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Somatosensory Neural Circuit Mapping

Neuroscience is a complex field which works, in part, to map out the series of neuronal circuits and synaptic connections that operate in the transmission of an external signal to the elicited response. Using the *Drosophila* fruit fly as a model organism, the following study aided in a fraction of this intricate question working with optogenetic technology and the blue light-gated cation channel, Channelrhodopsin-2 (ChR2). A transgenic fly line of the mutant variant T159C (ChR2-TC) was constructed through a series of molecular biology techniques and meiotic recombinations. Using the GAL4-UAS system with a *nomp-C* GAL 4 driver, ectopic expression of the variant was accomplished resulting in a line with specific expression of ChR2-TC in the mechanosensory neurons. This line was found to exhibit significantly enhanced sensitivity to blue light as compared to previous ChR2 lines. This increased sensitivity allowed us to induce a more robust behavioral response using narrowly focused light on spatially restricted areas of the larval body; a more naturalistic method not previously possible with the existing ChR2 lines which require whole body illumination to elicit behavioral responses. These behavioral responses, along with those of the wild type and *nomp-C/TNT* lines, were tested and quantified via behavioral assays.