Special Issue

How Can Astrocytes Specifically Modulate Information Processing in the Brain?

Message from the Guest Editor

In recent years, several studies using highly sophisticated tools demonstrated that by altering functions of astrocytes we can modify animals' behaviour in a surprisingly precise way and affect such extraordinary complex processes as memory formation and/or recall. This represents a formidable challenge to the current theories of memory, because all of them relate the formation of memory traces to modifications of numerous synapses widely distributed within some parts of the brain. At the same time, at present we do not know of any mechanism that could allow one astrocytic soma to differentially interact with all the thousands of end feet that it may possess and that may contact different synapses on several adjacent neurones. Neither is it clear how an astrocyte could work as an integrator of information of any kind. Indeed, the astrocytic membrane is electrically leaky, and charges/currents do not propagate far enough. $Ca2+$ elevations in different parts of the same cell seem to happen without coordination (unless the whole cell is exposed to a stimulant such as ATP).

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