Polyethyleneimine Functionalized Mesoporous Magnetic Nanoparticles with Enhanced Antibacterial and Antibiofilm Activity in an Alternating Magnetic Field

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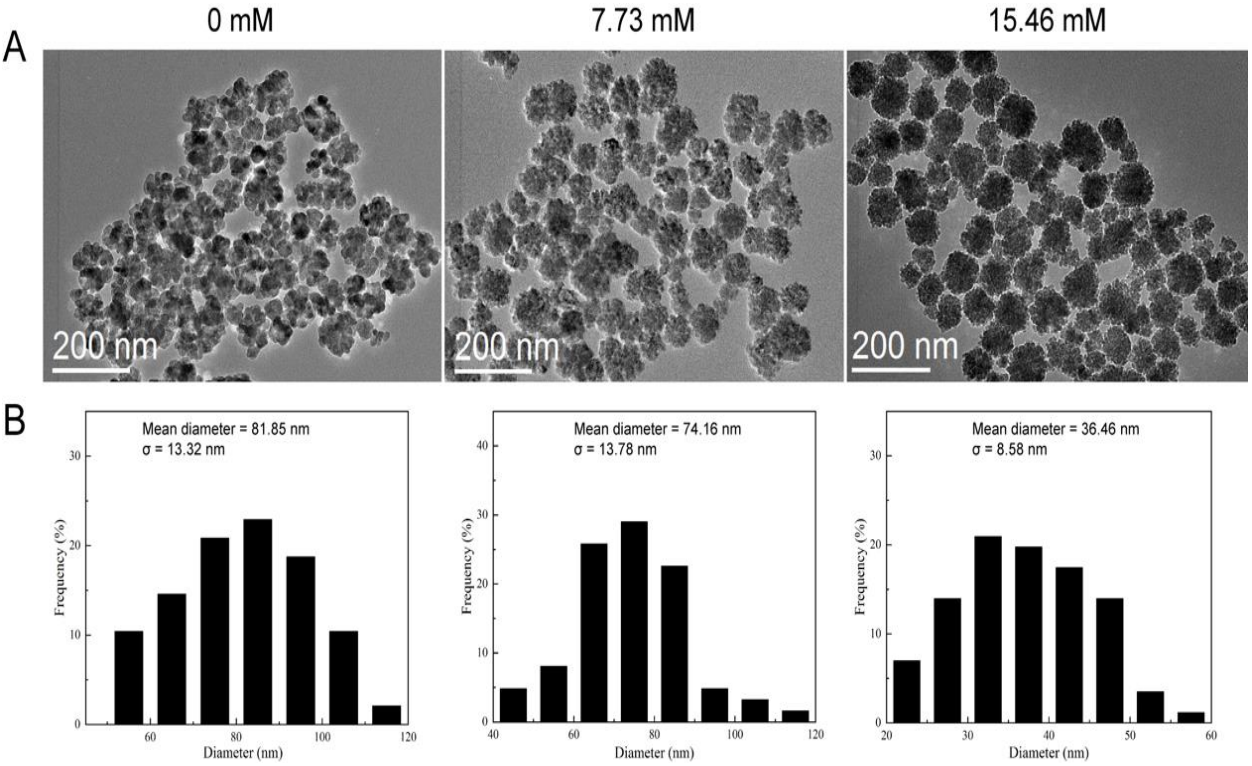

Figure S1. (A)TEM images of Fe_3O_4 NPs synthesized with different concentrations of Na_3Cit. (B) Size distribution histograms of Fe_3O_4 NPs synthesized with different concentrations of Na_3Cit.

