Perspectives of nanoneurotechnology for diagnosis and treatment of Alzheimer’s disease

Background: Nanoneurotechnology, an emerging technology of manipulating atoms and molecules at nano-scale to be able to have special and enhanced properties in terms of physical and chemical behaviors, has been demonstrating the great capabilities of developing drug carrier for overcoming blood brain barrier. Dementia of Alzheimer's type (AD) affects memory, thinking and behavior. Scientists believe that changes in the brain may begin 10-20 years before symptoms appear and AD is diagnosed. The need to diagnose and treat the devastating disease at an early stage is critical to manage and treat AD. Unfortunately, the lack of valid biomarkers limits the possibility of the earlier stages of Alzheimer’s disease. The advance of nanotechnology could offer huge opportunities in early-stage diagnosis and well-treatment of AD.

Methods: This presentation discusses the challenges of current treatment, diagnosis of AD and development on biocompatible nanoparticles and provides the rational and potential of using nanoparticles for both drug carrier and imaging contrast agent for diagnosis and treatment of AD.

Results: Biocompatible nanoparticles with diameter in the range of 1-100 nm could be used as target delivery system for drugs e.g., rivastigmine to overcome Blood Brain Barrier (BBB) and to minimize the side effects caused by over-dosage. In addition, biocompatible nanomaterials with enhanced optical and magnetic properties may allow them being excellent alternative contrast agents for early-stage diagnosis.

Limitations: The limit knowledge of biocompatibility of nanomaterials may inhibit the development of nanotechnology for diagnosis and treatment for AD.

Conclusion: With more studies on using nanomaterials and nanotechnology in complex biochemical environment of the central nervous system, it is most likely that nanomaterials and nanoneurotechnology can give significant impact on the early-stage diagnosis and treatment of AD. According to personal experiences, the author of this presentation discusses the application of new class of nanoparticles like dendrimers to the treatment and early diagnosis of Alzheimer’s disease.

Biography
Jerzy Leszek is full professor of psychiatry at the Medical University in Wroclaw, Poland, vice-director of the Psychiatry Department and head of Alzheimer’s Disease Laboratory. He is author and co-author more than 210 papers (especially from old age psychiatry), a lot of chapters to the books published in reputed Polish and international journals and serving as an editorial board member of several journals. He is Scientific Editor and co-author of first Polish academic handbook on Alzheimer’s disease and twenty another academic books from psychogeriatry published in Poland, European countries and in USA. He is member a lot of scientific associations eg. funder and president of Lower Silesian Association of Alzheimer’s Families, first of its kind in Poland and Former Member of Board of Directions of International Psychogeriatric Association(IPA). His Research area includes nanomaterial’s and nanotechnology in complex biochemical environment of the central nervous system.

jerzy.leszek@umed.wroc.pl