Poster

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Poster 14

[P-14-04] Selective neuroinflammation induced by chronic stress in zebrafish: Differential responses in telencephalon and habenula

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Keywords：neuroinflammation、unpredictable chronic stress model、depression、zebrafish

Background: Neuroinflammation is associated with depression. However, the mechanism behind neuroinflammation related to depression remains unknown, although it is broadly linked to intricate interactions in innate and acquired immunity pathways, with its specific effects on neuron generation and function still unclear.
Aims and Objectives: This study aimed to determine whether chronic stress affects the regulation of neuroinflammation in the telencephalon and habenular nuclei of the zebrafish brain.
Methods: Forty adult (4–5 months old) male and female (approximately 50:50) wild-type short-fin zebrafish were used. Unpredictable chronic stress (UCS) was applied to half of the animals. The novel tank, predator avoidance, and social preference tests were used to assess depression-like behaviors. We examined the mRNA expression of neuroinflammation-related genes including il1b, il6, infg1, tnfa, and nfkb2 in the telencephalon and habenular region. Additionally, RNAscope in situ hybridization was used to visualize il1b expression in both regions.
Results:UCS increased locomotor activity, including greater distance traveled, higher swimming velocity, and a higher frequency of vertical movement, with reduced latency to enter the upper zone. UCS also induced increased side-to-side motion in response to a predator and decreased proximity to conspecifics in the social preference test. Gene expression analysis revealed significant upregulation of il1b, tnfa, and infg1 in the telencephalon, but not in the habenular nuclei. RNAscope analysis further confirmed increased il1b transcript abundance in the telencephalon, while the habenular region showed no detectable elevation, despite comparable regional area, suggesting region-specific neuroimmune activation.
Conclusions: Chronic stress enhances neuroinflammation in the zebrafish brain, particularly in the telencephalon. The findings suggest that anatomical and molecular differences contribute to regional vulnerability, and support the involvement of telencephalic neuroimmune processes in stress-related behavioral changes. In contrast, the habenular nucleus showed no clear evidence of inflammatory cytokine upregulation, possibly reflecting distinct or delayed neuroimmune dynamics.