Guest Seminar

Alzheimer’s Disease: A Nanotoxicology’s Perspective

by

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Date    : 9 Aug 2019 (Friday)
Time   : 3:00pm
Venue : Room 6602 (Lifts 31-32)

Abstract

Alzheimer’s Disease (AD) is the most common cause of dementia. It is a chronic neurodegenerative disease. In our ageing society, the cost of caring for dementia is fast becoming an urgent issue, both economically and politically. Thus, devising effective treatments for AD is one of the key challenges in medical research. Central to AD is the Amyloid plaque. Its origin is still poorly understood. There are currently two main competing hypotheses regarding the mechanisms of AD. The Amyloid Cascade Hypothesis and the Vascular Hypothesis. Our research has shown that the Amyloid plaques are in fact fibrotic lesions, resulting from the over deposition of Amyloid-aβ scaffold materials, specific to the cerebrovascular capillaries. Since fibrosis is the result of chronic injury and repair, this interpretation has helped in re-aligning the sequences of events leading first to the plaque formation and then neuron apoptosis from over-producing amyloid oligomers. Thus, AD can be reinterpreted as a chronic cerebrovascular disease with neurodegenerative consequences.

The cerebrovascular microbleeds are the early events leading to AD. Hypoxia, related to ageing, is one of the primal cause of microbleeds. Other risk factors - hypo/hypertension, diabetes type II, atherosclerosis and systemic inflammation - also contribute to its formation via the deposition of microparticles in the brain. These nanoparticles are the products of local inflammation from the affected organs, released into the blood to spread inflammation further. If the repair to haemorrhagic injury is successful then inflammation resolves and a ‘stable’ plaque is produced with no neurodegeneration. If too much inflammation induced-proteolysis activities occur and degrade the fibres then the plaque become ‘unstable’ and prone to rupture. Thus, this continuing injury/repair process drives the activated neurons and astrocytes to over-produce amyloid, which eventually leads to their apoptosis.

Biography:

Prof. Lang Tran is Director of Quantitative Toxicology at the Institute of Occupational Medicine (IOM) and an Honorary Professor at Heriot Watt University. With over 16 years experience in the fields of toxicology and ecotoxicology, he has contributed over 50 peer reviews. A researcher at the forefront of particle toxicology, he has been heavily involved in the evolution of nanoparticle toxicology as a research field. He currently leads EU FP7 project MARINA (Managing Risks of Nanoparticles), which looks to develop specific reference methods for all the main steps in managing the potential risk of engineered nanomaterials. Dr. Tran also led EU FP7 project ENPRA and EU FP6 project PARTICLE_RISK, both of which investigated the toxicological properties of nanoparticles. He is a founding member of SnIRC, the Safety of Nanomaterials Interdisciplinary Research Centre. Dr Tran has also been involved in the writing of several major Government reviews of nanotechnology, including reports from DEFRA and HSE. He is involved in collaborative work into nanotoxicology QSAR Modelling with the JRC, and with NIOSH on Nanotechnology Risk Assessment, and was co-author of the HARN and CELL PEN reports, examining risks of high aspect nanomaterials (HARN), and penetration & translocation of NPs through cells within the body (CELL PEN).

All are welcome!