A single sex pheromone receptor determines chemical response specificity of sexual behavior in the silkmoth *Bombyx mori*

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Male moths locate their mates using species-specific sex pheromones emitted by conspecific females. In the silkmoth, *Bombyx mori*, a single pheromone component, (*E, Z*)-10,12-hexadecadienol (bombykol), which is detected by the sex pheromone receptor BmOR1, is sufficient to elicit full sexual behavior. In this study, using transgenic silkmoths expressing the sex pheromone receptor PxOR1 of the diamondback moth *Plutella xylostella* in BmOR1-expressing neurons, we show that the selectivity of the sex pheromone receptor determines the chemical response specificity of the sexual behavior. Bombykol receptor neurons expressing PxOR1 responded to its specific ligand, (*Z*)-11-hexadecenal (Z11-16:Ald), in a dose-dependent manner. Male moths expressing PxOR1 exhibited typical pheromone orientation behavior and copulation attempts in response to Z11-16:Ald and to females of *P. xylostella*. Transformation of the bombykol receptor neurons has no effect on their projections in the antennal lobe. These results indicate that activation of bombykol receptor neurons alone is sufficient to trigger full sexual behavior. Thus, a single gene defines behavioral selectivity in sex pheromone communication in the silkmoth.