The Effect of Dual Neurotransmission on Male Aggression and Courtship in Drosophila melanogaster

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In essentially all organisms, aggression is a behavior that provides not only benefits, such as access to resources and mates, but also risks such as injury. While research has identified neurons and neurotransmitters (signaling molecules) that are important for promoting aggression and courtship, recent evidence indicates that some neurons do not release just one neurotransmitter as previously thought, but instead release two or more neurotransmitters in a process known as dual neurotransmission. In this research, the role of dual neurotransmission is examined in neurons that contribute to aggression and courtship circuits in the Drosophila model organism. This effort helps determine how aggressive decisions are made. Using genetic tools and antibody labeling, it was found that the neurotransmitters octopamine (OA) and glutamate are co-expressed in neurons in the adult fly brain. OA's effect on aggression and courtship has already been researched, but glutamate's effect on the same behaviors in the invertebrate brain has not. To test how dual neurotransmission affects aggression in male flies, glutamate levels in OA-glutamate neurons were reduced through the process of RNA interference and eliminated through B3 recombinase. The results demonstrate a decrease in aggression in experimental flies compared to controls, specifically, a long latency to start fighting and a reduction in number of lunges (a key aggressive behavior). These results are the first to demonstrate glutamate function within OA neurons is required for sex-specific behavior and provide a foundation to examine how dual transmitting neurons fit into aggression and courtship circuitry in any system.

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