Dynamic Studies of the interaction of a pH responsive, amphiphilic polymer with a DOPC lipid membrane

Supplementary information

**2-(4,4-difluoro-5,7-dimethyl-4-bora-3a,4a-diaza-s-indacene-3-pentanoyl)
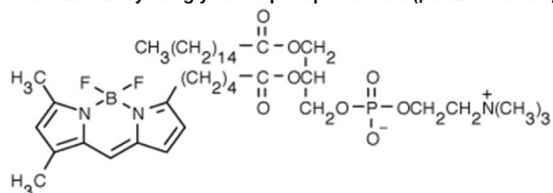-1-hexadecanoyl-sn-glycero-3-phosphocholine (β-BODIPY-C5-HPC)**

Figure S1: Structure of β-BODIPY-C5-HPC (took from the website www.thermofisher.com)
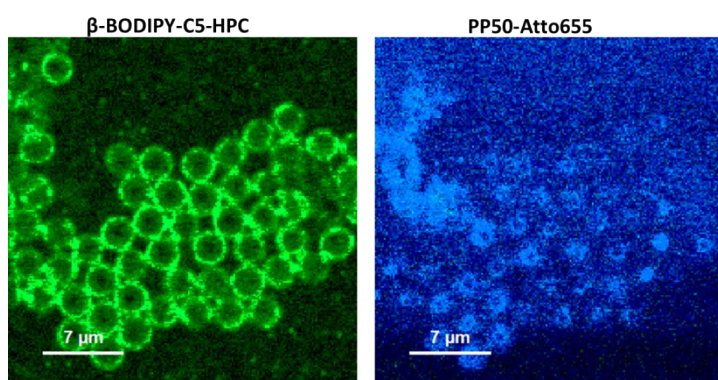

Figure S2: Confocal microscope images of DOPC lipid membrane with lipid fluorescent marker β-BODIPY-C5-HPC and PP50-Atto655 on the microcavity supported lipid bilayer made from PDMS, PBS buffer, pH 7.05
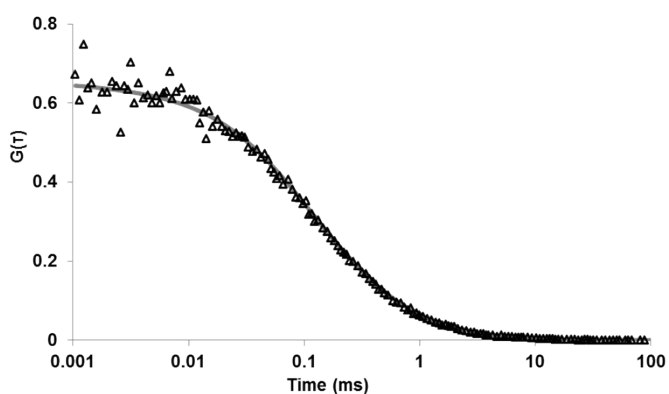

Figure S3: Autocorrelation function curve of atto655-PP50 in PBS buffer, pH 7.05. The triangles correspond to experimental data and solid line represent 3D-diffusion model fit.

Equation S1 represents 3D-diffusion model used to extract diffusion time of Atto655 labelled PP50 and fluorescent dye in solution.

$$G_{3D}(t) = \left(1 + \frac{f_T}{1-f_T}e^{-t/\tau_T}\right) \cdot \frac{1}{\langle N \rangle} \cdot \frac{1}{1+\left(\dfrac{\tau}{\tau_D}\right)^{\alpha}} \cdot \frac{1}{\left(1+\dfrac{\tau}{S^2\tau_D}\right)^{\frac{1}{2}}} \qquad (S1)$$

S is structure parameter, $S = z_o/r_o$ where z_o and r_o represent the axial and radial dimensions of the confocal volume.
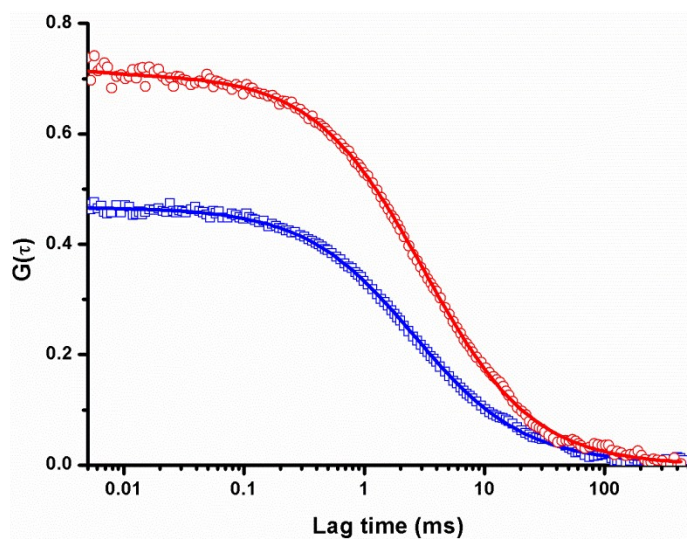

Figure S4: Representative autocorrelation function curve of lipids (β-BODIPY-C5-HPC labelled DOPC membrane)   before and after introducing PP50, PBS buffer, pH 6.5. Blue square represents experimental ACF curve of lipids before adding PP50 and solid line corresponds to 2D diffusion model fit. Red circle and solid line represent ACF curve of lipids after adding PP50 and its 2D-diffusion model fit.

