ENTRAINMENT OF A CIRCADIAN RHYTHM IN THE RHODOPSIN CYCLE OF white AND WHITE-EYED *period* MUTANT *Drosophila*. William S. Stark, De-Mao Chen, J. Scott Christianson and Randall Sapp, Division of Biological Sciences, University of Missouri - Columbia, Columbia, MO 65211, USA.

Photoreceptor turnover has been best studied in both vertebrates and invertebrates at the level of membrane shedding and renewal while animals remain on a lighting cycle. By contrast, relatively little is known about visual pigment turnover or about whether an endogenous circadian rhythm can be entrained. Membrane shedding in *Drosophila* compound eyes involves autophagy as in other invertebrates. We observe coated vesicles merging to multivesicular bodies (MVB's) which are attacked by primary lysosomes (Stark et al., *J. Neurocytol. 17*, 499-509, 1988). Stark *et al.* also reported that the rhodopsin of R1-6 receptors decreases within a few hours after light onset and then builds back to its maximum level. Such direct assessments of rhodopsin levels are possible because of the facility of microspectrophotometry (MSP) performed on living *w*hite-eyed flies using the deep pseudopupil to image the photoreceptive organelles (the rhabdomeres). Here we extended the MSP studies to mutants of the *per*iod gene (made white eyed with *cn bw*) which affect biological rhythms including ultradian rhythms. Importantly, one of the main sites of *per* gene expression is in the photoreceptor cells (e.g. Siwicki *et al.*, *Neuron 1*, 141-150, 1988). When isolated 1-2 days after eclosion and entrained 4-5 days, per^{l} (long), per^{s} (short) and per^{01} (arhythmic) flies show a rhodopsin cycle while still under the 12 : 12 diel photoperiod. The cycle is much like that of *w* except that, curiously, per^{s}'s rhodopsin levels are low throughout the beginning of the photophase. When similarly isolated and entrained flies are transferred to constant darkness, the *w*, per^{l} and per^{s} flies continue to show their respective rhodopsin cycles, while the rhodopsin remains high in the photophase of per^{01}. We conclude that an endogenous biological rhythm of rhodopsin level can be entrained and that *per*iod mutants influence photoperiodicity in important ways. Supported by NIH grant EY07192 and NSF grant BNS 8811062. We thank Mitchell S. Dushay of Jeffrey C. Hall's lab at Brandeis for constructing and providing the white-eyed *per* stocks.

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