

PROJECT 1 - linked to ACESM fellowship**DoS:** Letizia LeocaniTitle: Structural and functional translational methods for monitoring central nervous system involvement in demyelinating disordersCurriculum: Neuroscience and Experimental NeurologyLink to OSR/UniSR personal page: <http://www.hsr.it/ricerca/divisioni-centri-istituti-e-programmidiricerca/istitutodineurologiasperimentale-inspe/letizia-leocani/>**Project description** (Number of characters, including spaces: 2.000 - 3.000):

To develop and validate non-invasive structural and functional (electrophysiological) biomarkers of nervous system involvement, to be used for monitoring the natural history of demyelinating disorders with a translational approach. These are going to be provided by electroencephalographic techniques such as evoked potentials-EPs (motor, somatosensory, visual, cognitive) to test demyelination and neurodegeneration in sensorimotor pathways and associative areas, and by optical coherence tomography-OCT, allowing to measure retinal neuroaxonal involvement.

These techniques are suitable for non-invasive testing both in human and preclinical models of demyelinating diseases of the central nervous system. The quantification of neuro-axonal damage and demyelination allows to measure the extent and severity of nervous damage and to assess the effect of drugs acting on inflammation, demyelination, neuroprotection, remyelination). The main goal of the project is to define neurophysiological parameters allowing to measure the functional impact of demyelination/axonal loss in demyelinating diseases of the central nervous system in humans and in murine models. These measures will be correlated with structural information on anatomical tissue damage provided by non invasive neuroimaging techniques (OCT, MRI) and on histology where applicable.

Specific aims: to select and validate the ideal procedures for monitoring demyelinating diseases from the preclinical to the clinical setting, 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: translational approach for the characterization of functional (EPs) and anatomical (OCT, MRI, histology) features of demyelinating diseases of the central nervous system.

Skills to be acquired by the student: Perform independent literature search, study planning, recording, analysis and interpretation of visual, somatosensory, motor and/or cognitive evoked potentials in the clinical and/or preclinical setting in the context of demyelinating and neurodegenerative diseases. Interpret, the latter to be chosen according to the student's background and attitude. The student will be involved also in the diffusion of results, from publication to the presentation at scientific national and/or international meetings.

References (max. 3)

- Pisa M, Guerrieri S, Di Maggio G, Medaglini S, Moiola L, Martinelli V, Comi G, Leocani L. No evidence of disease activity is associated with reduced rate of axonal retinal atrophy in MS. *Neurology* 2017;89:2469-2475.
- Di Maggio G, Santangelo R, Guerrieri S, Bianco M, Ferrari L, Medaglini S, Rodegher M, Colombo B, Moiola L, Chieffo R, Del Carro U, Martinelli V, Comi G, Leocani L. Optical coherence tomography and visual evoked potentials: which is more sensitive in multiple sclerosis? *Mult Scler* 2014;20:1342-7.
- Leocani L, Rovaris M, Boneschi FM, Medaglini S, Rossi P, Martinelli V, Amadio S, Comi G. Multimodal evoked potentials to assess the evolution of multiple sclerosis: a longitudinal study. *J Neurol Neurosurg Psychiatry* 2006;77:1030-5.