



Ca²⁺ oscillations in astrocytes during the development of Alzheimer's disease: Impacts on the fMRI-BOLD signal

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Abstract: The mechanisms underlying the dysregulations in the local control of blood flow during the early-stages of the Alzheimer disease remain elusive. In this study, we combined multi-photon laser scanning microscopy, functional MRI and an APP transgenic mouse model to study the effect of amyloid- β deposition on vasomotions in the brain. First, we verified that the level of excitability of the astrocytic networks in acute hippocampus slices are up-regulated by the presence of amyloid- β peptides. Second, using a biophysical model for the astrocytic Ca²⁺ signaling, we demonstrated that these peptides causes both an increase in the passive Ca²⁺ influx and a significant reduction in the sensitivity of G protein-coupled receptors. Finally, a global drop-off in the spectral content of the ongoing fluctuations of the blood oxygen level-dependent (BOLD) signal was observed in transgenic APP mice, which was theoretically associated with an increase of vasoactive release from highly active astrocytes. We concluded that, Ca²⁺ activity in astrocytes seems to be compromised in the presence of the senile plaques and brings about regional variations in the brain vasomotion levels.

Biography: In 1988, I obtained a BS in Physics at the University of Havana. Selected as "Junior Associate" of the International Centre for Theoretical Physics, Trieste (Italy) from 1995 - 1998, where I completed the required credits for a master degree in biophysics. In 1999, I received a Doctorate in Physics from the University of Havana also completing part of my PhD thesis at the Pitie-Salpetriere Hospital in Paris. My first postdoc term was in the RIKEN Brain Science Institute (Japan) on the development of mathematical methods to study deep brain sources from MEG single trials. My second postdoc term was in Tohoku University (Japan) on the physiological foundations of fMRI and NIRs data. In 2004, I was appointed as an associate professor at Tohoku University and have been leading the Neuronal Mass Dynamic's group and a chronic facility for rodents since 2006.

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