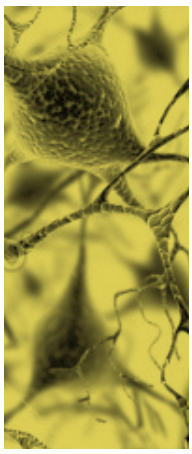
NANOSYN: Manipulation of synapses with nanotechnologies to study molecular mechanisms of neurodegeneration

Austria Canada Finland France Germany Italy Israel Luxemburg Poland Romania Spain

Project Description Brain function relies on regulated communication between neurons at contact points called synapses, where nerve terminals release chemical transmitters. Degeneration of nerve terminals is a hallmark of severe neurological human diseases. Our goal is to understand the mechanisms that maintain nerve terminals up-and-running and protects them from degeneration. Our study is focused on a mouse model with fragile nerve terminals that become degenerated at early adulthood. Those mice lack a protein (Cysteine String Protein-alpha) that probably is a chaperone that helps other synaptic proteins to be functionally active. Here, in cultured neurons, we will apply new technologies attempting to prevent or to recover nerve terminals from degeneration. NANOSYN will use nanotechnologies to engineer microcapsules loaded with fresh proteins to either substitute damaged proteins within the terminal or to invigorate protein repair. We will implement microscopes with laser illumination to open microcapsules and to achieve temporal and spatial control of protein release within neurons. We will visualize neuronal function with advanced microscopy approaches. In addition, NANOSYN will investigate the potential role of astrocytes in preventing neurodegeneration. We expect to open new possibilities to study and to interfere with molecular mechanisms of neurodegeneration in models of human diseases using nanoparticles-mediated protein delivery.



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