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Development of an ultra-sensitive assay for early diagnosis of Alzheimer's disease

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Alzheimer's disease (AD) is a chronic neurodegenerative disorder and the most common course of dementia, affecting more than 20 million people worldwide. Today, AD can be diagnosed only post mortem, detecting insoluble beta-amyloid peptide (Abeta) aggregates and neurofibrillary tangles in the patient's brain tissue.

The development of a therapeutic approach or a potential prevention strategy to AD is still severely hampered by the lack of a reliable method to diagnose AD at stages as early as possible. The method of choice would be able to correlate the result with the stage of the disease progression. Further, it needs to be non-invasive and repeatedly applicable to living patients.

In our group we will develop an ultra-sensitive assay for early and non-invasive diagnosis of AD. This highly specific and sensitive assay uses fluorescence correlation spectroscopy (FCS) and is sensitive enough to detect even single aggregates. The principle of the assay has already been shown to be successful to detect prion-protein aggregates in brain homogenate (1). Prion-protein aggregates are the characteristic feature of prion diseases like bovine spongiform encephalopathy (BSE).

Based on the experiences from the prion-protein aggregate assay, a procedure will be developed to obtain preparations from tissues and bodily fluids (e.g. blood and liquor) that contain Abeta aggregates (e.g. fibrils), which will be captured on a surface and subsequently be tagged with fluorescent-labelled specific antibodies or other probes. Thereby, even single aggregates will be detected by scanning the surface with an FCS-based method.

Further, the correlation of Abeta concentrations (aggregated) in tissues and bodily fluids with clinical symptoms of AD will be investigated.