Alzheimer’s disease (AD) is an incurable neurodegenerative disease, leading to cognitive impairment and progressive synaptic damage accompanied by neuronal loss. Misfolding of Aβ and tau proteins and their aggregation and accumulation are the main hallmark of AD. Recent clinical studies collectively suggest the necessity of diagnosing AD at an early stage for effective therapy. However, in spite of significant progress in imaging technologies, early diagnosis of AD remains a major challenge, which impedes successful treatment. We have previously reported on self-assembled cyclic D,L-α-peptides that can cross-interact with different amyloidogenic proteins and modulate their aggregation and toxicity by interacting with their early oligomers, most probably due to their structural and functional similarities to those of amyloidogenic proteins. For example, the cyclic D,L-α-peptide CP-2 recognized by the conformational antibody A11 (that binds toxic conformation of different amyloidogenic proteins), cross-reacts with Aβ, α-synuclein and tau-derived peptide and modulates their aggregation and toxicity through an “off-pathway” mechanism.

In this study, I will present a novel diagnostic strategy for molecular computed tomography (CT) imaging of Aβ aggregates at an early stage of AD. This strategy is based on the development of blood brain barrier (BBB)-permeable gold nanoparticles (GNPs) and a novel self-assembled cyclic D,L-α-peptide that selectively targets early Aβ oligomers, and modulates their aggregation and toxicity. Using this technology, AD was diagnosed in symptom-free transgenic AD mice as early as 2 months.