# Small-Angle X-ray Scattering Studies of the Interaction of Amyloid Peptide Monomers with DPPC Oligo-Lamellar Vesicles

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The β-amyloid peptide ($A_\beta$) is a 39-43 amino acid peptide that is a fragment derived from proteolytic cleavage of the large amyloid precursor protein (APP). The monomer of $A_\beta$ is soluble, but at higher concentration Aβ will self-assemble into fibril. The fibril aggregates of $A_\beta$ are associated to Alzheimer's disease. The interaction between Aβ and membrane is the key factor to the Alzheimer's disease. When Aβ transforms into to β-sheet structure, $A_\beta$ will aggregate to form fibrils and deposit on membrane. We have shown previously that both the Aβ monomer and fibrils can interact with the multilamellar DPPC liposomes. In the current study, the interaction between the Aβ monomer and the DPPC oligo-lamellar vesicles was investigated by SAXS.

Figure 1 shown the SAXS profiles of pure DPPC vesicles at different temperatures. The correlation peaks at 0.1 $Å^{-1}$ became a broad peak as the temperature was increased to 43 °C. At 43 °C, the hydrocarbon tails were in liquid crystalline state (melted) and the correlation between the membranes within the multilamellar vesicles were destroyed. Only the form factor of the bilayer was observed at 43 °C.

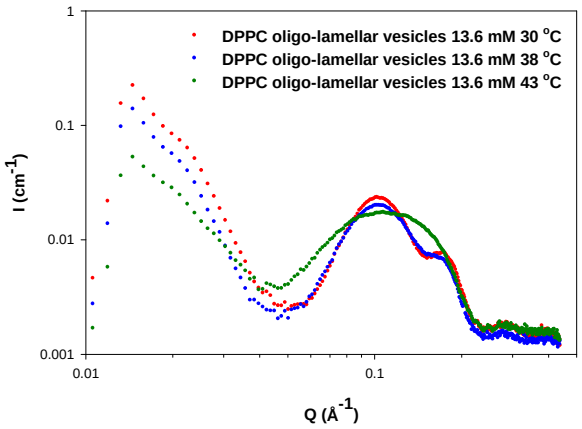


**Figure 1.** The SAXS profiles of DPPC oligo-lamellar vesicles at 30 °C, 38 °C and 43 °C.

Figure 2 shows the effect of adding Aβ monomers at 30 °C. The scattering profiles are similar but the scattering intensity is higher when more Aβ monomers are added. It is evident that Aβ monomers are indeed inserted into the DPPC bilayers.

The scattering profiles of DPPC oligo-lamellar vesicles inserted with Aβ monomers at 43 °C are shown in Figures 3. Similar to the pure DPPC case, at 43 °C only the form factor of the bilayer can be observed. With the insertion of Aβ, the scattering intensity is higher due to the incorporation of the Aβ in the DPPC bilayer. Detail analyses will be carried out to reveal the detail structure of the DPPC bilayers inserted with Aβ.

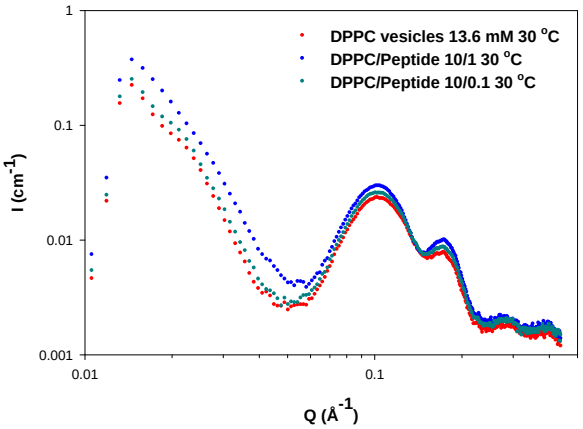


**Figure 2.** DPPC oligo-lamellar vesicles with Aβ monomers at 30 °C. The lipid to peptide ratios were equal to 10/1 and 10/0.1 respectively.

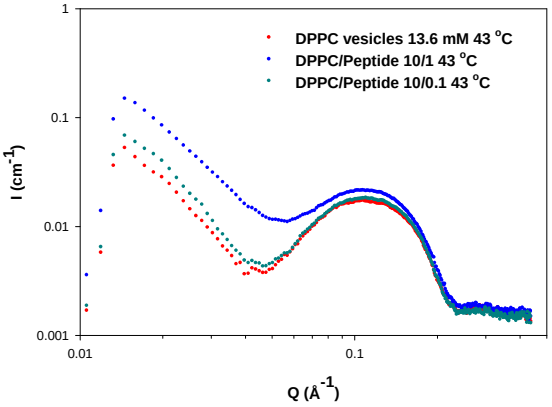


**Figure 3.** DPPC oligo-lamellar vesicles with Aβ monomers at 43 °C. The lipid to peptide ratios were equal to 10/1 and 10/0.1 respectively.