Supporting Information for

Side-Chain Amino Acid Based Cationic Antibacterial Polymers: Investigating the Morphological Switching of Polymer Treated Bacterial Cell

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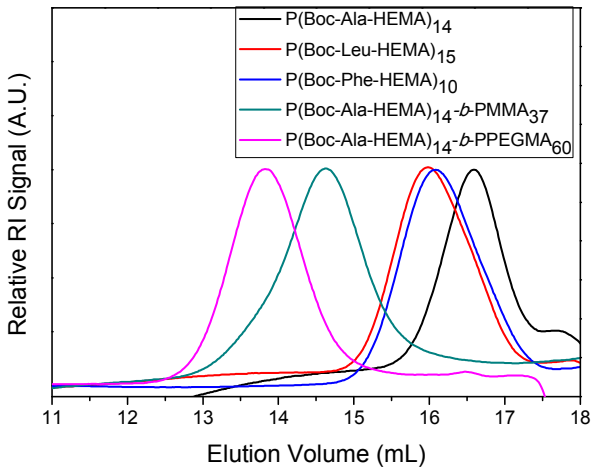

Figure S1. GPC RI traces of P(Boc-Ala-HEMA)$_{14}$, P(Boc-Leu-HEMA)$_{15}$, P(Boc-Phe-HEMA)$_{10}$, P(Boc-Ala-HEMA)$_{14}$-*b*-PMMA$_{37}$ and P(Boc-Ala-HEMA)$_{14}$-*b*-PPEGMA$_{60}$.

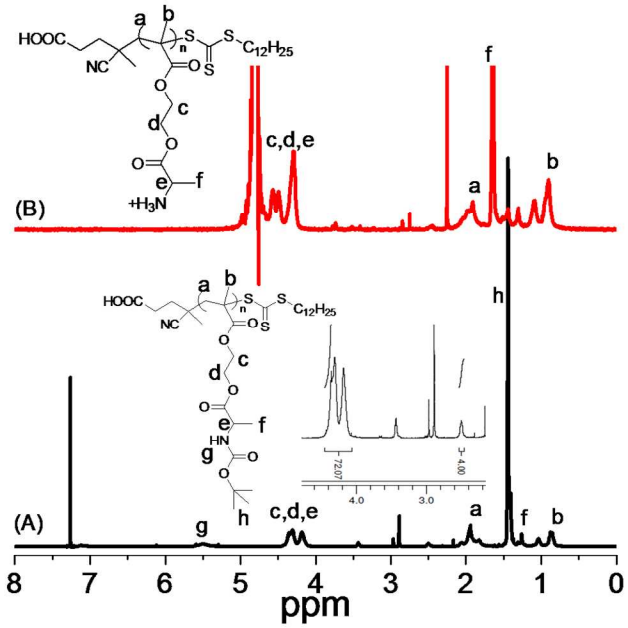

Figure S2. ^{1}H NMR spectra of P(Boc-Ala-HEMA)$_{14}$ in $CDCl_3$ (A) and P(Ala-HEMA)$_{14}$ in D_2O (B).

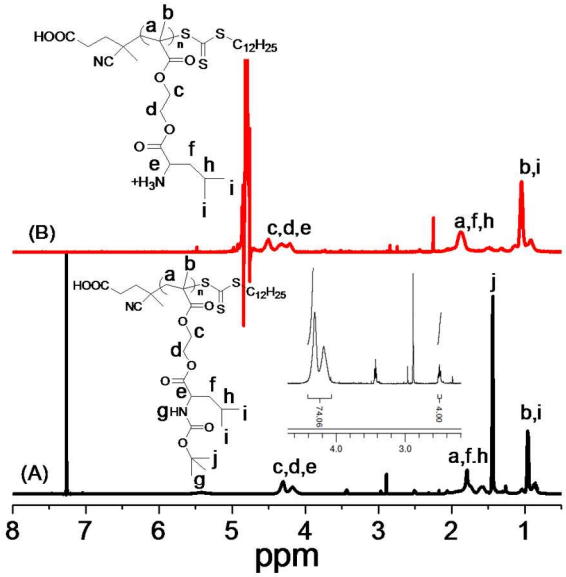

Figure S3. ^{1}H NMR spectra of P(Boc-Leu-HEMA)$_{15}$ in $CDCl_3$ (A) and P(Leu-HEMA)$_{15}$ in D_2O (B).

