News in the field of astroglial functions in the central nervous system

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Glial cells are the most numerous cells in the brain. Among the glial cell family, which includes oligodendrocytes and microglia, **astrocytes** compose by themselves 30 % of the volume of the nervous system. **Astrocytes** were for a long time considered as passive cells, presenting just a supporting role in the mature central nervous system (CNS). However, progressively, many diverse functions have been attributed to these cells which highlight their essential role in the nervous system. They firstly contribute to the cerebral architecture during development, in the form of embryonic **astrocytes** of the "radial glia", serving as railways to immature neurons. **Astrocytes** are also necessary for blood-brain-barrier construction. Their major implication in the formation and the plasticity of synapses has been evidenced. The **astrocyte** is the only cell in the brain able to stock glucose as a source of energy and the release of growth factors by these cells is essential to maintain the neural function. These cells possess unique enzymes, proteins, and transporters which allow them to supply neurons with energy, substrates for neurotransmitters synthesis, trophic factors and antioxidants. They control brain homeostasia. Following an increase in **astroglial** calcium, the surrounding neurons respond actively. This implies some kind of communication, some new ways of transmission which involve many other molecules like ATP or prostaglandins . **Astrocytes** and neurons are linked into an elaborate symbiosis and normal brain function represents the outcome of these interactions. Within the past few years, attention has focused on the role of **astrocytes** in adult neurogenesis. The growth of new neurons from neural stem cells has been shown to occur in the adult mammals in specific brain areas. Adult **astrocytes** from the hippocampus, are capable of regulating neurogenesis in this area, by instructing the quiescent stem cells to adopt a neuronal fate. This reinforces the view that **astrocytes** assume an active regulatory role in the neurogenic process. Recently, it has been shown that human **astrocytes** can function as stem cells, able to generate all three major brain cell types. A single **astrocyte**, from the lateral ventricle was able to generate neurons without the addition of any growth factors. Adult cortical **astrocytes** retain also the capacity to re-express an earlier developmental and unexpected new role, that of stem cell/ progenitor in the adult brain. Neural stem cells with the characteristics of **astrocytes** persist in the sub ventricular zone (SVZ) of the juvenile and adult brain. Radial glial cells not only serve as progenitors for many neurons and glial cells after birth, but also give rise to adult SVZ stem cells that continue to produce neurons throughout adult life. Such cells might be harnessed and in the future used to regenerate damaged areas in the CNS. If scientists are able to engineer these stem cells to escape from the cell cycle and grow into a specific lignage, then, it creates a way to repair or prevent damages caused by neurodegenerative diseases.