Supporting information

Structure and Dynamics of Lipid Membranes Interacting with Antivirulence End-phosphorylated Polyethylene Glycol Block Copolymers

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Figure S1. SANS profiles of hABAPEG (a) and hPi-ABAPEG (b) in D\textsubscript{2}O with different concentrations. (c) SANS profiles (symbols) and the best-fit results (solid lines) with a worm-like chain model of 1 wt\% hABAPEG and hPi-ABAPEG in D\textsubscript{2}O.
Note: SANS profiles of ABAPEG and Pi-ABAPEG copolymers in D₂O with different concentrations at high q range are proportional to each other, indicating there are no significant differences of local chain conformation before and after end-phosphorylation. This is consistent with the best-fit results with a worm-like chain model.

Figure S2. SLD Determination of hPi-ABAPEG and dPi-ABAPEG copolymers: (a) the square root of SANS intensities of hPi-ABAPEG in the mixtures of H₂O and D₂O with different volume ratios; (b) the square root of SANS intensities of the mixture of hPi-ABAPEG and dPi-ABAPEG with different weight fractions in D₂O. SANS intensities shown here are taken at q = 0.2 Å⁻¹.

Note: In Figure S2 (a), the SLD of hPi-ABAPEG copolymer is determined as 0.699 × 10⁻⁶ Å⁻² at the square root of SANS intensity equal to 0 cm⁻¹ through a linear fit. As the SLDs of hPi-ABAPEG copolymer and D₂O are known, the SLD of dPi-ABAPEG copolymer is determined as 6.27 × 10⁻⁶ Å⁻² by the cross point of the linear fit of the square root of SANS intensities at the weight fraction of hPi-ABAPEG equal to 0. 6.27 × 10⁻⁶ Å⁻² is corresponding to the SLD of a D₂O/H₂O mixture with a volume ratio of 98.5:1.5.
Figure S3. (a) NSE spectra of hABAPEG and hPi-ABAPEG in D$_2$O solutions at 37 °C at different $q$ values. The corresponding $q$ values [Å$^{-1}$] are indicated. Lines through the points represent the single stretched exponential fits, which describe the data well. (b) $q$-dependence of the characteristic time, $\Gamma$, obtained from the fittings. The segmental dynamics of polymer chains has no significant changes after end-
**Figure S4.** Normalized X-ray reflectivity, $R/R_F$, of hDMPC monolayers at the air-water interface and water with a mass fraction of 0.1 % hABAPEG subphases.

**Figure S5.** DLS measurements show that hDMPC ULV vesicles at 37°C and 20°C and in the presence of 1 %, 3 %, and 5 % hPi-ABAPEG copolymers. For each condition, the radii measured at different times are normalized by the mean ULV radius (61 nm) measured at time = 0 h from the same condition.
Figure S6. Temperature-dependent $\kappa$ of pure DMPC ULVs and DMPC ULVs in the presence of 1\% dPi-ABAPEG copolymers.