
REQUIREMENTS FOR AGGRESSION: ALTERING EAAT1 EXPRESSION TO MANIPULATE GLUTAMATE UPTAKE IN DROSOPHILA MELANOGASTER

Lucy Sirrs *, Hellgate High School, Missoula, MT

Aggression is a behavior required for survival and reproduction. Research has identified several neurons and neurotransmitters (signaling molecules) that are important for promoting aggression, but the neurotransmitter glutamate has only recently been identified, and its role is not fully understood. This research examines how manipulation of glutamate expression via altered expression of its transporter, EAAT1, alters aggression in the *Drosophila* model

organism. Glutamate function was reduced by increasing expression of the glutamate transporter, EAAT1 (Excitatory Amino Acid Transporter 1). EAAT1 recycles extracellular glutamate to regulate neuronal communication. By increasing the amount of EAAT1, more glutamate is recycled, reducing its ability to signal to the downstream neuron. EAAT1 expression was increased via controlled transgenic expression. Conversely, glutamate function was increased by reducing expression of EAAT1 via RNA interference. Using genetic tools and antibody labeling, it was verified that EAAT1 is widely expressed in glial cells throughout the brain. A reduction in glutamate produced male flies that were less aggressive compared to controls, similar to previous research that manipulated glutamate expression only in octopamine neurons. Specifically, experimental flies took longer to start fighting, lunged less, and produced fewer wing threats and wing extensions. Flies with increased glutamate levels were also less aggressive, though this may be due to limited function at the neuron or the neuromuscular junction, where a motor neuron and a muscle fiber meet. These results demonstrate glutamate function is required for sex-specific behavior and provide a foundation to determine the role of glutamate in aggression circuitry in any system.