High concentration pheromone specific spike suppression of antennal lobe projection neurons

Terufumi Fujiwara[1], Tomoki Kazawa[2], Shigehiro Namiki[2], S. Shuichi Haupt[2], and Ryohei Kanzaki[1,2]

[1] Graduate School of Information Science and Technology, The University of Tokyo, Japan,

[2] Research Center for Advanced Science and Technology, The University of Tokyo, Japan

For many species of animals, sex pheromone is indispensable sensory information. The neuronal circuit in the male silkmoth, *Bombyx mori*, is a convenient system to reveal the relation between pheromone input and behavior, because male mating behavior is triggered by only one major female sex pheromone component, bombykol. Pheromone-triggered behaviors of several insect species including moths are modified at high pheromone concentrations. Using Ca^{2+} imaging, we investigated the concentration-response characteristics of antennal lobe projection neurons which exclusively respond to bombykol (toroid projection neurons, T-PNs). At the somata, the activities of T-PNs decreased at higher concentrations while responses at the dendrites still increased. Loose-patch recording of these PNs revealed that once they received a high concentration pulsed bombykol stimulus, spike response to a subsequent stimulus could be suppressed for 10 s or longer. This suppression was abolished by picrotoxin, a $GABA_A$ receptor blocker. Furthermore, local interneurons (LNs), which are mostly GABAergic, responded to bombykol above a rather high threshold coinciding with response decrease in T-PNs. These results imply that LNs shut out bombykol information specifically at high concentration. We will discuss the relation between this physiological phenomenon and mating behavior.