Neuroinflammatory processes induced during EAE also affect the hippocampus and its associated cognitive processes

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**INTRODUCTION**
Scientific advances have clearly shown the important role of the immune system and glia on many neuronal functions like synaptic plasticity and cognition. In the healthy brain, a complex immune-neurocircuitry takes place between neurons, glia and infiltrating immune cells to maintain CNS homeostasis and ensure the remodeling of synaptic circuits contributing to neural plasticity and memory. However, under diseased conditions, the delicate balance between neuroprotective and neurotoxic effects of immune responses can be rapidly disrupted due to an excessive or prolonged activation of immune and glial cells and can lead to neuronal damages inducing synaptic plasticity alterations and cognitive impairments. These deficits are very common in many neuroinflammatory diseases like multiple sclerosis but the mechanisms involved are still poorly understood. This project aims to study the effects of neuroinflammation on neuronal network activity and synaptic plasticity in mouse hippocampus and to highlight the inflammatory actors related to cognitive disorders. We are particularly interested in immune mechanisms developed during experimental autoimmune encephalomyelitis (EAE), a model of MS that we use in our study like a model of CNS chronic neuroinflammatory disease.

**A. HIPPOCAMPAL SYNAPTIC PLASTICITY IS MODIFIED DURING EAE**

**B. REMITTING MICE PRESENT A COGNITIVE IMPAIRMENT**

**C. NO DEMYELINATION OCCURS IN THE HIPPOCAMPUS OF EAE MICE**

**D. STRUCTURAL INTEGRITY OF THE HIPPOCAMPUS IS PRESERVED DURING EAE**

**E. ASTROCYTES AND MICROGLIA ARE ACTIVATED IN THE HIPPOCAMPUS OF EAE MICE**

**F. PROINFLAMMATORY CYTOKINES ARE PRODUCED IN THE HIPPOCAMPUS DURING EAE**

**CONCLUSION**
Our study demonstrates that although motor impairments are the main symptoms of EAE, immune responses and neuroinflammation developed during EAE can also affect cognitive structures like hippocampus and can lead to cognitive impairments. Different modifications of hippocampal synaptic plasticity were observed during the course of the disease and despite the lack of demyelination and any structural alterations, an inflammatory state marked by activated astrocytes and microglia along with the production of inflammatory cytokines (IL-6, TNF-α) develops in the hippocampus of EAE mice. Future plans will consist on a more detailed analysis of the role of the NFκB signaling pathway, activated microglia and the inflammasome in the hippocampus during EAE to investigate their potential implication in cognitive disorders associated to neuroinflammation.