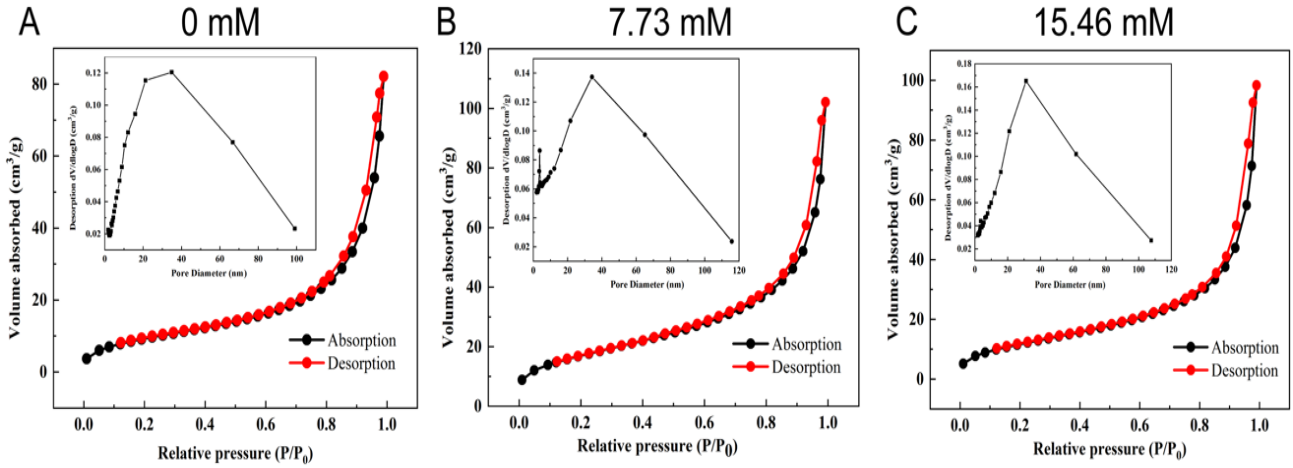

Figure S2. Nitrogen adsorption-desorption isotherms and corresponding pore-size distribution curves (inset) of Fe_3O_4 NPs synthesized with different concentrations of Na_3Cit: (A) 0 mM of Na_3Cit; (B) 7.73 mM of Na_3Cit; (C) 15.46 mM of Na_3Cit.

Table S1. BET surface area and pore size of Fe_3O_4 NPs synthesized with different concentrations of Na_3Cit.

The concentrations of Na_3Cit (mM)	BET surface area (m^2/g)	Pore size (nm)
0	35.0329	14.50554
7.73	61.2710	10.22019
15.46	44.0334	13.80913

