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Sommario/riassunto

Glial cells are no longer considered passive bystanders in neuronal brain circuits. Not only are they required for housekeeping and brain metabolism, they are active participants in regulating the physiological function and plasticity of brain circuits and the online control of behavior both in invertebrate and vertebrate model systems. In invertebrates, glial cells are essential for normal function of sensory organs (C. elegans) and necessary for the circadian regulation of locomotor activity (D. melanogaster). In the mamallian brain, astrocytes are implicated in the regulation of cortical brain rhythms and sleep homeostasis. Disruption of AMPA receptor function in a subset of glial cell types in mice shows behavioral deficits. Furthermore, genetic disruption of glial cell function can directly control behavioral output. Regulation of ionic gradients by glia can underlie bistability of neurons and can modulate the fidelity of synaptic transmission. Grafting of human glial progenitor cells in mouse forebrain results in human glial chimeric mice with enhanced plasticity and improved behavioral performance, suggesting that astrocytes have evolved to cope with information processing in more complex brains. Taken together, current evidence is strongly suggestive that glial cells are essential contributors to information processing in the brain. This Research Topic compiles recent research that shows how the molecular mechanisms underlying glial cell function can be dissected, reviews their impact on plasticity and behavior across species and presents

novel approaches to further probe their function.