Time to egg-laying: A new model of time-based memory in *Drosophila*

Yijin Wang, Haiyun Gong, Zhefeng Gong and Li Liu

State Key Lab. of Brain and Cognitive Science, Institute of Biophysics, Chinese Academy of Sciences, 15 Da Tun Road, Chao Yang District, Beijing, 100101, China.

Light-dark cycles play a critical role of animal circadian rhythms that organize their behavior and physiology to adapt to daily environment. The formation of conditioning memory also regulates animal response to external cues. To date, very few studies on memory have considered time-based memory that was regulated by light-dark cycle. Here we describe a new model of time-based memory in *Drosophila*. In this learning paradigm, light-dark cycle of egg-laying was associated with different food condition. The female flies reproduce more eggs during the time paired with yeast food, whereas they reproduce less eggs during the time paired with agar food. After 9 cycles training, flies could maintain egg-laying memory at least 3 days. Moreover, we found that using agar food as punishment is more effective than using yeast as reward in egg-laying memory formation. This model would supply a new paradigm for the study of molecular and neural mechanism underlying the relationship between conditioning memory and circadian rhythms.