PsychoAAD-2013

OMICS Group Conferences
Accelerating Scientific Discovery

International Conference on
Psychology, Autism and Alzheimer's Disease

September 30 - October 1, 2013 San Antonio, Texas, USA

SPION-enhanced MR imaging for monitoring Alzheimer's plaque formation and microglial activation in APP/PS-1 transgenic mouse brain

Laurel O. Sillerud
University of New Mexico, USA

Abstract

We report MRI studies in APP/PS1 transgenic mice, which demonstrate the ability of our novel anti-amyloid precursor protein (APP) conjugated superparamagnetic iron oxide nanoparticles (SPIONs) to penetrate the blood-brain barrier to act as a contrast agent for plaque imaging. The conspicuity of the plaques increased from 5.1 ± 0.5 to 8.3 ± 0.2 when the plaque contrast to noise ratio was compared in control AD mice with SPION-treated AD mice. The number of MRI-detected plaques increased from 347 ± 45 in the control AD mice, to 668 ± 86 with SPION treatment. AD is associated with a microglia-dependent neuro inflammation regulated by the pro-inflammatory transcription factor NF-κB. We therefore treated APP/PS1 mice for one year with a low dose (100 ppm) of either of two trans-stilbene NF-κB inhibitors, resveratrol, or its synthetic analog, LD55. Both trans-stilbenes lowered Aβ plaque density in the cortex, caudoputamen and hippocampus by 70-100%. Optical measurements confirmed that resveratrol reduced average Aβ plaque density by 2.3 ± 0.4-fold. *Ex vivo* measurements of microglial activation by Iba-1 immunofluorescence showed that resveratrol also reduced average microglial activation by 4.2-fold. The same concentration of our novel trans-stilbene, LD55, produced a significantly larger ($p<0.01$) reduction in Aβ plaque density than resveratrol (3.1 ± 0.5-fold) as well as a 3.5-fold lowering of microglial activation. We conclude that SPION-enhanced MRI can be usefully applied to studies of AD in Tg mice and that both resveratrol and LD55 are efficient at reducing Aβ plaque burden and concomitantly reducing neuro inflammation in AD.

Biography

Laurel O. Sillerud completed his Ph.D. at the University of Minnesota, performed postdoctoral research at Yale University, directed the Biomedical NMR Facility at Los Alamos National Laboratory, and currently is a Research Professor at the University of New Mexico, where he also directs the MRI Core at the UNM Brain Center. He was elected as a fellow of the AAAS in 2013.

laurel@proton.health.unm.edu