The Effects of Lithium Chloride, Potassium Chloride and Valproic Acid Treatment on the Development of Drosophila Oregon-R and Midline Mutant Eyes

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We have gathered genetic evidence suggesting that the T-box transcription factor gene midline (mid) functions within stress-reactive signaling pathways. Reduced levels of mid expression during early eye development result in significant interommatidial bristle loss, reduced pigmentation, and apoptosis within the adult compound eye (Das et al., 2013). To determine whether decreased expression of mid in eye tissues initiates apoptosis at the transcriptional level by changes in chromatin remodeling, we undertook a pharmacological approach and systemically treated wild-type, Oregon-R or mid mutant fruit flies either throughout their lifecycle with sodium valproate (VPA), an inhibitor of histone deacetylases (HDACs). Similarly, we treated flies with lithium chloride (LiCl), a drug known to inhibit glycogen synthase kinase 3 (GSK-3). Inhibition of GSK-3 under specific conditions prevents neuronal apoptosis. We repeated these pharmacological studies except that drugs were fed to one-day old third-instar WT or mid mutant larvae until eclosion (hatching). We predicted that VPA and LiCl treatment would rescue bristle loss, pigmentation and/or cell viability in mid mutant eyes in a dose-dependent manner. However, we obtained different results depending on the developmental window in which flies were treated with drugs.