



The Role of CRMP in Synapse Formation in *Drosophila*

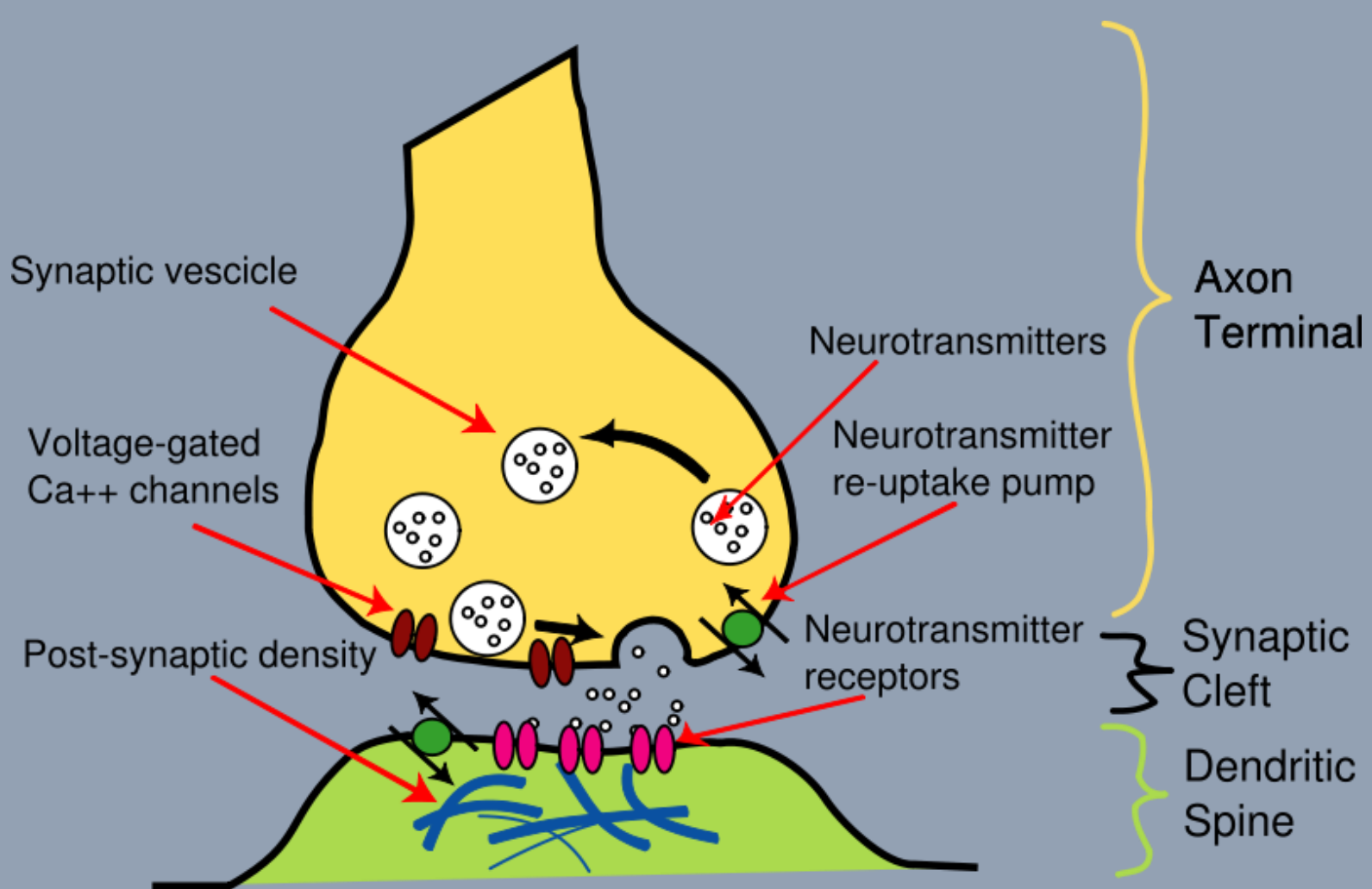


