Biomimetic Surfaces for the Detection of Β-Amyloid

Research indicates a strong dependence between β-amyloid toxicity and ganglioside concentration within neuronal cell membranes. Based on the structure of gangliosides, we hypothesize that this dependence is direct result of the sialic acid content of the gangliosides within the cell membrane (as has been supported by other researchers). We propose that by taking advantage of this relationship, it is possible to develop a biomimetic surface to be used in sensing techniques that can bind β-amyloid selectively. Furthermore, by properly developing the substrate on which the biomimetic surface is constructed, it is possible to not only detect β-amyloid, but to also determine its structure (amyloid vs. random coil). Structural determinations can be performed via surface-enhanced Raman spectroscopy (SERS). Our initial work has shown that both goals are reasonable. Investigations indicate that SERS will work as a sensing system for the detection of β-amyloid. SERS shows both high sensitivity and structural analysis allowing for the determination of the structure of the bound protein. However, the system is going to be dependant upon the size, selectivity, and binding capacity of the recognition molecule being used. Taking these factors into account, we have developed numerous recognition platforms that show considerable selectivity ($K_{A\beta} > 1 \times 10^7\ M^{-1}$) and sensitivity for β-amyloid.