MORPHOMETRIC AND RELATED ANALYSES OF *Drosophila* RHABDOMERES. J. Scott Christianson, Randall Sapp, De-Mao Chen, Gregory Zinkl, Linnette Maier, Kent Studer and William S. Stark, Division of Biological Sciences, University of Missouri, Columbia, MO 65211.

We are analysing the photoreceptors of normal, mutant and carotenoid deprived *Drosophila* in a multidisciplinary program of research involving electron microscopy (EM), microspectrophotometry (MSP) and electroretinography (ERG). The photoreceptor organelles (rhabdomeres) do not vary in size as a function of time of day. This is in contrast with (1) rhodopsin which shows a transient decrease at 4 hr after light onset in a 12 hr light 12 hr dark photoperiod, which entrains to an endogenous circadian rhythm and which is affected by the *period* mutants; and (2) the sensitivity which also decreases to a minimum at 4 hr after light onset. The *norpA* mutant, which has rhodopsin but has *no* receptor *p*otential (and lacks phospholipase C, PLC, Yoshioka *et al., J. Biochem. 97*, 12151-1254, 1985) lacks the rhodopsin rhythm under a 12 : 12 hr entrainment cycle. We are presently further investigating the light-driven processes present and absent in *norpA*. *NorpA* lacks wild-type's light-induced uptake as witnessed by microspectrofluorometry after Lucifer yellow was microinjected into the eye. Thus we were not surprised by our inability to cure *norpA* by injecting PLC (courtesy of S. D. Shukla, e.g. *Life Sci.*, 30, 1323-1332, 1982) into the eye and observing whether the light driven ERG recovered as a function of light pulses. Yet light does affect *norpA* receptors in that light deprivation protects them against rhodopsin (and probably rhabdomere) loss. Specifically, in light / dark (L/D) rearing, visual pigment decreases in *norpA* but increases in controls and ultrastructure is altered; *norpA*'s visual pigment matches controls in D/D and structure is preserved; and L/L causes visual pigment loss in both. Carotenoid deprivation decreases rhodopsin and lowers the density of freeze fracture bumps in the microvilli of the rhabdomeres but does not disrupt the microvilli (Harris *et al., Nature 266*, 648-650, 1977). We are using EM morphometry and now present evidence that the cross sectional area of the rhabdomeres is about half as great in vitamin A deprived flies. Carotenoid replacement therapy causes the visual pigment levels to recover over the course of several days (Stark *et al., J. Neurocytol. 17*, 499-509, 1988). We have visualized the opsin specific to the R1-6 receptors in the compound eye (RH1, deCouet and Tanimura, *Eur. J. Cell Biol. 44*, 50-56, 1987) and for ocellar receptors in these simple eyes (RH2, Shieh *et al., Nature 338*, 67-70, 1989) using monoclonal antibodies to reveal a rapid rhodopsin recovery which proceeds first through the rough endoplasmic reticulum. The present studies are geared to determining mechanisms of photoreceptor maintenance taking advantage of *Drosophila*.

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