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Analysis of Potential Effects of pH on Vesicle Release in Neuromuscular Junctions of Drosophila Third Instar Larvae

It is well established that an increase in $\text{[Ca}^{2+}\text{]}_\text{i}$ triggers vesicle fusion. However, other ways of increasing vesicle fusion rates have been described, including hyperosmotic solutions and a decrease in pH$_i$. In this study I have sought to clarify how changes in pH$_i$ can trigger vesicle release by attempting to express a novel light-activated proton channel in Drosophila larvae. I managed to successfully generate flies expressing the channel. However in an initial scan of channel functionality, when expressed in motoneurons and activated by light, no changes in presynaptic pH$_i$ were detected, and there were also no increases in vesicle fusion frequency observed. When expressed in muscle cells, the light activated channel was found to conduct a current with no detectable proton permeability. The reason why this novel light-activated channel conducts protons when expressed in oocytes, but does not appear to do so in Drosophila, remains unclear.