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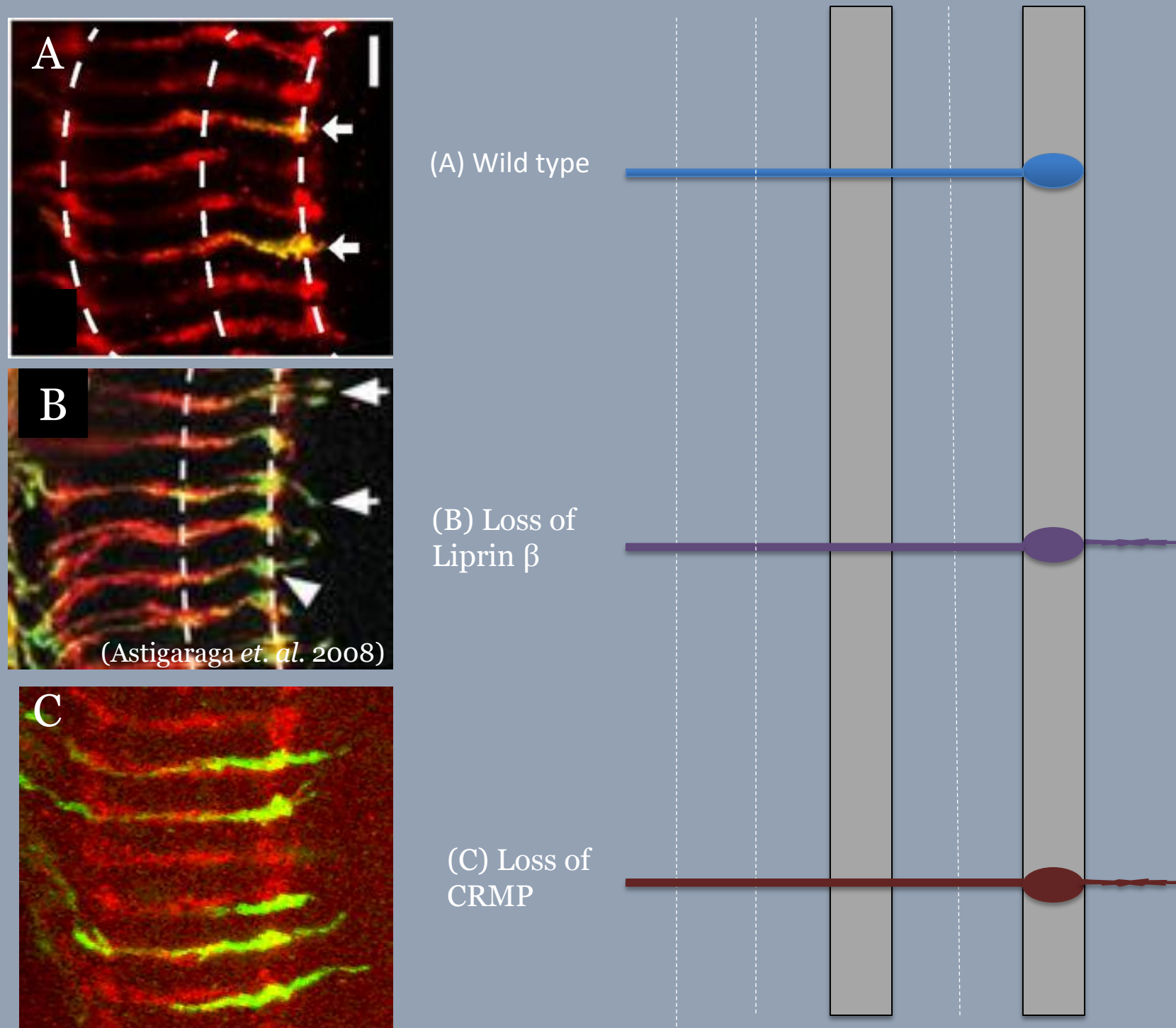
2013 Summer Program for Undergraduate Research

