

# Cyanines for Detection, Diagnostics and Therapeutics of Alzheimer's Disease

Prof. Ricky M. S. Wong



Department of Chemistry, Hong Kong Baptist University, Hong Kong, China

## Abstract

Alzheimer's disease (AD) is the most common but still incurable neurodegenerative dementia found in the elderly, which leads to an impairment of many cognitive functions and memory loss. It has become a severe social and economic burden to the society due to the increasing ageing population worldwide. Since the underlying causes is still not well understood yet, it does pose a grand challenge to the scientific community for the development of effective detection methods, diagnostic tools as well as treatment approaches for this devastating disease. It is believed that the pathogenesis and disease progression are closely associated with the formation and accumulation of neurotoxic forms of amyloid- $\beta$  ( $A\beta$ ) oligomers and aggregates due to the inefficient clearances. As the deposition of the  $A\beta$  aggregates is the crucial event in the pathogenesis and occurs much earlier than other clinical symptoms,  $A\beta$  species represents a promising predictive biomarker for AD diagnosis. In addition, the development of effective inhibitors that can prevent neurotoxic oligomeric  $A\beta$  formation has been considered as one of therapeutic approaches for AD treatment.

Recently, we have discovered proprietary  $A\beta$  responsive lead cyanine fluorophores which show strong fluorescence enhancement upon binding with amyloid- $\beta$  species and effective  $A\beta$  peptide aggregation inhibition with which their applications on detection, diagnostics and therapeutics have been explored. Some of these newly developed  $A\beta$  oligomerization/ aggregation cyanine inhibitors showed desirable functional and biological properties including strong binding toward  $A\beta$  species, fluorescence enhancement upon binding with  $A\beta$  species, blood-brain barrier permeability, low toxicity, and neuroprotection against  $A\beta$ -induced toxicities. Its application on imaging of  $A\beta$  species *in vivo* has been successfully demonstrated. In addition, triple transgenic mice intraperitoneally treated with the developed cyanines showed significant cognitive improvement, as assessed by Morris water maze test. In this presentation, a comprehensive overview of our recent progress on the exploration of effective detection methods, diagnostic tools as well as intervention approaches for AD will be presented.