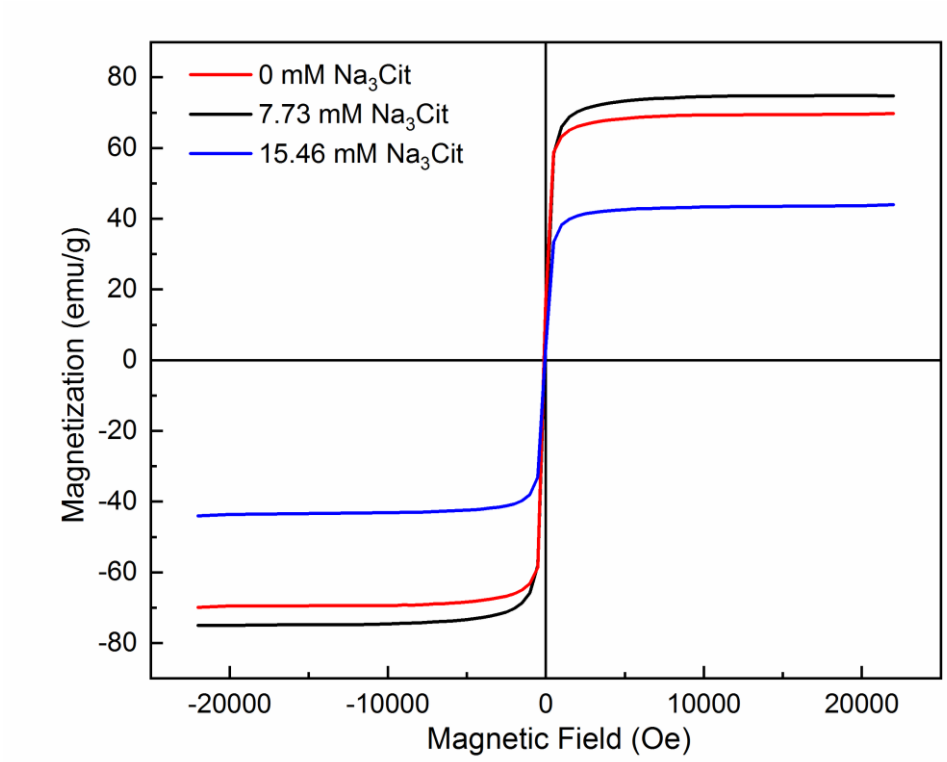

Figure S3. The magnetic hysteresis loops of Fe_3O_4 NPs synthesized with different concentrations of Na_3Cit at room temperature.

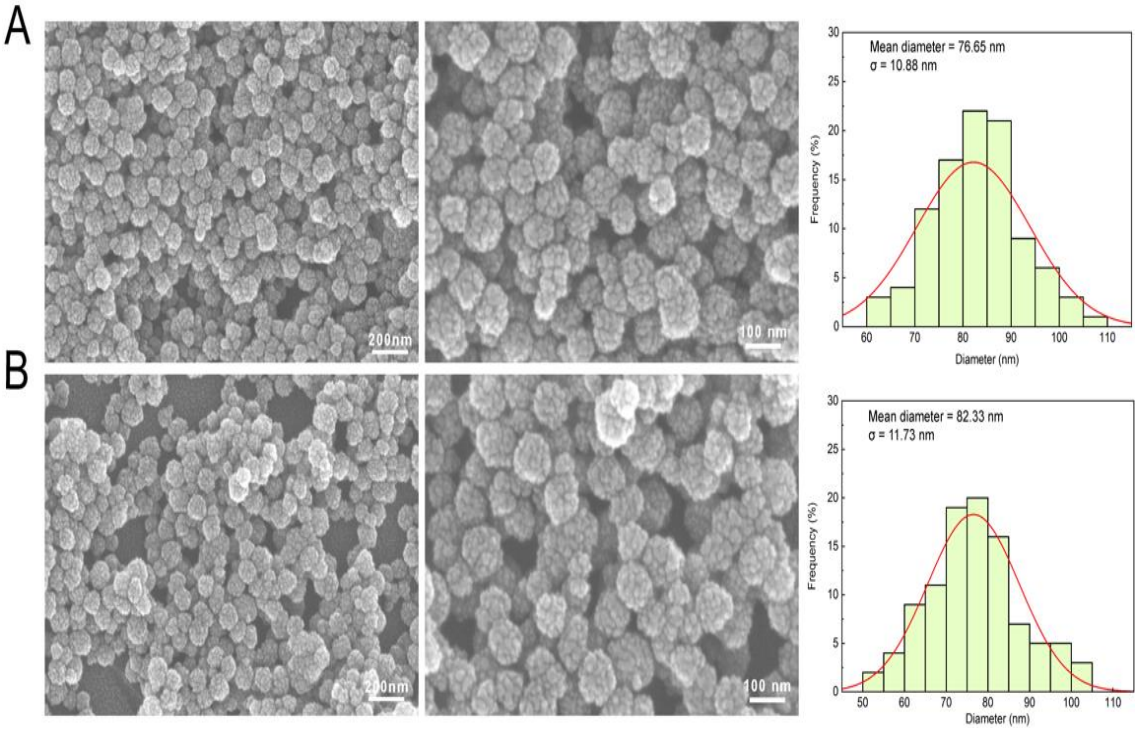

Figure S4. Scanning electron microscopy images and size distribution histograms of Fe_3O_4 and Fe_3O_4@PEI NPs. (A) Fe_3O_4 NPs. (B) Fe_3O_4@PEI NPs.

