Surpporting information

Raman spectroscopy for detecting supported planar lipid bilayers composed of ganglioside-GM1/sphingomyelin/cholesterol in the presence of amyloid-β

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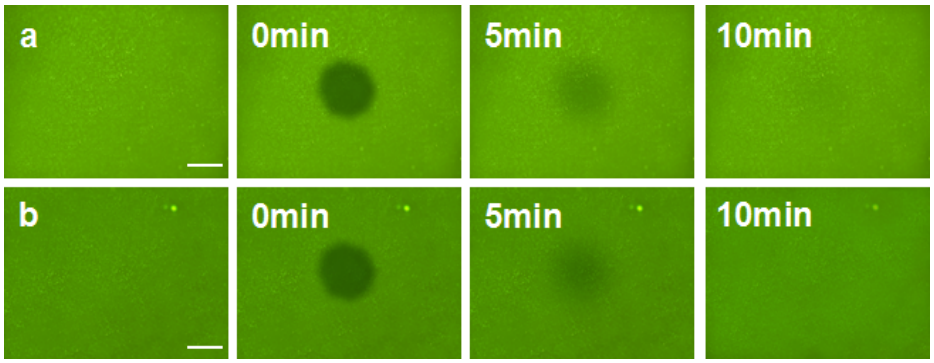

Figure S1. Sequential fluorescence images after photobleaching 20GM1/40SM/40Chol SPBs formed on mica surface at RT(a) and 37 °C(b) for 24 h.The observed times are before and after photobleaching 0, 5 and 10 min from left to right. The scale bar is 20 μm.

To confirm the stability of the SPBs, we incubate the formed SPBs (20GM1/40SM/40Chol) in water at RT and 37 °C for 24 h. A FRAP series of SPBs after 24 h incubation are shown in Fig. S1. The observed recovery time is 10 min, which is the same with that of the initial SPBs. The results suggest that the SPBs both are stable in water at RT or 37 °C.

Figure S2. Raman spectroscopy of substrate mica.

As shown in Raman spectra of mica in Fig.S2, the mica substrate has abundant and strong peaks in the region 500-1110 cm^{-1}, which could swamp the signal of SPBs. Therefore, we had difficulty analyzing the conformation of the SPBs in this region.

Figure S3. CV curves of SPBs composed of 20GM1/40SM/40Chol in the presence of Aβ(1-40) for different incubation time at 37 °C. (a) 0 h, (b) 12 h, (c) 24 h, (d) 36 h and (d) 48 h incubation at 37 °C, respectively.

Cyclic Voltammetry (CV) measurements were performed using an electrochemical workstation CHI660A (Chen hua Instrument company, Shanghai). A three-electrode electrochemical system was used for the CV experiments. A gold (Au) electrode, a Pt plate and a saturated Ag/AgCl (KCl-saturated) electrode are the working, counter and reference electrodes, respectively. CV was conducted in the potential range from −0.1 V to 0.6 V with a scan rate of 100 mVs^{-1}. The electrolytes are 0.05 M $K_3Fe(CN)_6$/0.05 M $K_4Fe(CN)_6$ in 0.5 M KCl.

The SPBs were prepared on Au by vesicle fusion. Then, the Aβ(1-40) solution was added on the SPBs. The final concentration of Aβ(1-40) is 1μM, and the samples are incubated at 37 °C. The CV

curves are shown in Fig. S3, and the incubation times are 0 h (a), 12 h (b), 24 h (c), 36 h (d) and 48 h(e). There are no peaks for the probe molecules in curves a and b, which suggests that the SPBs are compact and insulating on the Au surface. After a 24 h incubation, a pair of well-defined reversible waves occurs in curves c, d and e. It is clear that the probe molecules reach the Au surface due to the disruption of the SPBs by Aβ(1-40).

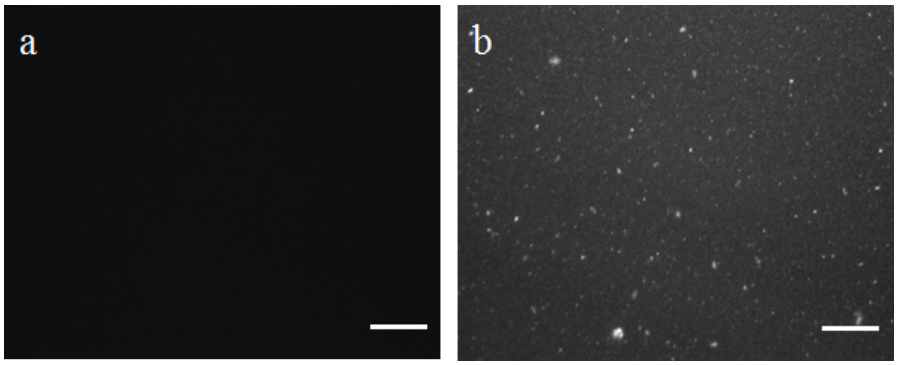

Figure S4. FM images of the SPBs composed of 20GM1/40SM/40Chol in the presence of Aβ(1-40) for 0 h (a); 24 h incubation at 37 °C (b). The scale bar is 20μm. The concertration of thioflavin T are 5μM.

When Aβ(1-40) was initially added (0 h, Fig.S4a), fluorescence signals were not observed in the GM1/SM/Chol (20:40:40) SPBs. After the Aβ(1-40) solution was added to GM1/SM/Chol (20:40:40) SPBs on the mica surface and the sample was incubated at 37°C for 24 h (Fig.S4b), the brighter particles indicated amyloid aggregation was observed.

Figure S5. Raman spectra (1000-1800 cm^{-1}) of SPBs composed of 5GM1/55SM/40Chol in the presence of Aβ(1-40) for different incubation time. (a) 0 h, (b) 6 h, (c) 12 h and (d) 24 h incubation at 37 °C, respectively.

Fig. S5 shows the interaction between 5GM1/55SM/40Chol SPBs and the Aβ(1-40) peptides, and most of the features of these Raman spectra are similar to the 20% GM1 containing sample. The distinctions are the absence of the 1260 (amide III α-helix) and 1410 (Tyr) cm^{-1} peaks in the 12 h spectra (spectrum c). The degrees of conformational change and Aβ(1-40) aggregation are weaker for the 5% GM1 containing sample, suggesting that the amount of GM1 plays an important role in the interaction between the GM1/SM/Chol SPBs and Aβ.

Figure S6. Raman spectra (2800-3000 cm^{-1}) of SPBs composed of 5GM1/55SM/40Chol in the presence of Aβ(1-40) for different incubation time. (a) 0 h, (b) 6 h, (c) 12 h and (d) 24 h incubation at 37 °C, respectively.

The ν(C–H) region of the Raman spectra for 5GM1/55SM/40Chol SPBs with Aβ(1-40) (Fig. S6) displays similar information to the 20GM1/40SM/40Chol SPBs.