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Behavioral and Biochemical Characterization of Neuroinflammation in Aged GFAP-IL6 Transgenic Mice

By producing a chronic state of neuroinflammation, the GFAP-IL6 transgenic mouse line is a relevant model for astroglial and microglial activation, involving pathways linked to neurodegeneration and aging. Within this model, astrocytes overproduce the IL6 cytokine, leading to the subsequent production of potentially harmful inflammatory cytokines, such as TNF-alpha. The aim of this present study is to identify the behavioral and biochemical hallmarks of this strain, under the conditions of natural aging. We evaluated fifteen 19-month-old GFAP-IL6 mice and their wildtype counterparts on a battery of behavioral tasks, including acoustic startle response and prepulse inhibition, spontaneous motor activity in an open-field apparatus, and passive avoidance. Following behavioral trials, brain tissue was collected for western blotting and immunohistochemistry to quantitatively and spatially assess proteins associated with neuroinflammatory processes. Western blot analyses were conducted to quantify the levels of GFAP, TSPO, and synaptophysin, providing insights into astrocyte reactivity, neuroinflammation, and synaptic integrity. Immunohistochemistry was performed on brain tissues from 19-month-old mice to examine neuroinflammatory changes specifically within the cortex and hippocampus. GFAP and Iba1 antibodies were used to stain and assess the activation of astrocytes and microglia, respectively. Our findings indicated that GFAP-IL6 mice had significantly reduced latency to startle compared to wildtype mice in the acoustic startle response ($p = 0.018$). The behavioral profiles observed in both populations of mice correlate with their biochemical profiles, suggesting that inflammation is associated with altered behavioral responses in GFAP-IL6 mice, including deficits in sensorimotor processing. Ongoing quantitative analyses of histological and western blot data will further elucidate the relationship between inflammation levels and behavioral outcomes.

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