They Get Knocked Down, But They Get UP Again! The Effect of Head Impacts on Phototaxis and Geotaxis in Drosophila melanogaster

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Traumatic brain injury (TBI) occurs when an impact forces the brain to collide with the cranial bones. Despite decades of research, these injuries are still inadequately understood due to the restrictions on animal models and limited human studies The purpose of this study was to determine whether wild-type Drosophila melanogaster could be used to conduct TBI research. Drosophila have an enclosed brain structure homologous to the human brain. Controversy has arisen over the use of cholecalciferol (Vitamin D3) in combination with progesterone to aid in the recovery of the brain from TBI. To determine whether the presence of cholecalciferol and/or progesterone would improve performance in phototaxis and geotaxis assays after inducing damage by impacts, Drosophila were exposed to various combinations of food containing the additives. Increasing the number of impacts significantly affected phototaxis and geotaxis in the control group. There was a statistically significant effect of progesterone on the phototaxis response suggesting that progesterone aids in the recovery from damage caused by the impacts. The positive response by Drosophila exposed to progesterone could be due to this hormone's ability to reduce inflammation of the brain induced by the immune system. This reduced swelling could have improved recovery allowing the Drosophila to respond to the light stimulus with greater success. This study demonstrated that progesterone may play a role preventing excessive damage experienced by the Drosophila brains and could lead to a significant treatment for TBI in higher organisms.

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