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Abstract

Glia going emotional: The impact of acute and repeated neonatal separations on S100ß-IR and GFAP-IR astrocytes in the medial prefrontal cortex.

Astrocytes, once considered as merely supporting cells in the brain by only assisting neuronal functions are now implicated to play crucial roles in neuronal migration, establishment and maturation of synaptic contacts during early development. Relatively, only few reports have shown the impact of the neonatal environment on glial plasticity in higher associative brain regions as the medial prefrontal cortex (mPFC) that process, integrate and evaluate memories of learning and experiences. The present work tests the hypothesis if glial plasticity is affected by neonatal separation that altered the neuronal spine density of the mPFC in our previous findings. Neonatal separation was applied during the first three postnatal weeks, a critical period for synaptic plasticity in rodents. The expressions of two astrocytic markers, S100ß and GFAP were used to determine the impact of acute and repeated separation in five experimental groups of *Octodon degus*: 1) control, n=5 (CON): undisturbed in the home cage with parents and siblings from postnatal day (PND) 1-21; 2) acute separation+short reunion, n=6 (Group 2): 6-hr separation from parents and siblings on PND 21, returned to the home cage for 1 hr; 3) acute separation+extended reunion, n=4 (Group 3): 6-hr separation from parents and siblings on PND 19, returned to the home cage until PND 21; 4) repeated separation+short reunion, n=6 (Group 4): 1hr/day separation from parents and siblings on from PND 1-21, returned to the home cage for 1-hr after the last separation; 5) repeated separation+extended reunion, n=4 (Group 5): 1hr/day separation from parents and siblings on PND 1-14, returned to the home cage from PND 14-21. The density of S100ß-IR and GFAP-IR astrocytes was quantified in the subregions of mPFC including anterior cingulate (ACd), precentral medial (PrCM), prelimbic (PL) and infralimbic (IL) cortices. The somatosensory cortex (SSC) was used as a nonlimbic control region. Both acute and repeated neonatal separation altered the density of S100ß-IR and GFAP-IR astrocytes in the mPFC showing an increase in the density of S100ß-IR astrocytes in a region and layer-specific manner but a decrease in the density of GFAP-IR counterparts. Acute separation affected both the density and morphology of S100ß-IR and GFAP-IR astrocytes in the mPFC but repeated separation affected only the density but not the morphology of astrocytes. Extended reunion restored the reduced branching complexity of GFAP-IR astrocytes after acute separation but diminished the astrocytic branching after repeated stress. In the SSC, acute and repeated neonatal separation did not affect the S100ß-IR astrocytes but increased the density of GFAP-IR counterparts. These alterations may have consequences in neuron-glia interaction thereby affecting the participation of astrocytes in modulating the synaptic plasticity particularly during the early period of postnatal development. These findings also provide evidence of uniqueness in spatial and temporal specificity of glial response towards a particular environmental stimulation.