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Redearch interests and Areas of Expertise

Our group is working on the neuron cytoskeleton, Alzheimer disease and axonal regeneration. In the last years we have mainly focused our work on Alzheimer disease. This disease is characterized by the presence, in the brain of the patients, of two aberrant structures: senile plaques (composed by beta amyloid peptide) and neurofibrillary tangles (which main component is tau protein). A possible link between beta amyloid aggregates and the aggregation of tau protein is the activation of the protein kinase GSK3. Thus, we have isolated a transgenic mouse overexpressing that kinase in mouse brain. The transgenic mice show memory impairment. It could be due to the observed degeneration of their dentate gyrus. Additionally, there is a lack of neurogenesis in the subgranular zone of the dentate gyrus. On the other hand, the presence of phosphorylated tau could facilitate neurodegeneration, as determined by the analysis of other transgenic mice overexpressing GSK3 and tau protein.
Our current working hypothesis is that in Alzheimer disease patients an effect similar to that described in the transgenic GSK3 mouse model could take place and that it may explain the loss of memory found at the earlier stages of the disease.
In addition, we are studying now and for the future the basis for spreading of tau pathology during the progression of the disease.
More recently, we have initiated the study of the possible influence of specific microRNAs on tauopathies.

Education: 1967 Master Chemistry. Universidad Complutense. Madrid; 1971 Ph. D. Biochemistry. Universidad Complutense. Madrid.

Employment: 1967-68 Fellow in Instituto de Estudios Nucleares, Junta de Energía Nuclear, Madrid;1968-71 Fellow in Instituto G. Marañón (CSIC), Madrid; 1972-75 Post Doctoral Fellow in Laboratory of Molecular Biology, NIH, Bethesda, MD; 1975-76 Staff Member in Instituto de Biología del Desarrollo (CSIC), Madrid; 1976-02 Head of Microtubule Laboratory in Centro de Biología Molecular "Severo Ochoa" (CSIC), Univ. Autónoma, Madrid; 1984 Head of Research line "Differentiation and morphogenesis", Centro de Biología Molecular Severo Ochoa; 1987 Professor, Centro de Biología Molecular "Severo Ochoa"; 1986-88 Director of Centro de Biología Molecular "Severo Ochoa"; 1988-91 President of the Evaluation Committee for Biochemistry and Molecular Biology, Spain; 1990-91 Member Scientific Commission (CSIC) and Scientific Coordinator for biology and Biomedicine; 1991-94 Coordinator of the Area for Biochemistry and Molecular Biology of the Spanish Agency for Scientific Evaluation; From 2000 to 2004, President of the Spanish Society of Molecular Biology and Biochemistry; From 2002 to 2004, Director of Centro de Biología Molecular "Severo Ochoa"; Since 2011, Director of CIBERNED.

Academies: Academia Europaea; Spanish Royal Academy of Sciences, seat number 46.

Societies: EMBO; Society for Neuroscience, USA; American Society for Cell Biology; European Neural Network; Alzheimer's Association; Spanish Societies for Cell Biology,

Biochemistry (President 2000-2004) and Microbiology; President of Spanish Committee of the International Union of Biology. Sciences (until 1991); European Neural Network**.**

Awards: Real Academia Española de Ciencias Exactas, Físicas y Naturales, 1996; Medal from the University of Helsinki, 1997; Carmen and Severo Ochoa Foundation, 1998; Prize from Foundation Pfizer, 2001 and 2002; Prize from Foundation Lilly in Biomedical Research, 2002; National Prize "Santiago Ramón y Cajal", 2004.

Mentorship: JA has supervised 23 students and Doctoral Thesis and also supervised more that 20 Post-Doctoral training.

5 most relevant publications

1. **Avila J**, Diaz-Nido J (2004) Tangling with hypothermia. Nat Med 10: 460-461
2. **Avila J** (2010) Alzheimer disease: Caspases first. Nat Rev Neurol 6: 587-588
3. Tortosa, E., Galjart, N., **Avila, J.** & Sayas, C. L. (2013) MAP1B regulates microtubule dynamics by sequestering EB1/3 in the cytosol of developing neuronal cells, EMBO J. 32, 1293-306
4. Llorens-Martin M, Fuster-Matanzo A, Teixeira C, Jurado-Arjona J, Ulloa F, DeFelipe J, Rabano A, Hernandez F, Soriano E, **Avila J** (2013) GSK-3β overexpression causes reversible alterations on postsynaptic densities and dendritic morphology of hippocampal granule neurons in vivo Mol Psychiatry, 18: 451-60
5. Fernandez-Nogales, M., Cabrera, J. R., Santos-Galindo, M., Hoozemans, J. J., Ferrer, I., Rozemuller, A. J., Hernandez, F., **Avila, J.** & Lucas, J. J. (2014) Huntington's disease is a four-repeat tauopathy with tau nuclear rods, Nat Med. 8, 881-85

Publications and Citations: JA has co-authored over 450 publications, several of which in Journals in the fields of Neuroscience and Cell biology. These Publications were cited over 16000 times (H index: 66).

Funding: Spanish Ministry of Economy and Competitive: SAF 2014-53040-P, "Tau toxicity in neurodegeneration"; SAF 2011-24841, "The role of GSK3 and tau protein in neurogenesis and neurodegeneration. The consequences for Alzheimer disease"; Autonomous Region of Madrid: S2010/BMD-2331, "Signalling networks and effector pathways in cellular and animal models for neurodegenerative diseases"; Institution of Health Carlos III: CIBERNED, "Alzheimer disease and other neurodegenerative diseases".