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Background



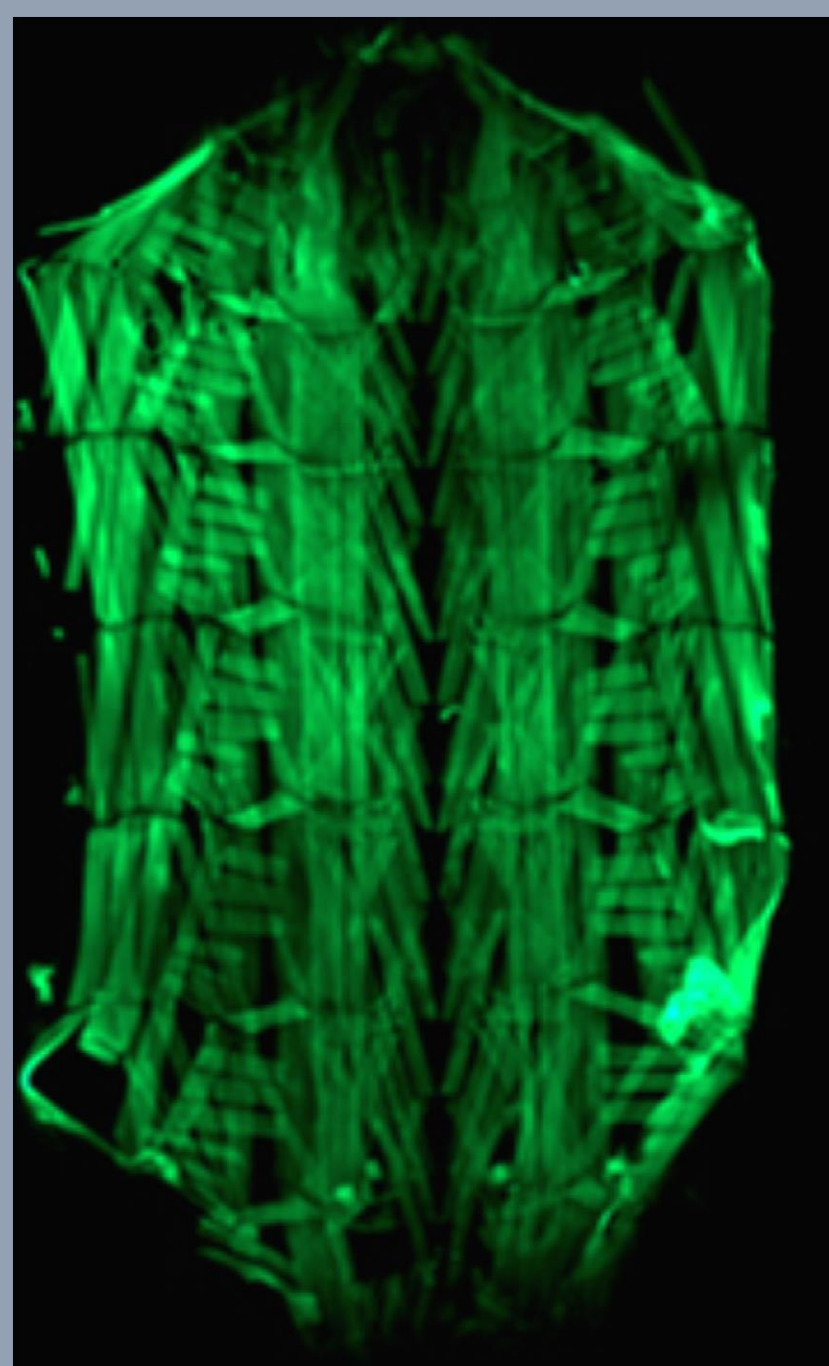
- Proper synapse formation is required for a functional nervous system to develop.
- The conserved Liprin β is necessary for pre-synaptic stability and growth in R7 photoreceptors and at the neuromuscular junction.



Is CRMP necessary for pre-synaptic development?

Methods

Immunohistochemistry on neuromuscular junctions (NMJs)