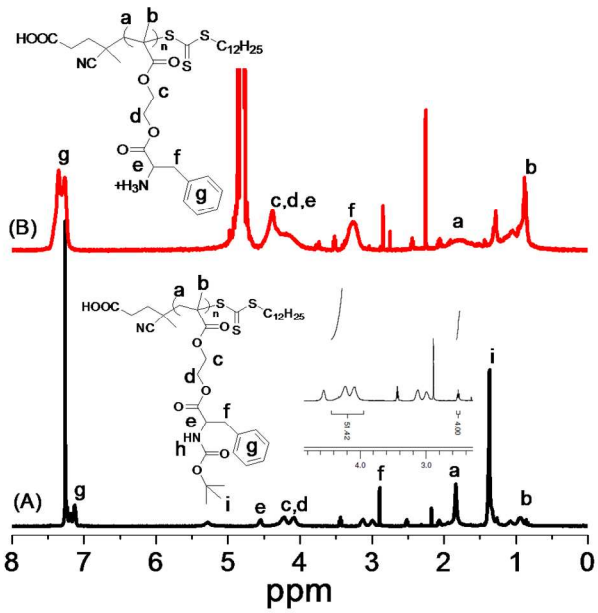

Figure S4. ^{1}H NMR spectra of P(Boc-Phe-HEMA)$_{10}$ in $CDCl_3$ (A) and P(Phe-HEMA)$_{10}$ in D_2O (B).

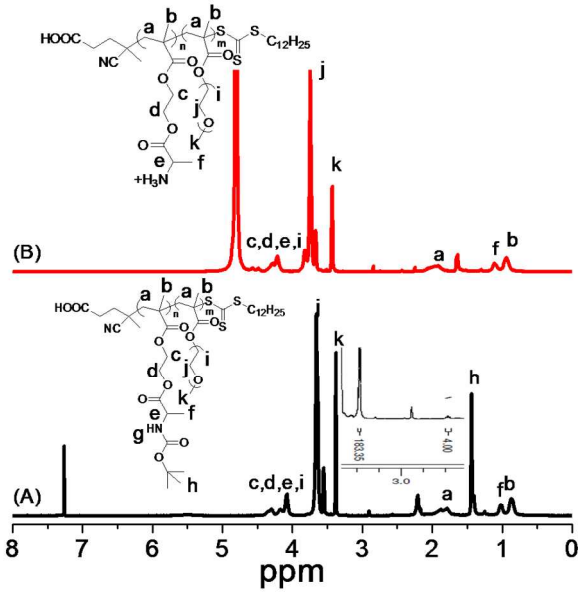

Figure S5. ^{1}H NMR spectra of P(Boc-Ala-HEMA)$_{14}$-*b*-PPEGMA$_{60}$ in $CDCl_3$ (A) and P(Ala-HEMA)$_{14}$-*b*-PPEGMA$_{60}$ in D_2O (B).

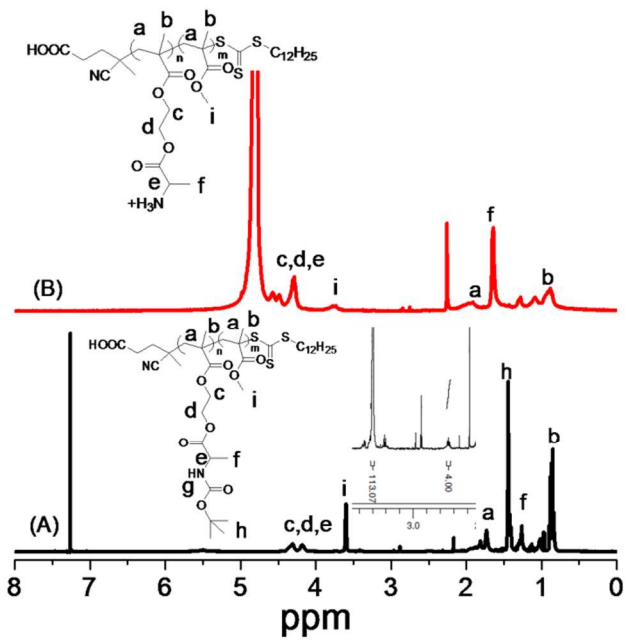

Figure S6. ^{1}H NMR spectra of P(Boc-Ala-HEMA)$_{14}$-*b*-PMMA$_{37}$ in $CDCl_3$ (A) and P(Ala-HEMA)$_{14}$-*b*-PMMA$_{37}$ in D_2O (B).

