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Theranostic NIR Probe for Amyloid-Imaging In Vivo and Attenuation of Amyloid - Induced Toxicity

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Abstract

Statement of the Problem: Alzheimer's disease (AD) is incurable and presently 47 million of people worldwide suffer from it. Early intervention, particularly prior to the onset of any disease symptoms, may offer an opportunity to stop or delay the disease progression. Amyloid-β (Aβ) peptides/species are one of the highly important biomarkers and drug target for AD. Thus, development of sensitive probes to detect the presence and monitor the progression of these Aβ deposits is of paramount importance for early diagnosis from which early intervention and delaying measures can be performed. Practice: we have designed, synthesized and spectroscopically characterized a novel series of donor-acceptor type cyanine fluorophores for its potential as a NIR fluorescence probe for in vivo imaging of Aβ in AD mouse model. Among them, DBAN was found to exhibit excellent functional properties for Aβ imaging including strong NIR fluorescence enhancement upon binding with Aβ species, high selectivity toward Aβ species, good biocompatibility and stability, and excellent blood-brain barrier (BBB) permeability. Importantly, DBAN was successfully applied for in vivo and ex vivo imaging of Aβ in AD mouse model. In addition, DBAN showed effective inhibitory effect on Aβ aggregation, significant neuroprotection effect against the Aβ-induced toxicities, and suppression on Aβ-induced ROS generation signifying its great promise as a theranostic agent for the early diagnosis and therapy of AD.

Conclusion & Significance: A novel NIR fluorescence turn-on probe for real-time imaging of Aβ in AD mouse model and simultaneously, protecting against the Aβ-induced toxicity was designed, developed and experimentally demonstrated. Our design strategy provides insights into the design and development of an effective theranostic NIR imaging probe to target Aβ species for the early diagnose and treatment of AD.

Biography:

M. S. Wong is a Professor of the Chemistry Department at the Hong Kong Baptist University. He received his PhD degree from The University of Texas, Austin USA in 1992. He was a Marion-Merrell-Dow/Université Louis Pasteur Postdoctoral Research Fellow at Université Louis Pasteur, France. After postdoctoral research at Institute of Quantum Electronics, ETH-Zürich, Switzerland, he joined the Research School of Physical Sciences & Engineering, Australian National University as a research fellow and then moved to Hong Kong Baptist University in 1998 as an assistant professor. He was the Head of the Chemistry Department from 2011 to 2014.

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