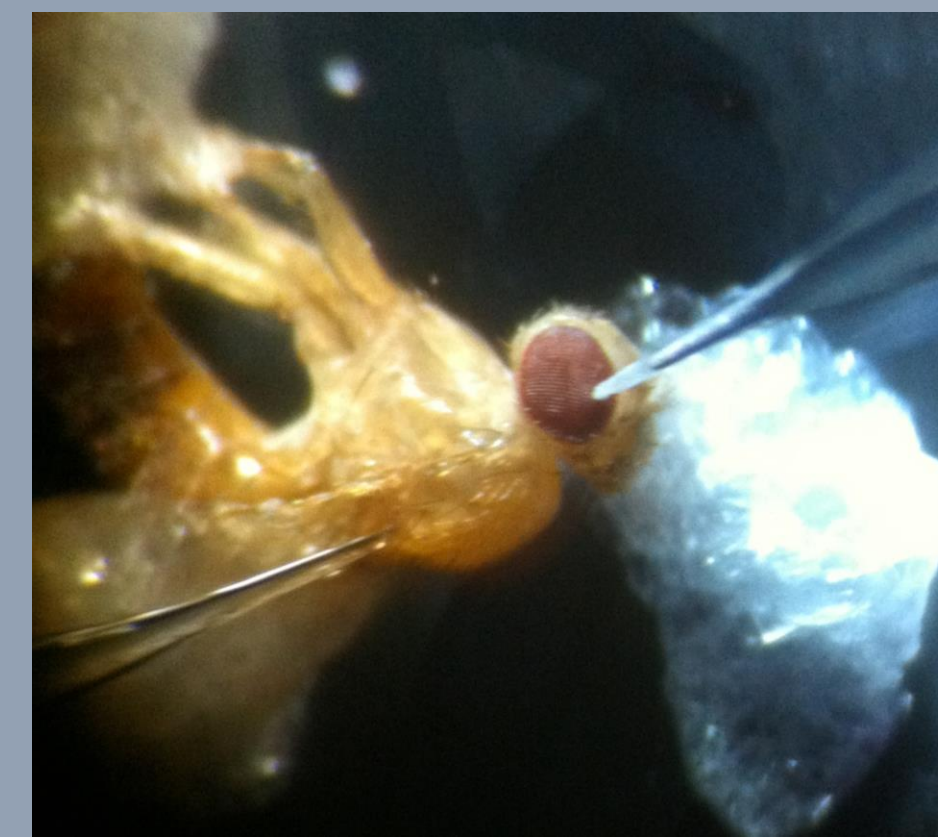


L3 pelt muscle fluorescence

- Dissected *Drosophila* larval L3 pelts to reveal muscles.
- Stained larval pelts for neurons and muscles.
- Bouton number at muscle 4 was quantified blind then normalized to muscle size. Experiments were performed on two *CRMP* trans-heterozygous mutant stocks and a wild-type control.

