**Description of the institute**

Department of Neurology, University Hospital Zürich, University of Zürich

The Department of Neurology deals with the diagnosis and treatment of diseases of the brain, spinal cord, nerves and muscles. Every year more than 6,500 patients with frequent or rare neurological diseases are treated in our clinic on an outpatient or inpatient basis. In addition, patients of other disciplines are co-supervised by our doctors as needed.

The section Neuroimmunology and MS Research (nims) at the Department of Neurology, University Hospital Zurich, is home to one of the largest MS clinics in Switzerland, as well as a number of research groups pursuing clinical, translational and fundamental research within the field of neuroimmunology and MS. We see patients not only from the canton of Zurich, but also offer expert opinions and special treatments for MS patients from all over Switzerland and abroad. The nims has yearly over 4000 outpatient and semi-stationary treatments and consultations.

Our team of specialist nursing staff, technicians, physicians and scientists (in total: 40 persons, clinicians: 9, researchers: 15 therefrom 5 PhD Students, 3 postdocs, 3 professors) has the goal to provide patients with the highest and internationally accepted standards. This includes nursing care and counseling in all aspects of MS, comprehensive diagnostics, as well as symptomatic and immunomodulating treatment. The medicinal possibilities of basic therapies range from substances such as interferon-beta, Glacial mercer acetate, teriflunomide and fingolimod to medicines such as natalizumab, alemtuzumab, ocrelizumab or other immunotherapeutic agents for patients with active MS or insufficient response to basic therapies. In addition, we intensively work on new treatment options in our clinical trial unit, among others, autologous hematopoietic stem cell transplantation (aHSCT).

The focus of our research is on the better understanding of the disease heterogeneity of MS by imaging methods (magnetic resonance tomography, MRI; optical coherence tomography, OCT) and biological markers and processes. In the laboratory, we are investigating disease mechanisms of MS with particular emphasis on cellular immunology and biochemistry.

Based on these new findings, we are driving forward the development of new MS treatments. New experimental trial designs to unmet medical needs in MS have been developed and partially tested in phase Ib/IIa studies. These experimental trials also offered unique opportunities to understand the mechanism of action of a new treatment and the underlying biology.

Main scientific contribution of the past years:

* Identification of novel target autoantigens and link between gut flora and MS: T cells react to a protein called GDP-L-fucose synthase. This enzyme is formed in human cells as well as in bacteria frequently found in the gastrointestinal flora of patients suffering from multiple sclerosis. (Planas et al., Science Translational Medicine, 2018)
* Functional characteristics of T- and B cells in MS: Certain B cells activate the specific T cells that cause inflammation in the brain and nerve cell lesions (Jelcic et al., CELL 2018)