P(Boc-Ala-HEMA)$_{14}$	$+H_2O$	Soluble	Test solution with litmus paper	Blue to red		Acid
P(Boc-Leu-HEMA)$_{15}$	$+H_2O$	Soluble	Test solution with litmus paper	Blue to red		Acid
P(Boc-Phe-HEMA)$_{10}$	$+H_2O$	Soluble	Test solution with litmus paper	Blue to red		Acid
P(Boc-Ala-HEMA)$_{14}$ -*b*-PPEGMA$_{60}$	$+H_2O$	Soluble	Test solution with litmus paper	Blue to red		Acid
P(Boc-Ala-HEMA)$_{14}$ -*b*-PMMA$_{37}$	$+H_2O$	Soluble	Test solution with litmus paper	Blue to red		Acid

Scheme S1. The aqueous solubility test to determine the presence of acidic functionality in all of the polymers.

Table S1. The aqueous solubility data in terms of concentration (g/L) of all of the polymers.

Polymer	Concentration
P(Boc-Ala-HEMA)$_{14}$	>10 g/L
P(Boc-Leu-HEMA)$_{15}$	>10 g/L
P(Boc-Phe-HEMA)$_{10}$	>10 g/L
P(Boc-Ala-HEMA)$_{14}$-*b*-PPEGMA$_{60}$	>10 g/L
P(Boc-Ala-HEMA)$_{14}$-*b*-PMMA$_{37}$	>10 g/L

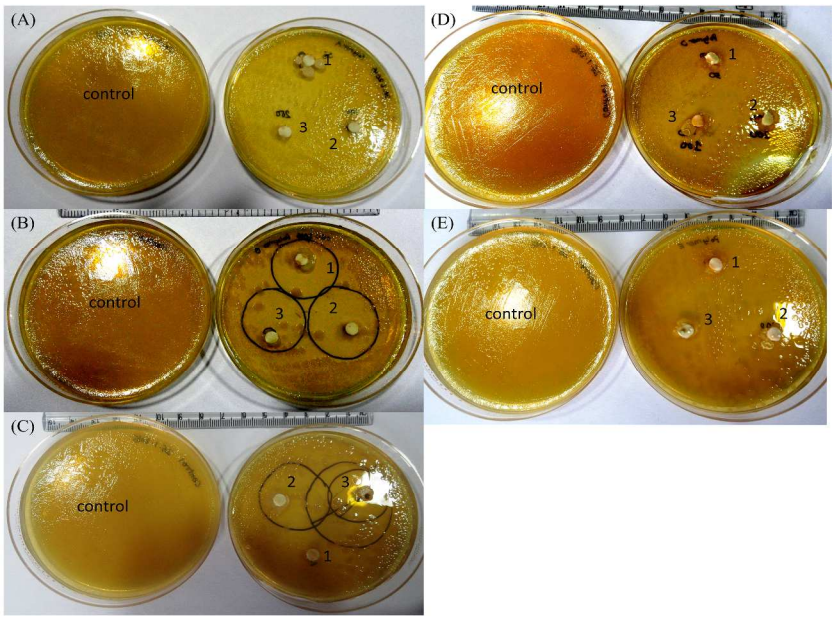

Figure S7. Zone of inhibition experiment against *E. coli* treatment with (A) P(Ala-HEMA)$_{14}$, (B) P(Leu-HEMA)$_{15}$, (C) P(Phe-HEMA)$_{10}$, (D) P(Ala-HEMA)$_{14}$-*b*-PPEGMA$_{60}$ and (E) P(Ala-HEMA)$_{14}$-*b*-PMMA$_{37}$ at (1) 50 µL, (2) 100 µL and (3) 200 µL from 10 mg/mL stock solution. Corresponding control experiments (without polymer) are also shown. The experiment was performed in duplicate and compared with control plate in each cases.

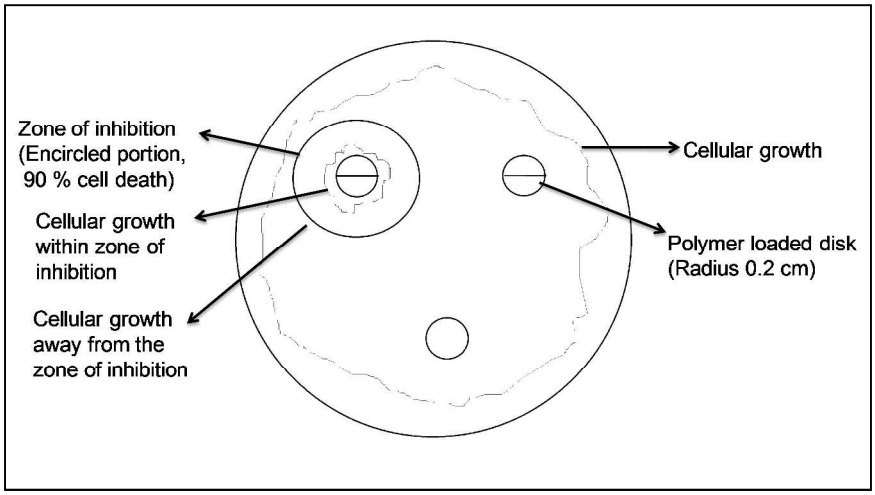

Figure S8. Schematic diagram of a petriplate.