Table S1: FLCS data analysis of lipids and pp50 on PDMS microcavity at pH 6.5 for 4 hours

Time	Lipid probe (β-BODIPY-C5-HPC)			Atto655-PP50		
(hours)	α	τ_i (ns)	D (µm²/s)	α	τ_i (ns)	D (µm²/s)
DOPC	0.94±0.11	5.9±0.2	10.7± 0.8			
Immediate	0.95±0.04	5.9±0.2	9.3±0.4	0.8±0.1	3.0±0.02	79.7±19.3
0.3	0.97±0.06	5.82±0.11	9.0±0.31	0.8±0.21	2.99±0.02	83.5±20.2
1	0.99±0.03	5.70±0.4	8.63±0.5	0.91±0.13	2.98±0.02	78.7±14.0
2	0.97±0.05	5.45±0.36	8.06±0.51	0.74±0.2	3.03±0.04	71.0±19.0
4	0.97±0.06	5.66±0.31	8.68±1.0	0.97±0.22	3.02±0.03	71.4±25.0

D is diffusion coefficient, τ_i is fluorescence lifetime and α is anomalous exponent. All the time points were repeated atleast 2 times on different days and standard deviations were calculated from atleast 20 points for a given time.

Table S2: FLCS data analysis of lipids and pp50 on PDMS microcavity at pH 7.05 for 4 hours

Time (hours)	Lipid probe (β-BODIPY-C5-HPC)			Atto655-PP50		
	α	τ_i (ns)	D ($\mu m^2/s$)	α	τ_i (ns)	D ($\mu m^2/s$)
DOPC	0.95±0.05	6.06±0.14	11.1 ± 0.8			
Immediate	0.94±0.06	5.9±0.07	7.8± 0.4	0.85±0.08	3.03±0.02	66.85±25.0
0.3	0.97±0.04	5.96±0.13	10.10±1.01	0.8±0.14	3.04±0.02	61.75±20.2
1	0.98±0.03	5.97±0.11	10.1± 1.02	1.0±0.14	3.01±0.01	83.0±18.2
2	0.98±0.03	6.0±0.12	10.1±0.88	0.8±0.12	3.05±0.01	71.75±18.2
4	0.97±0.03	5.98±0.15	9.40±0.82	0.91±0.12	3.03±0.01	80.0±29.0

Table S3: FCS data analysis of lipids and pp50 on PDMS microcavity at pH 7.5 for 4 hours

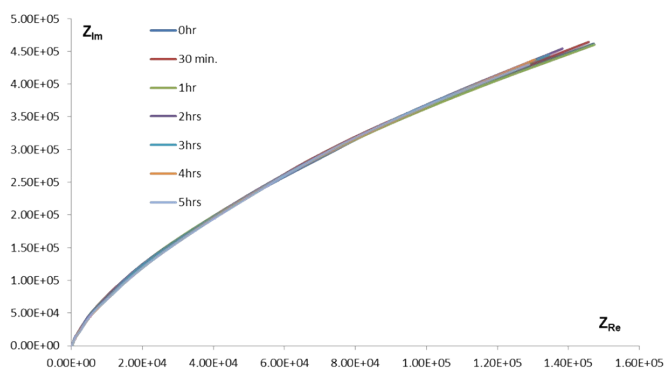| Time (hours)	Lipid probe (β-BODIPY-C5-HPC)			Atto655-PP50		
	α	τ_i (ns)	D ($\mu m^2/s$)	α	τ_i (ns)	D ($\mu m^2/s$)
DOPC	0.94±0.03	5.65±0.32	11.2± 1.6			
Immediate	0.92±0.06	5.07±0.37	9.5± 1.08	0.86±0.08	3.0±0.01	79.6±19.6
0.3	0.95±0.05	5.64±0.33	10.0±1.0	0.89±0.14	3.0±0.03	93.5±20.5
1	0.96±0.04	5.51±0.27	11.2± 1.4	0.86±0.12	3.0±0.03	87.6±21.0
2	0.95±0.05	5.35±0.43	11.72± 1.7	0.88±0.1	3.03±0.03	84.5±18.0
4	0.97±0.05	5.38±0.37	10.21±1.33	0.95±0.02	3.01±0.04	81.65±22.0

Figure S5: Representative Nyquist plot for DOPC lipid membrane, PBS buffer, pH 7.05 on gold microcavity without PP50 for 5 hours.