

Temporal modulation of the subventricular zone neural stem cell niche by choroid-plexus cerebrospinal fluid derived factors

ABSTRACT:

Background

The choroid plexus (CP) influences the brain parenchyma through its paracrine function by secreting factors towards the cerebrospinal fluid (CSF), and its capacity to transform blood-circulating molecules that it transports towards the CSF. How factors synthesized and secreted by the CP affect the neurogenic niches, particularly in the subventricular zone (SVZ) neural stem cell population is still mostly unexplored, both during development and in early postnatal stages, but also in the mature brain.

Aim

We aimed at determining the contribution of molecules secreted from the CPs towards the CSF in the modulation of the subventricular zone neural stem cell population during several stages of brain maturation and in the adult brain.

Method

Microarray analysis and RNA-Seq were used to characterize the temporal dynamics of the mRNA population of the early postnatal and the adult CP in the rat. In vitro cell cultures of neurospheres incubated with CP derived proteins and whole CSF samples to evaluate the impact of CP proteins in the SVZ neural stem cell niche dynamics.

Results

Transcriptomic analysis of the early postnatal (P1, P10) adult and aging CP revealed an age-dependent shift in the gene expression landscape of the rodent CP. This shift impacts the response of neurons and glial cells under both physiological and dysfunctional conditions such as upon an inflammatory stimulus. Furthermore, we confirmed that two CP-derived proteins (AREG and IGFBP2) altered the proliferation and differentiation pattern of neural stem cells in the SVZ niche.

Conclusions

The CP/CSF are conveyors of specific molecules that alter cell physiology of the central nervous system in an age-dependent manner.

Keywords

Choroid plexus, Cerebrospinal fluid, Subventricular zone, Neural stem cells

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Researcher's Contacts:

João Carlos Sousa
Life and Health Sciences Research Institute (ICVS),
School of Health Sciences, University of Minho.
Campus de Gualtar
4710-057 Braga
Portugal
Phone: +351 253604848

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Fax: +351 253604809

Email: jcsousa@med.uminho.pt