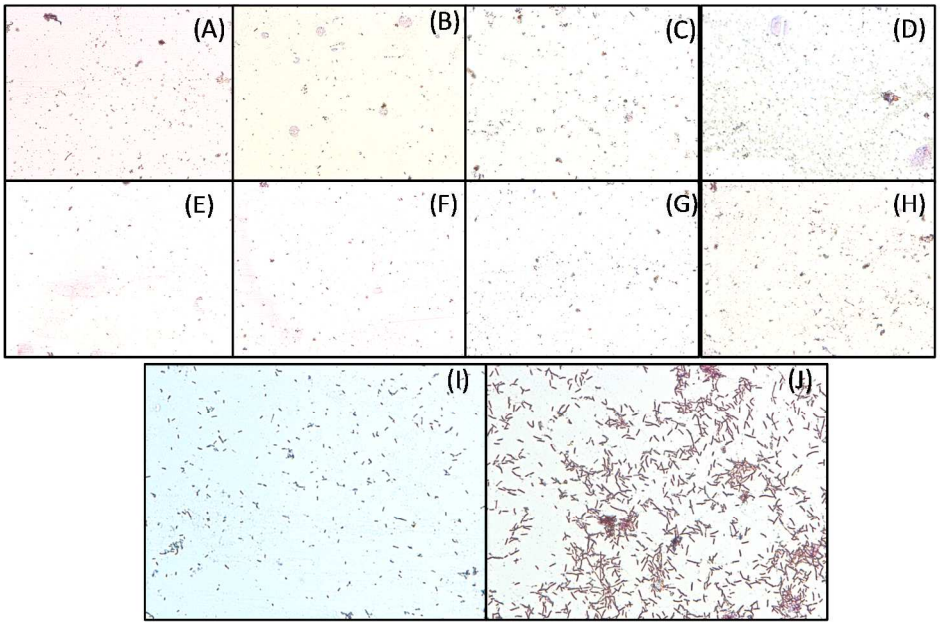

Figure S9. Gram staining images of *E. coli* during bacterial growth in Luria Broth medium treated with P(Leu-HEMA)$_{15}$ polymer at (A) time (t) = 0, (B) t = 1 h, (C) t = 2 h, (D) t = 3 h, (E) t = 4 h, (F) t = 5 h, (G) t = 6 h, (H) t = 7 h, (I) t = 12 h and (J) control (without polymer) after 12 h incubation. Population of bacteria was found to be much lower compared to control (J) and retention of primary stain colour appear to some extent after 12 h incubation (I).

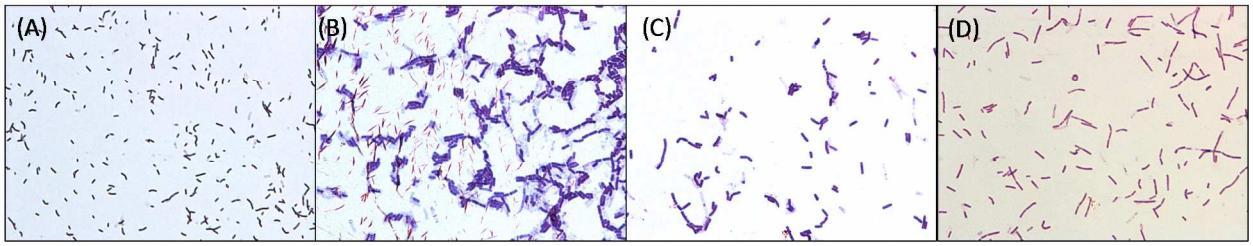

Figure S10. Optical microscopic images of *B. subtilis* cells after Gram staining: (A) control, after treatment with P(Leu-HEMA)$_{15}$ near the zone of inhibition (B) from congested cell area, (C) from discrete cell area, and (D) away from the zone of inhibition. Stacking of cells with intact cell morphology and cell size appeared during polymer treatment.