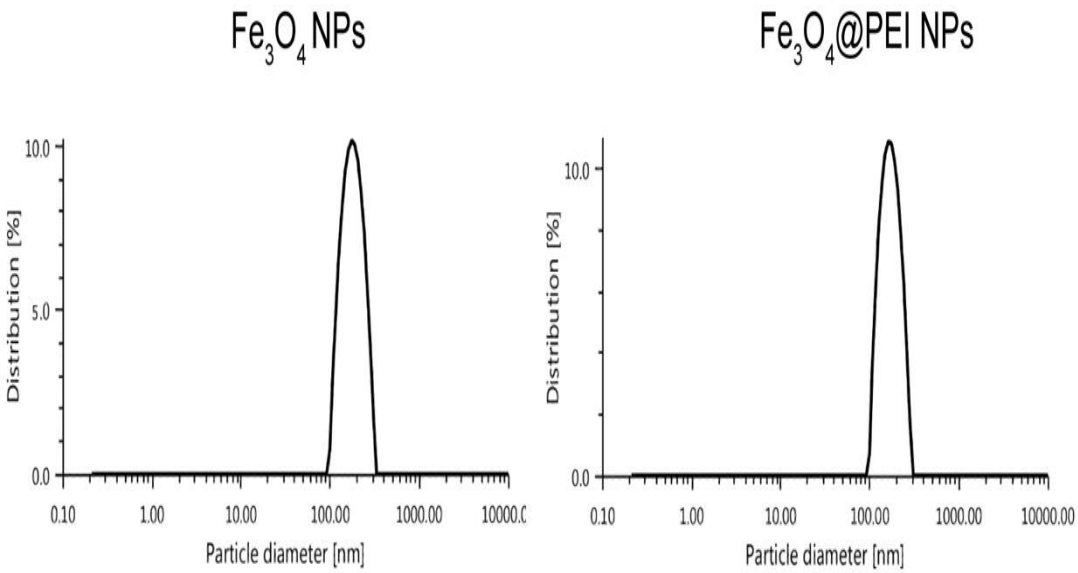

Figure S5. Dynamic light scattering (hydrodynamic size distribution) of Fe_3O_4 and Fe_3O_4@PEI NPs.

Table S2. Dynamic light scattering data of Fe_3O_4 and Fe_3O_4@PEI NPs.

Sample	Hydrodynamic diameter (nm)	Peak (nm)	Polydispersity index (%)
Fe_3O_4 NPs	177.86	173.69	10.1
Fe_3O_4@PEI NPs	185.70	183.23	8.4

