

## Molecular mechanisms for sensing sex pheromone

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The detection of chemicals in the external environment - so called, chemosensation - is essential for the survival in many animals because the chemical cues possess information about food and suitable mating partners. In 1959, Karlson and Luscher defined pheromones as "substances secreted to the outside of an individual and received by a second individual of the same species in which they release a specific reaction, for example, a definite behavior or developmental process". This new term was created based on identification of a volatile sex attractant that is released by the female silk moth and elicits the full sexual behavior of male moths (Fig. 1). Since then, the insect chemosensory system has been a subject of great interest because of its remarkable selectivity and because of its association with sexual behavior. In the first part of my lecture, I describe the story that led to the discovery of long-awaited pheromone receptors that play a role in sensing sex pheromone in the silk moth (Fig. 2).

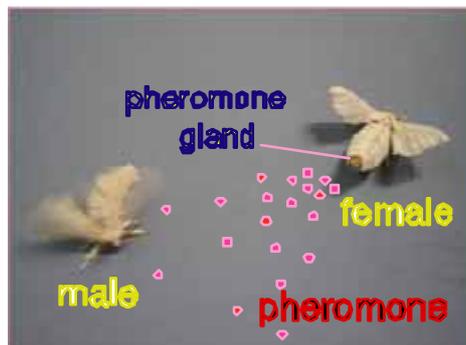


Fig. 1 Pheromone-mediated sexual communication in silk moths

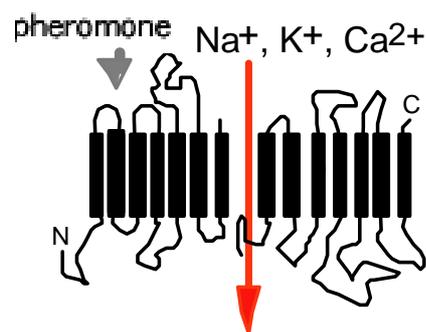


Fig. 2 Insect pheromone receptors sensing sex pheromone and evoking an electrical signal

In many mammalian species, pheromones are sensed by the second olfactory system called the vomeronasal organ located at the base of the nasal cavity. In the

second part of my lecture, I describe an unusual aspect of pheromonal courtship in mice via the vomeronasal system: we discovered a male-specific peptide that was secreted in tear fluids of male mice and transferred to the female vomeronasal organ wherein it elicited an electrical response (Fig. 3, 4). Mice appear to send sex-specific information by not only volatile pheromones released in urine, but also genetically-coded non-volatile peptide pheromones secreted by exocrine-glands such as in tears during direct contact. Sex pheromone in male tears!? Fortunately or unfortunately, however, humans have lost the gene encoding this sex-specific peptide and also do not possess a functional vomeronasal organ. Instead, we developed a novel strategy to communicate each other through the visual system and hearing using a language. Based on our work on various pheromonal communication systems from insect to mammals, I will discuss how each organism has acquired a unique strategy to transmit sex-specific signals and sense the information by adopting their social and living environment during the processes of evolution.

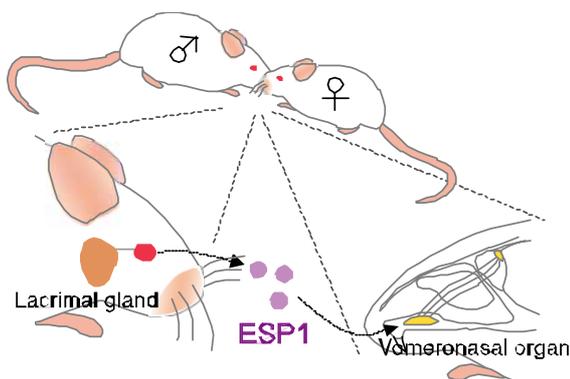


Fig. 3 Peptidic pheromone ESP1 secreted in male tears is transferred to female vomeronasal organ

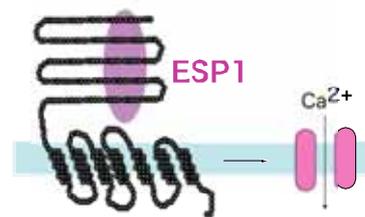


Fig. 4 ESP1 receptor sensing ESP1 and evoking calcium signal

**References:**

- Insect pheromone receptor: Nakagawa et al. (2005) Science 307, 1638
- Mouse pheromone in tears: Kimoto et al. (2005) Nature 437, 898-901