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Interactions between astrocytes and microglial cells in the hippocampus

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A great amount of data is currently available on the role played by astrocytes and microglial cells in normal and pathological conditions, due to their relevance in the progression of neurodegenerative diseases. It is known that astrocytes provide homeostasis for neuronal networks, regulate neuronal maturation and synapse formation, modulate neurotransmission, act as progenitor cells in the neurogenic zone, and may influence microglial phagocytosis. On the other hand, they may enhance an inflammatory condition by producing and releasing inflammatory cytokines and amyloid fibrils. Microglial cells are the immunocompetent cells of the central nervous system, they remove damaged neurons and dysfunctional synapses in normal and pathological brain. They constantly act as sensor cells in normal brain, their ramified processes constantly scanning brain environment and eventually extending toward their targets. The same molecular pathways characterizing these activities are also utilized by microglia to influence nervous system development and connectivity in the normal and developing brain. However, inflammation may lead to deregulation of microglial cells, resulting in aggravation of disease progression. In this scenario, the comprehension of the interactions occurring between astrocytes and microglial cells, could be essential to get an inclusive synthesis of the evidence on their functions which are constantly accumulating. This study is aimed to verify whether the contacts occurring between astrocyte and microglia processes may undergo significant changes in number and spatial distribution according to different functional states of glial cells. To this aim we performed 3D particle analysis on confocal optical volumes acquired in the CA1 hippocampal region of control- and chronically inflamed- young and old rats.

Keywords

Astrocytes; microglial cells; cell-cell interactions; inflammation; aging.