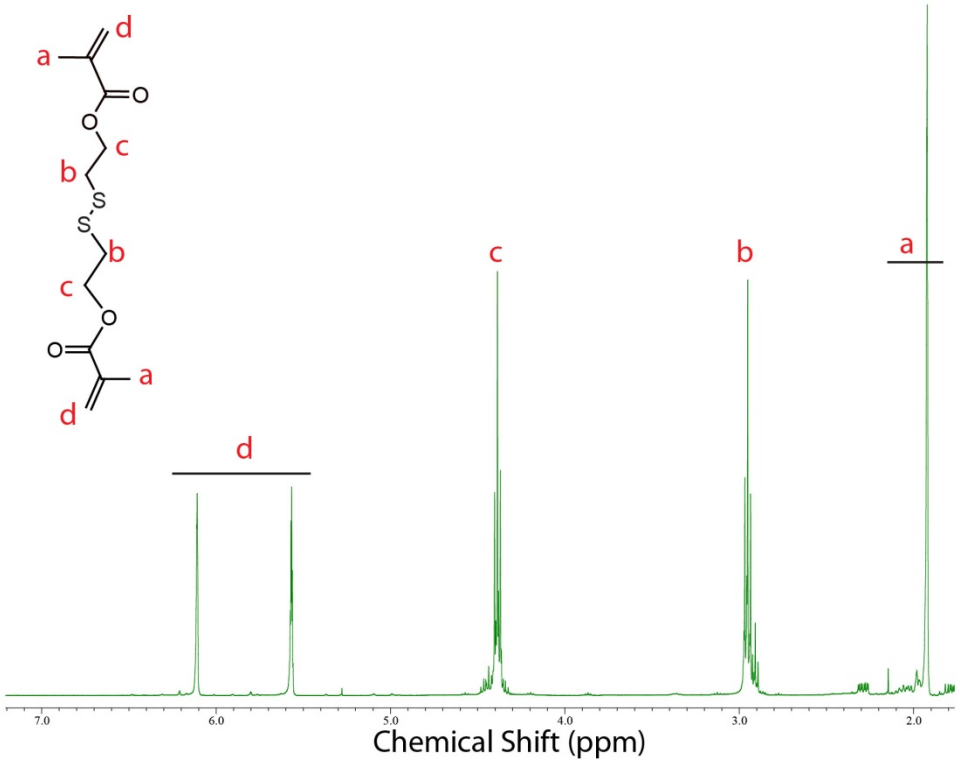

Figure S1 – ^{1}H – NMR Spectrum of the DSDMA monomer.