Methods Continued

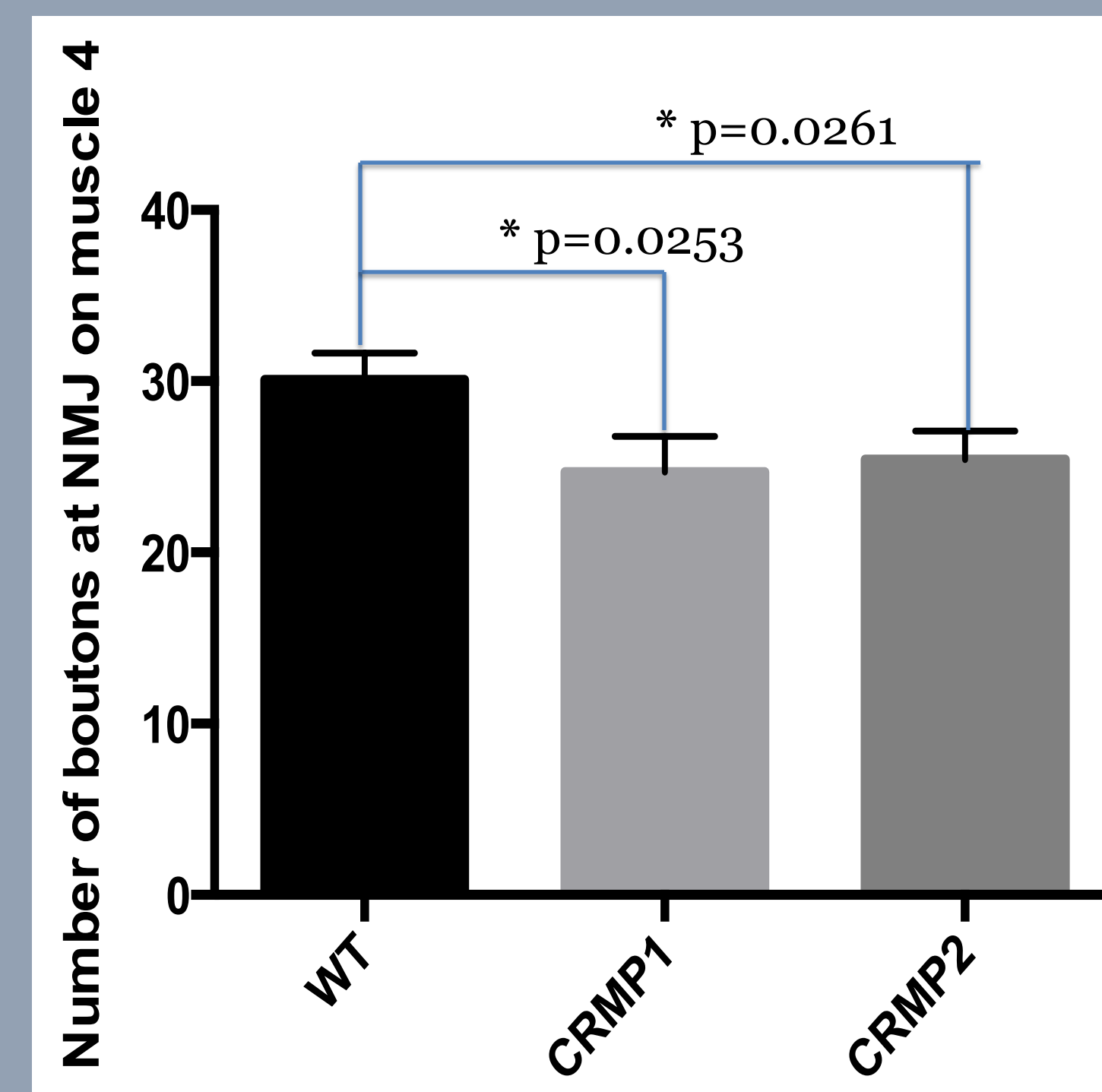
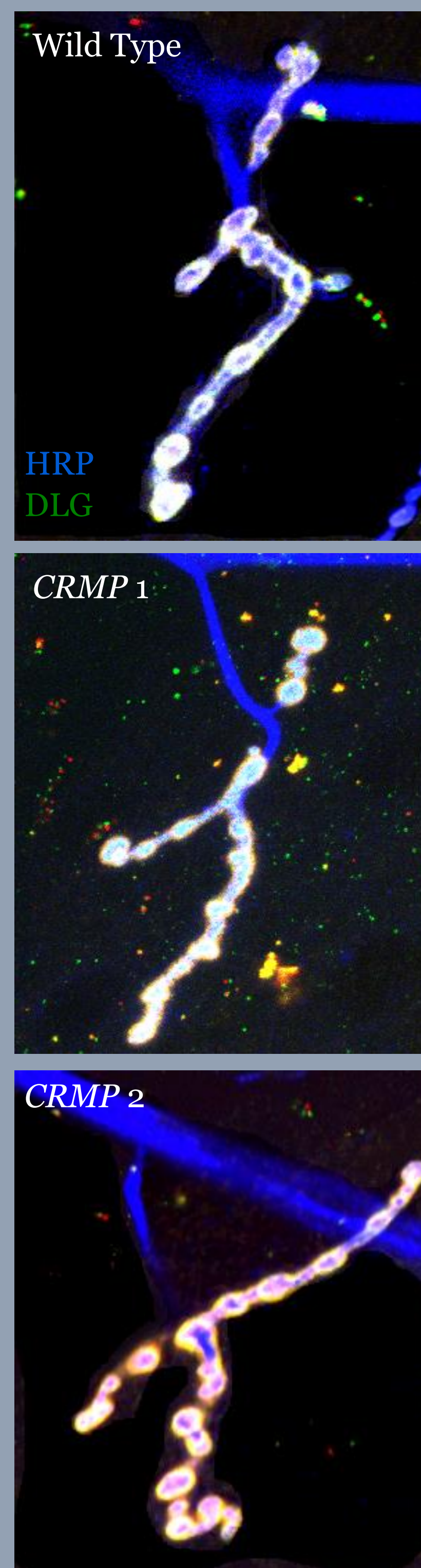
Electroretinograms (ERGs)



- Electroretinograms test photoreceptor functionality.
- Inserted electrodes into the fly's shoulder and eye.
- Measured "off" transient voltage which was normalized to receptor potential.

