

【Grant-in-Aid for Scientific Research (S)】

Biological Sciences (Biological Sciences)



Title of Project : How sexual experience modulates innate behavior: a neurogenetic study in *Drosophila*

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Research Area : Behavioral genetics

Keyword : Courtship behavior

【Purpose and Background of the Research】

The mechanism whereby genes and the environment interact to shape a behavior remains an enigma despite its tremendous importance in understanding human nature. Molecular cloning of the *fru* gene and neuroanatomical demonstration of sexual dimorphisms in *fru*-expressing neurons led to the notion that *fru* functions as a master regulator of the formation of courtship neural pathways, which operate as hard-wired circuitries to generate genetically determined courtship behavior. Thus genetic mutations in *fru* result in changes in the courtship target choice in these males. Recent studies have challenged this view, by showing that inappropriate courtship is suppressed in *fru* mutants that are raised in isolation. The present proposal aims to determine the mechanism by which social experience affects the mate preference in *fru* mutants, thereby unraveling the molecular underpinning of gene-environment interactions in shaping the behavior.

【Research Methods】

The tethered male preparation is used to induce courtship behavior with photoactivation of brain neurons via channelrhodopsin. In vivo patch clamp is applied to *fru*-expressing single neurons to record plastic changes induced by social experience. The polymeraseII occupancy is determined at identified Fru-target genes by the TaDa method to detect possible changes associated with social experience.

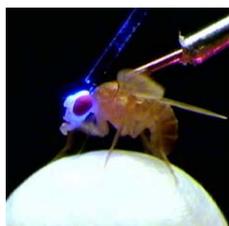


Figure 1 Courtship induced in a tethered male via channelrhodopsin-activation.

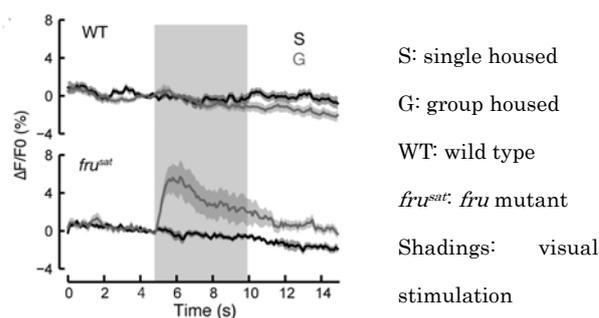


Figure 2 Social effects on neural activities.

【Expected Research Achievements and Scientific Significance】

Although the importance of nature-nurture interplay in specifying complex behavioral traits has been recognized, its mechanistic bases remain obscure. This study will clarify the molecular and cellular mechanisms underlying the nature-nurture interaction in shaping behavior. It will not only renovate our view of the relation of mind and brain but also potentially yield a means to improve mental health.

【Publications Relevant to the Project】

- Kohatsu, S. and Yamamoto, D. (2015) Visually induced initiation of *Drosophila* innate courtship-like following pursuit is mediated by central excitatory state. Nat. Commun. 6, 6457.

【Term of Project】 FY2016-2020

【Budget Allocation】 140,900 Thousand Yen

【Homepage Address and Other Contact Information】

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