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Thesis title :

Dynamics of endocytosis in neuronal dendrites during synaptic plasticity

Keywords : Endocytosis, Fluorescence microscopy, Synaptic plasticity, Live cell imaging, Neuronal culture

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Abstract

Synapses, points of communication between neurons, are stable structures, but also have a high plasticity. Many forms of synaptic plasticity (long term potentiation or depression, LTD) involve the transport of receptors at synapses to or from intracellular organelles, the endosomes. On the other hand, in models of Alzheimer's disease, the activity of endocytosis and recycling is changed (accelerated endocytosis and larger endosomes) and this could significantly affect synaptic plasticity. Several studies have characterized the endocytic zones near excitatory synapses that may have a particular role in the internalization of synaptic receptors. We have developed methods to detect the formation of endocytic vesicles (Merrifield et al, 2005; Taylor et al, 2011; Shen et al. 2014) to follow the formation of recycling endosomes and their exocytosis (Jullié et al, 2014) by fluorescence imaging techniques on hippocampal neurons in culture.

The objective of this thesis is to observe the changes of endocytosis and recycling after protocols inducing LTD. We will compare neurons in the basal condition and during LTD, as well as during selective block of endocytosis at synapses and in models of Alzheimer's disease (overexpression of the truncated form of the amyloid precursor protein, APP by beta - secretase, neurons from mice transgenic APPswe, PSEN1dE9). In this project we will use extensively advanced techniques in live cell imaging and image analysis.

Qualification required

Good knowledge in neurobiology or in cell biology, with an interest for live cell fluorescence imaging. Ability to work in a team with a multidisciplinary environment.