Project for the PhD Course in Molecular Medicine (a.y. 2016/2017)
Neuroscience and Experimental Neurology
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Project Title: Functional and structural in vivo assessment of demyelination, remyelination, axonal loss

Aims of the project: to setup and validate in vivo biomarkers of nervous system involvement, with particular attention to optic nerve -ON- and spinal cord in neuroinflammatory and neurodegenerative diseases of the central nervous system. These are going to be provided by evoked potentials-Eps (motor– MEP, somatosensory-SEP, visual-VEPs, cognitive) to test (demyelination and conduction block/axonal loss in sensorimotor pathways), OCT (axonal loss in ON and optic tract), MRI (axonal loss, BBB disruption, demyelination). These techniques will be used both in human CNS diseases involvement and in animal models (mice EAE, other murine models). The quantification of axonal damage and demyelination will allow to measure, cross-sectionally and longitudinally, the extent and severity of damage occurring in the CNS and to assess the effect of drugs acting on inflammation, demyelination, neuroprotection, remyelination). Define neurophysiological parameters allowing to measure demyelination/axonal loss in EAE and other murine models of CNS involvement (rat, genetically manipulated mice). This will be achieved through correlation with techniques providing information about anatomical tissue damage.

Specific aims: to select and validate the ideal non-invasive procedures and models for monitoring neurodegenerative diseases, with focus on reproducibility and cross-sectional and longitudinal sensitivity of electrophysiological measures and OCT, and their correlation with structural abnormalities (MRI, histology).

Major Milestones: characterization of functional (EPs) and anatomical (OCT, MRI, histology) features of human and animal models of CNS involvement.

Key References: