Gliogenesis control of brain neuroplasticity, neurophysiology and cognitive function

ABSTRACT

Background
Although many advances have been made in understanding how cellular plasticity in the adult central nervous system (CNS) controls complex behaviors, the majority of evidence is focused on neuronal cells. Glial cells are increasingly recognized as fundamental partners of neurons in the maintenance of neurochemical and electrophysiological homeostasis. However, the real implication of astrocytes and astrogliogenesis for CNS neurophysiology and behavioral patterns, in the healthy brain, is still largely unknown.

Aims
This project was designed to (i) explore how adult astrogliogenesis remodels neuro-glial networks in adult CNS, (ii) determine how ablation of hippocampal adult-born astrocytes (ABAs) and pre-existing astrocytes (Pre-As) in the healthy brain impact on physiology and behavior.

Method
We developed an innovative genetic tool to promote targeted cell-death of ABAs and Pre-As in the adult brain, while not affecting the neuronal lineage.
We further explored the gliogenic control of brain neuroplasticity, neurophysiology and cognition, through an animal model which presents astrocytic dysfunctions, the IP3R2 KO mouse model.

Results
We developed the constructs to ablate ABAs and Pre-As and proved their specificity for astrocytes in vitro. Moreover, our results show that astrocyte dysfunctions, including astrogliogenesis impairment, might be correlated with alterations in emotional and cognitive behavior in aged mice.

Conclusions
Our novel viral tools and studies in vivo will allow to study how astrogliogenesis impacts on brain neuroplasticity, neurophysiology and cognitive function. We are confident that this study will greatly advance our knowledge on the importance of cell cytogenesis processes for brain function.

Keywords

Gliogenesis, Adult brain, Plasticity, Behaviour

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