Results

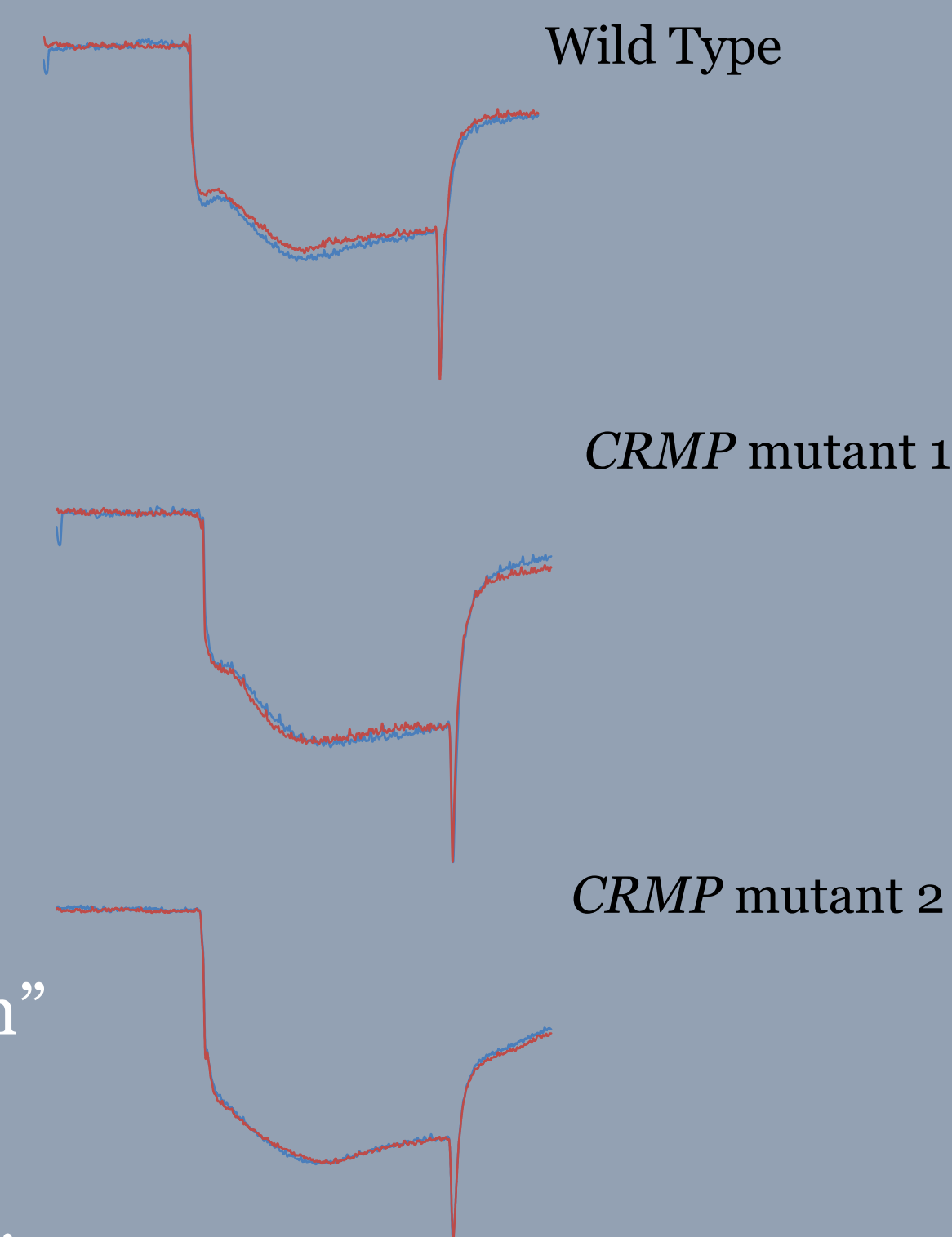
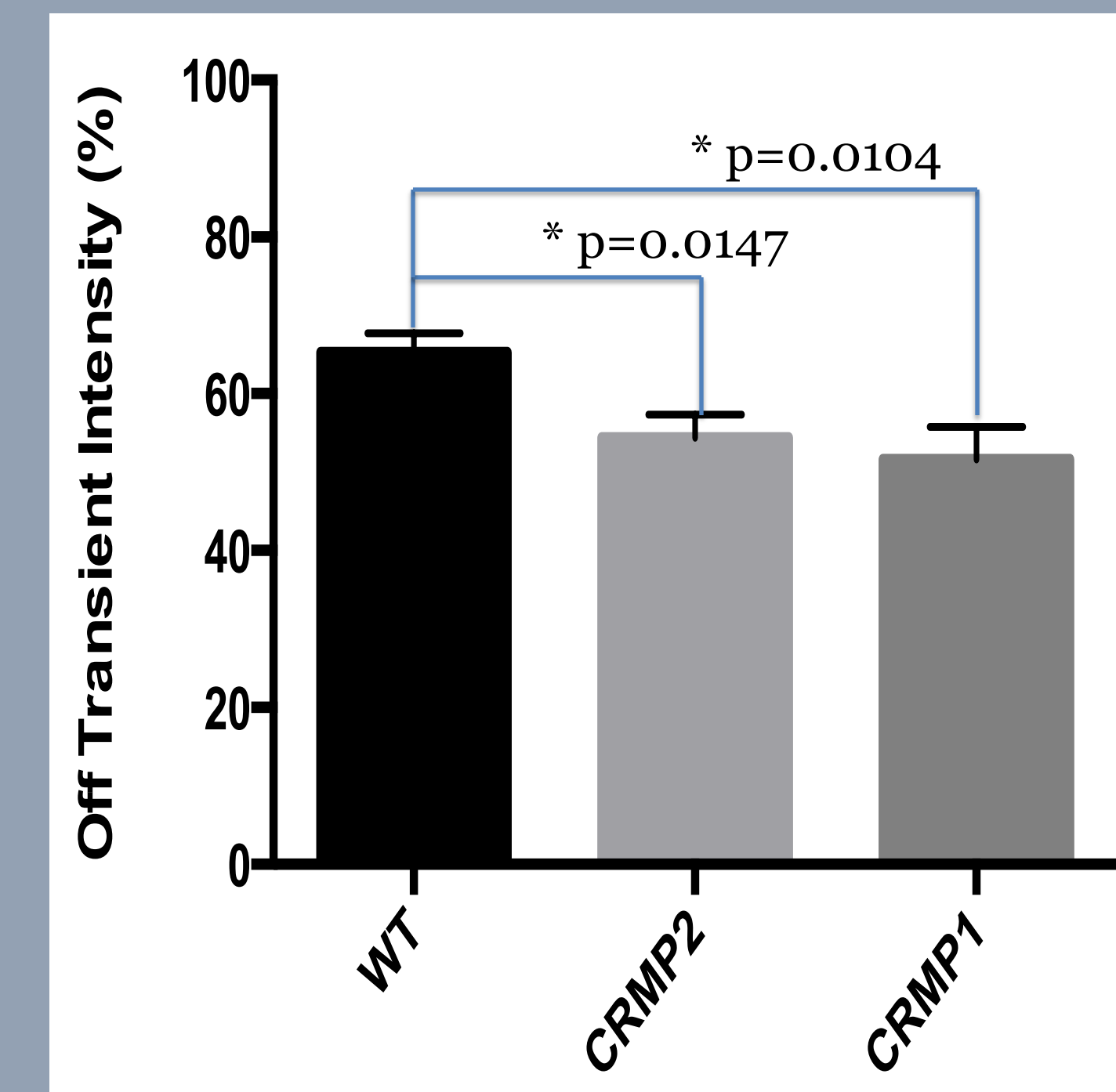
CRMP NMJs have reduced bouton number