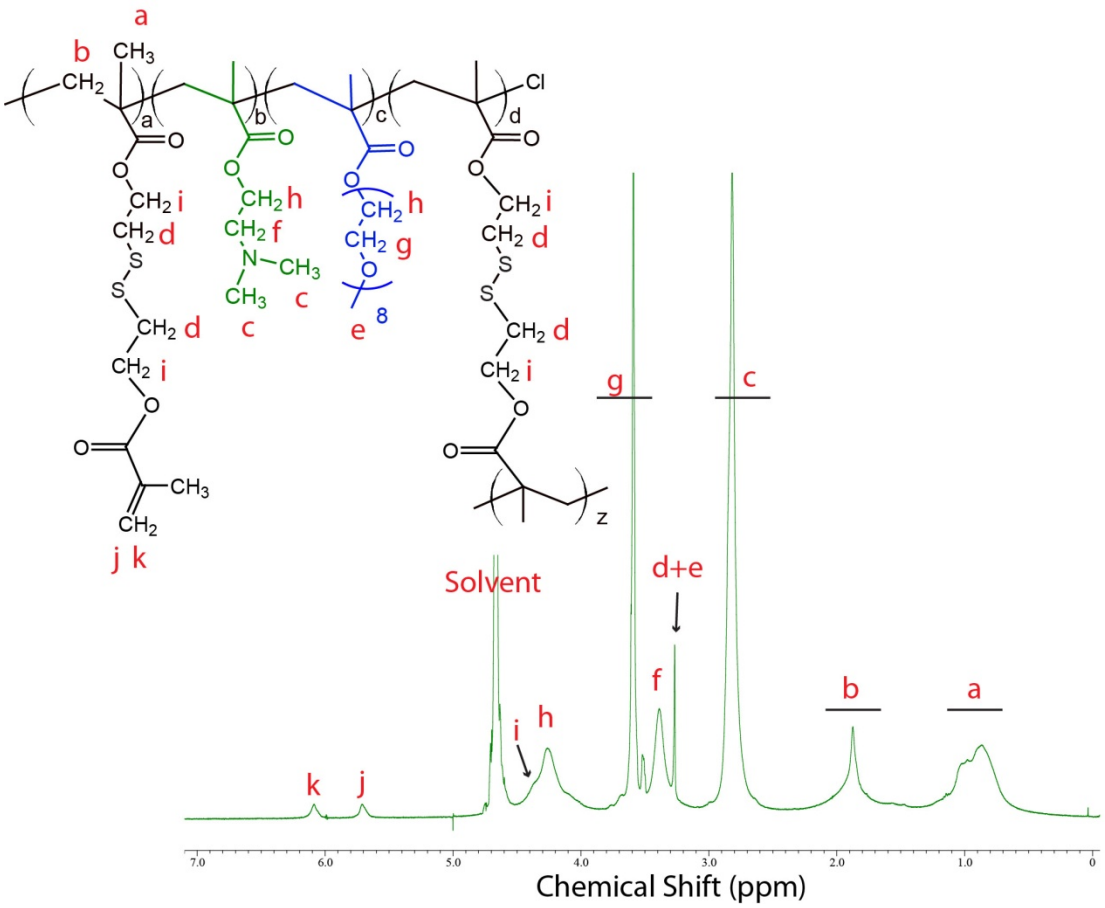

Figure S2 – ^{1}H – NMR Spectrum of DSP8 with peak identification for subsequent analysis.

Equation S1

DMAEMA component (**D**) = f/2 or c/6

PEGMEMA component (**PEG**) = g/30

$$\text{Total DSDMA} = \frac{i + h - (2\mathbf{D}) - (2\mathbf{PEG})}{4}$$

DSDMA with free vinyl (**V**) = k or j

$$\text{Branching DSDMA } (\mathbf{B}) = \frac{i + h - (2\mathbf{D}) - (2\mathbf{PEG}) - (4V)}{4}$$

Total content = **D** + **PEG** + **V** + **B**
Percentage of each component is given as a percentage of the total content:

$$\text{e.g. percentage of free vinyl} = \frac{\mathbf{V}}{\mathbf{D} + \mathbf{PEG} + \mathbf{V} + \mathbf{B}}$$

Table S1 – Characterisation of DSP8 by GPC analysis of the molecular weight, and ^{1}H-NMR analysis of the final composition by percentage component.

M_n	M_w	PDI	DMAEMA	PEGMEMA	Vinyl DSDMA	Branching DSDMA
16.7	25.3	1.52	73.7%	9.2%	11.6%	5.6%

Table S2 – Analysis of the polymer molecular weight during the reaction process.

Time (hrs)	M_n (kDa)	M_w (kDa)	PDI (M_n/M_w)	% Conversion
1	4898	5.635	1.15	4.6
2	6671	7.939	1.19	12.9
3	8581	10.524	1.23	19.8
4	12693	16.254	1.28	30.2
5	15451	20.524	1.33	38.2
6	20885	30.075	1.44	43.2

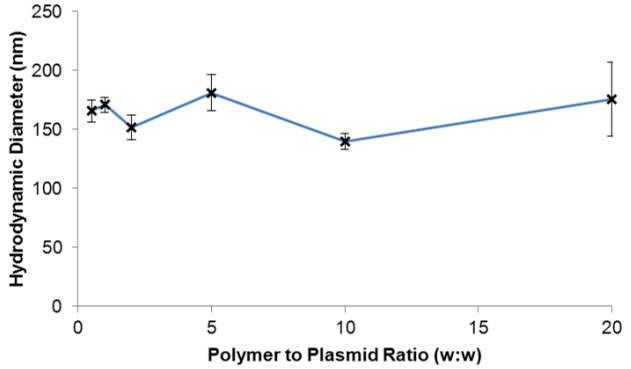

Figure S3 – Dynamic light scattering measurements of the polyplexes in PBS four days post-formation.

SI References

1. Li Y, Armes SP. Synthesis and chemical degradation of branched vinyl polymers prepared via ATRP: use of a cleavable disulfide-based branching agent. *Macromolecules* 2005; **38:** 8155-8162.