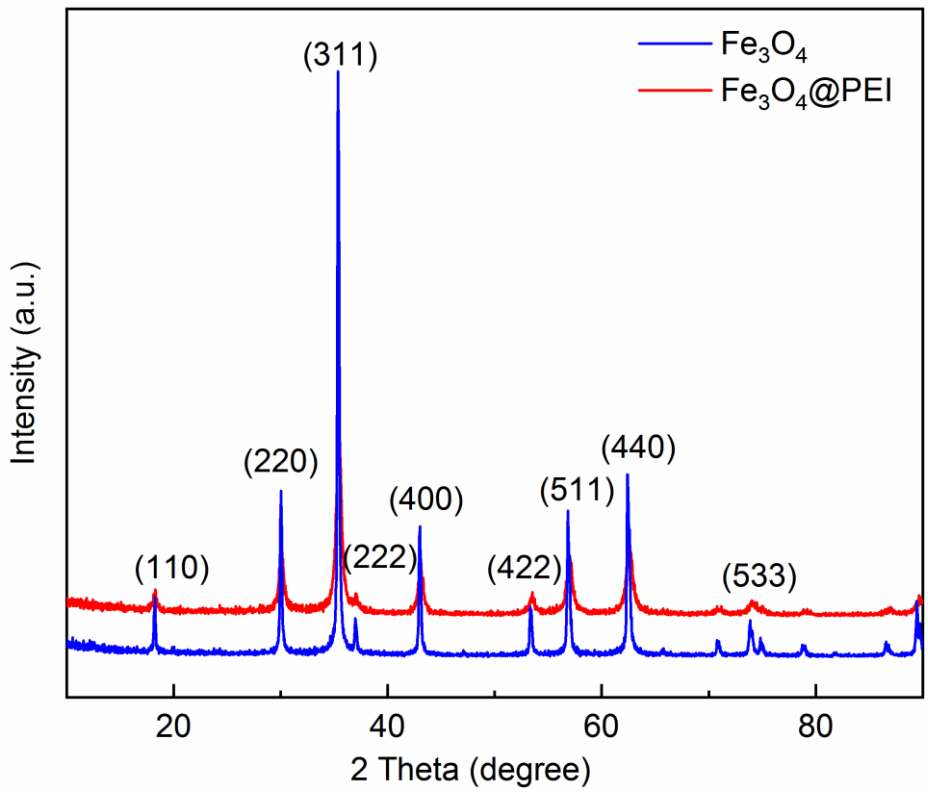

Figure S6. XRD patterns of Fe_3O_4 and Fe_3O_4@PEI NPs.

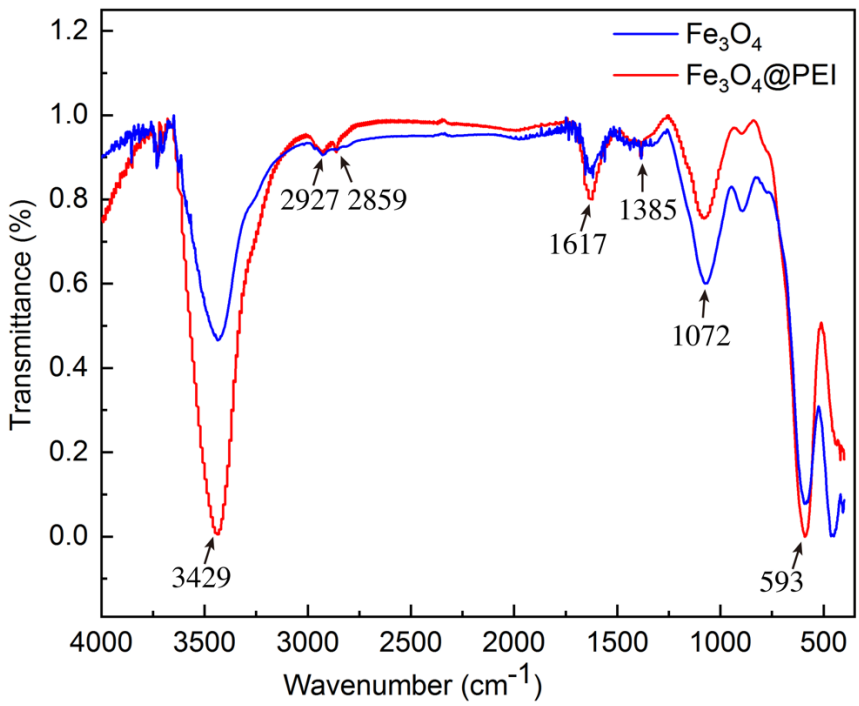

Figure S7. FTIR spectra of Fe_3O_4 and Fe_3O_4@PEI NPs.