- Both *crmp* mutants show a significant reduction in bouton number (n=12).
- Although *CRMP* larvae have normal locomotory activity, they have fewer boutons at the neuromuscular junction. This supports the hypothesis that CRMP is required for proper pre-synaptic development.

Results Continued

ERGs of *CRMP* flies have reduced "off" transients



- ERGs show that *CRMP* flies have "on" and "off" transients
- *CRMP* flies show reduced "off" transients suggesting that photoreceptor functionality is decreased.

Future Directions

- CRMP has been shown to interact with N-type calcium channels therefore we will observe calcium channel localization at the NMJ and photoreceptors.
- Electrophysiology experiments in the muscle will be performed to detect NMJ synaptic functionality defects.

References

Astigarraga, S. Hofmeyer, K. Treisman, J. E. (2010) Three *Drosophila* liprins interact to control synapse formation. *Journal of Neuroscience*: 58-68

Brittain, J. M. Wang, Y. Khanna, R. (2012) CDK-5 phosphorylation of CRMP-2 enhances its interaction with Cav 2.2. *FEBS Lett.*: 3-8

Vilinsky, I. Johnson, K. G. (2012) Electroretinograms in *Drosophila*: A Robust and Genetically Accessible Electrophysiological System for the Undergraduate Laboratory. *JUNE*: 149-157

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