Targeted Screen of Genes Involved in Drosophila Neuromuscular Junction Development

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Mechanisms involved in neuromuscular junction (NMJ) morphogenesis and active zone (AZ)-GluR receptor alignment are an active field of research in Drosophila neuroscience. I investigated four poorly characterized genes for regulatory roles at the NMJ: 1) Ig-CAM family member Basigin, 2) calcium-sensitive kinase CASK, 3) putative N-myc homologue CG2082, and 4) kinase Par-1. I knocked down these genes in neuronal tissue using RNAi and imaged NMJs with immunofluorescence microscopy. AZ-GluR colocalization defects were found in all four lines ($p < 0.001$), implicating the genes in promoting AZ-GluR cluster alignment. The Basigin knockdown line exhibited significantly more branching than the wild-type ($p = 0.023$), suggesting that Basigin downregulates NMJ branching. Finally, knockdown of each of the four genes reduced bouton area and AZ count per bouton ($p < 0.001$), implicating the genes in upregulating bouton size. These are novel findings in the literature for these four genes, representing a meaningful step toward a better understanding of the molecular processes at the NMJ. This understanding has medical significance due to the involvement of synapse biology in neurodegenerative disorders.

Awards Won:

Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Intel ISEF Category