Improved sensitivity in miniaturized immunoassay using Tyramid Signal Amplification

Introduction

Neurodegenerative disorders attract significant attention in the medical and scientific communities. Besides the need for improved understanding the molecular mechanisms contributing to disease progression there is a great need for improved tools for diagnosis, prognosis and prediction of outcome from available therapies.

During the last several decades Amyloid β (Aβ) has attracted a lot of interest as a biomarker of Alzheimer's disease (AD). Aβ is the main constituent of amyloid plaques found in all AD brains. The exact molecular mechanisms behind the formation of plaques is still not entirely clear but it seems that several intermediate states between monomer forms of Amyloid β ($A\beta_{1-40}$ and $A\beta_{1-42}$, respectively) are involved in disease progression. Access to sensitive and specific assays for the relevant molecular species of Aβ is likely to be useful when evaluating pre-clinical and clinical disease models.

Background

Gyrolab is an automated system for miniaturized immunoassay in a flow-through format. Assays are performed in a Compact Disc (CD) in which parallel microstructures have been incorporated to allow the full sequence of operations needed to generate quantitative analytical information. The system operates in the nanoliter domain of sample volumes and is particularly suitable for analysis where sample availability is limited.

Reducing sample volume implicitly means that the number of analyte molecules present in the sample is reduced. Still, the design of the assay procedures in Gyrolab may generate assay sensitivities comparable or better than conventional systems. The inherent affinity properties of reagents used in the immunoassay is most important for assay performance. We now would like to investigate the possibilities to improve assay sensitivity by incorporating established signal amplification procedures into the Gyrolab process.

Project proposal

The project is aimed at evaluating Tyramid Signal Amplification (TSA) in immunoassays run on Gyrolab with a goal to improve assay sensitivity by a factor of 2-10. Optimization of assay conditions will be done on well-known and high performing immunoassays with the focus of increasing signal to background ratio in a useful manner for improving assay sensitivity. Subsequently, successful procedures will be adapted to different assays for Aβ to verify the utility of signal amplification procedures.

Time

The project is planned to be started during January 2012.

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