G-CSF as a Preventative Treatment for Traumatic Brain Injury in Drosophila melanogaster

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The goals of this study were to continue developing a Drosophila melanogaster model of traumatic brain injury (TBI) using the “High Impact Trauma” (HIT) device to inflict injury and induce, incapacitation, compromised mobility, and vacuolar lesions in the neuropil post-injury. In addition, the goal was to treat specimens with G-CSF and compare it to methylene-blue as a preventative measure to mitigate the severity of TBI. Traumatic brain injury is a worldwide cause of irreversible injury or death. The most common causes include falls, vehicle collisions, sports injuries, and armed or unarmed assault, and emergency room visits due to TBI have been increasing for all age groups. Currently, no effective, treatment for TBI exists, and there are limited preventative measures. Consequently, a readily-available treatment such as G-CSF should be investigated. Prior to injury, D. melanogaster were treated with 5µg/kg doses of methylene-blue. Using the HIT device, a standard procedure of four strikes was used to inflict specimens with mild to moderate closed-head TBI. Treated and untreated specimens underwent incapacitation and climbing assays, MI24 measurement, and specimens were histologically analyzed to detect morphological changes to the brains, primarily vacuolar lesions and damage to the retina and fenestrated membrane. Injured specimens exhibited significantly greater incapacitation and loss of mobility, and higher MI24 than controls, which was ameliorated with G-CSF and methylene blue treatments. Both treatments were also effective in reducing neurodegeneration, which was severe in untreated groups. G-CSF and methylene blue produced comparable results, so both are viable treatments for potential further study.

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