



RESEARCH TOPIC MEM7
Role of the immune system in neuronal functions
Curriculum MEM

Laboratory name

Laboratory of Pharmacology and Brain Pathology, IRCCS Humanitas Research Hospital, Rozzano, Milano, Italy

Pre-clinical Supervisor

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Abstract

The continuous crosstalk occurs between the nervous and the immune systems is particularly relevant during development and aging, where the starring actor is recognized as microglia, the main brain residential myeloid cells. Microglia contribute to physiological neurodevelopment, by regulating neurogenesis and neuronal survival, favoring synapse formation, and participating in synaptic pruning process. Thanks to the recent introduction of single-cell sequencing techniques, it is now recognized that these widely heterogeneous roles are supported by distinct subtypes of microglia, characterized by broad genetic diversity. In the last years, our laboratory has contributed to demonstrate the effects of cytokines on synaptic formation and function (1,2). We have also characterized the role of the microglial protein TREM2 and found that TREM2 defects result in derangements in circuit formation, accompanied by behavioral defects (3,4). The project will focus on investigating the role of the immune system (cytokines, microglia, TREM2) in neurodegenerative diseases, through an array of different techniques. Experiments in mouse models and analyses in patient samples will be performed. Possible strategies to modulate immune system activation will be exploited to rescue brain damages.

Main technical approaches

Project execution requires a multidisciplinary approach based on a combination of techniques including:

- molecular biology;
- confocal microscopy;

Scientific references

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2) M.Matteoli, D. Pozzi, M. Fossati and E. Menna (2023) Immune synaptopathies: how maternal immune activation impacts synaptic function during development. EMBO J. DOI: 10.15252/emboj.2023113796

3) Filipello F, Morini R, Starvaggi C, Canzi A, Corradini I, Erreni M, Otero K, Piccio L, Perrucci F, Tamborini M, Rajendran L, Menna E, Vetrano S, Michalski B, Fahnstock M, Paolicelli R, Matteoli M (2018) The microglial innate immune receptor TREM2 is required for neuronal synapse elimination. Immunity 48(5):979-991

4) N Scott-Hewitt*, F Perrucci*, R Morini, M Erreni, M Mahoney, A Witkowska, A Carey, E Faggiani, L T Schuetz, S Mason, M Tamborini, M Bizzotto, L Passoni, F Filipello, R Jahn, B Stevens* & M Matteoli* (2020) Local externalization of phosphatidylserine mediates developmental synaptic pruning by microglia. EMBO J. 2020 Aug 17;39(16):e105380.

Type of contract

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