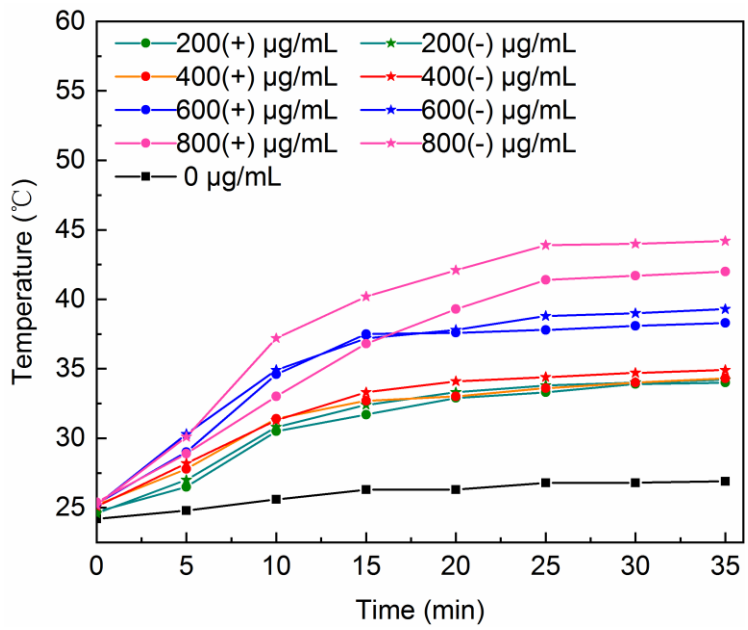

Figure S8. Time-temperature curves with different concentrations of Fe_3O_4 and Fe_3O_4@PEI NPs in a sterile condition under an AMF treatment. "–" and "+" represent Fe_3O_4 and Fe_3O_4@PEI NPs, respectively.

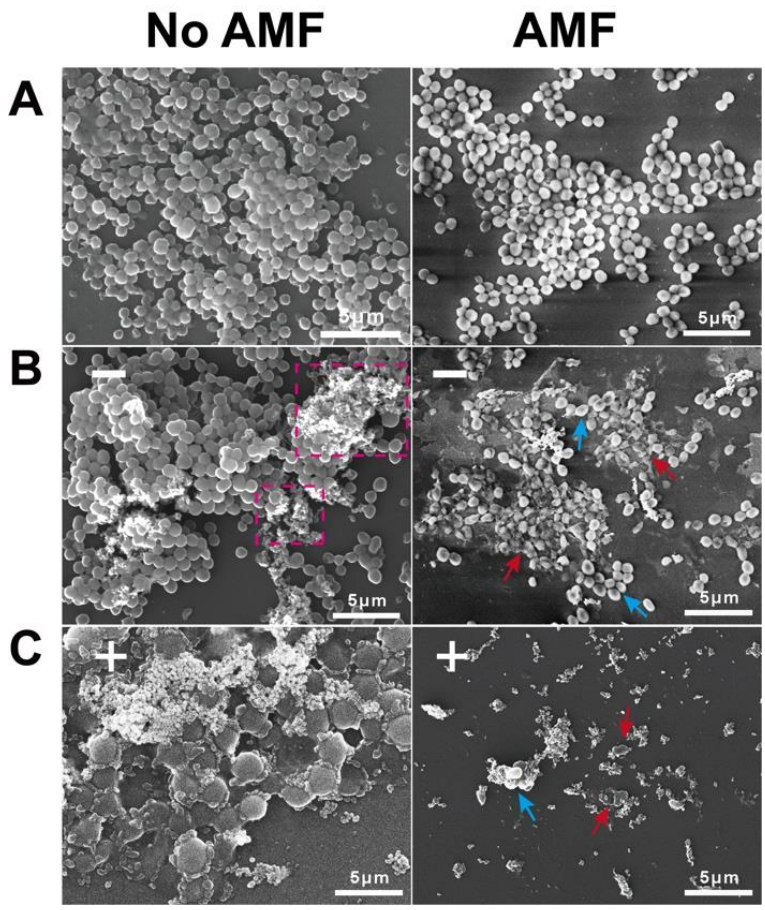

Figure S9. Scanning electron microscopy images of *S. aureus* biofilms. (A) *S. aureus* without NPs. (B) *S. aureus* with Fe_3O_4 NPs. (C) *S. aureus* with Fe_3O_4@PEI NPs. "–" and "+" represent Fe_3O_4 and Fe_3O_4@PEI NPs at the concentration of 800 μg/mL, respectively.