

13/11/2015

New Research Group: Neuro-Immunity



The brain is one of the organs that generate most research, especially because there is still a lack of understanding of its operating mechanisms. Two examples are the cause and development of neurodegenerative diseases, widespread in Western countries, which cause a significant loss of quality of life for people who suffer them and their families. The Neuro-Immunity research group, belonging to the Institut de Neurociències, focuses its research on common immunological aspects of Parkinson's disease and gliomas.

The Neuro-Immunity group, newly created within the Institut de Neurociències (INc) at the UAB, studies neuroinflammation and neuroimmune responses to injury of the central nervous system, focusing primarily on the study of Parkinson's disease and gliomas.

Regarding Parkinson's disease, the aim is to understand immune interactions among dopaminergic neurons, which are the neurons that die in an accelerated and progressive way during the disease (and which use dopamine as primary neurotransmitter), and glial cells (which along with neurons form the nervous system) in experimental models of Parkinson's disease. Knowledge of these neuron-glia interfaces *in vivo* and *in vitro* will help to devise anti-inflammatory therapeutic strategies to prevent or at least slow Parkinsonian degeneration.

Gliomas, in turn, are abnormal masses of tissue due to an overgrowth of the cells that form it, and are found in the brain. The Neuro-Immunity group explores in depth the neuro-immune

microenvironments that exist in human glioma samples and reproduction of these parameters in experimental models in vivo and in vitro. It focuses especially on the function of immune cells such as microglia (cells forming the immune system of the nervous system), macrophages (cells involved in immune response) and lymphocytes (a variety of white blood cell), to achieve the elimination of tumour cells. The results from this project will suggest new strategies for immunotherapy.

Currently, the Neuro-Immunity group is led by Carlos Barcia, a Ramon y Cajal researcher, who lectures on the Master's Degree in Neuroscience and is a thesis supervisor on the PhD programme in Neuroscience. Elena Saavedra, George Paul Cribaro and Paola Casanova, PhD students, Laura Rodriguez, a master's student, and Rafaela Munoz, a Medicine undergraduate, are also part of the group.

Strategic Aims

The main objectives of the research group are as follows.

- 1) To understand the immune system and the neuro-inflammatory responses peculiar to the brain. At the laboratory, they take particular interest in studying the mechanisms driving glial cell activation and blood cell infiltration.
- 2) To suggest, based on basic research on neuro-immunity, specific targets as therapeutic options for degenerative diseases and other brain insults.
- 3) To disentangle the microstructural arrangement of immune-related cell-cell interactions within the brain, with special emphasis on microglial cells, and how these interactions are formed or altered in brain injury.
- 4) To block intercellular gliapses (glia-target interactions) with different anti-inflammatory strategies to allow the preservation of neurons in models of neurodegenerative diseases.
- 5) To interfere with intercellular contacts using neutralizing antibodies or similar strategies, to potentiate immune responses to eliminate particular cells, such as tumour cells.

Research dissemination

During his research, Carlos Barcia has used confocal microscopy to obtain images of responses of nervous system cells. These images have appeared on the covers of scientific journals because of their content and artistic value, and they have been the object of exhibitions: microscopic journeys, where science and art merge.

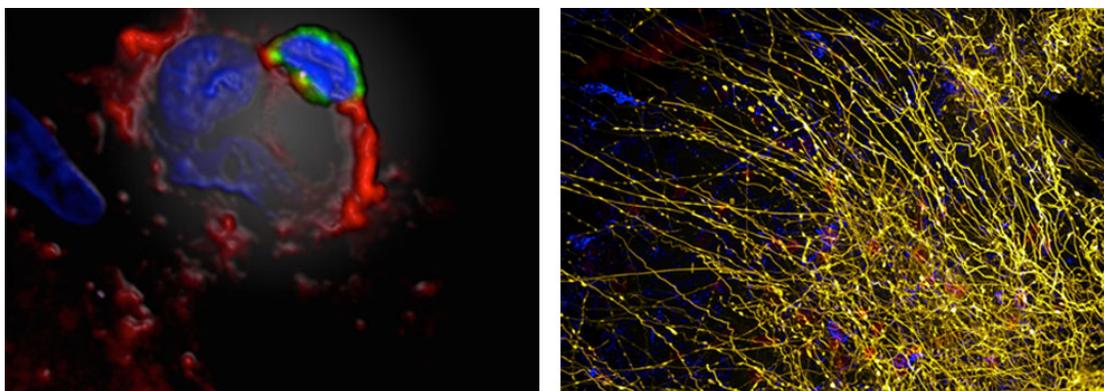


Image 1: On the left, human brain: immunological synapse of a T cell (green) over a tumour cell (red). On the right, human brain cortex: microglial cells (blue), astrocytes (yellow) and cell nuclei (red).

The Institut de Neurociències (INc)

In 2003 a group of molecular biologists, physiologists, neuropathologists, histologists, psychologists, psychobiologists and bioinformaticians working at the UAB created the INc with the main strategic goal of leaving traditional disciplines behind, and adopting a multidisciplinary and translational approach to key issues about the brain in the 21st century: neurodegeneration, neuroregeneration, and the underpinnings of the normal and disturbed mind.

They are interested in how the normal brain works, what happens when it is diseased, and how to cure it. They explore all levels of biological organization – from the interaction between single molecules to complex behaviours – using cell cultures, animal models and human patients. And their ultimate goal is to apply novel molecular, cellular, genetic and psychological therapies to brain pathology.

Selected publications of the group and its Principal Investigator

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