Characterization of Amyloid β aggregation via Supercritical Angle Fluorescence and Raman microscopy and spectroscopy

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The two main forms of the Amyloid β (Aβ) peptide, Aβ1-40 and Aβ1-42 play an important role in Alzheimer's disease (AD), one of the main neurodegenerative diseases related to aging. The most important consequence of AD is the degradation of neural cells due to the aggregation of Aβ into oligomers and fibrils with a subsequent accumulation outside the neurons [1]. Both Aβ peptides play a different role in the AD process and in neurotoxicity. Therefore, a comparison of the aggregation of both peptides is crucial.

In this work, we studied the aggregation of Aβ *in vitro*, directly on the lipid bilayer and compare the surface with the bulk solution, using Supercritical Angle Fluorescence (SAF) [2] and Raman (SAR) [3] microscopy and spectroscopy. The advantage of Raman over fluorescence is the label-free method with the resolution of the peptide's secondary structure. The experiments clearly show Aβ1-42 aggregates stronger at the surface where more α-helices are present, whereas Aβ1-40 forms mostly β-sheets. In addition, we studied the effect of calcium ions and confirmed a structural change of the peptides.

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