Supplementary Information

**Figure S1.** $^1$H-NMR spectrum of TMC (400 MHz, in D$_2$O).

**Figure S2.** Schematic representation of the synthetic chemical route followed for the preparation of the thiolated trimethyl chitosan (TMCSH).
**Figure S3.** Relative expression of BDNF mRNA in dissociated DRG primary cultures at 72 hours after transfection with naked plasmid DNA encoding for BDNF (pBDNF), TMCSH/pBDNF or TMCSH-HC/pBDNF nanoparticles. BDNF mRNA expression was normalized to GAPDH expression levels and expressed as relative to untreated DRG primary cultures. *p<0.05 in multiple comparisons between treatment groups.