Serotonin receptors expressed in Drosophila mushroom bodies differentially modulate larval locomotion

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Drosophila melanogaster has been successfully used as a simple model to study the cellular and molecular mechanisms underlying behaviors, including the generation of motor programs. Thus, it has been shown that, as in vertebrates, CNS biogenic amines (BA) including serotonin (5HT) participate in motor control in Drosophila. Several evidence show that BA systems innervate an important association area in the insect brain previously associated to the planning and/or execution of motor programs, the Mushroom Bodies (MB). The main objective of this work is to evaluate the contribution of 5HT and its receptors expressed in MB to motor behavior in fly larva. Locomotion was evaluated using an automated tracking system, in Drosophila larvae (3rd-instar) exposed to drugs that affect the serotonergic neuronal transmission: alpha-methyl-L-dopa, MDMA and fluoxetine. In addition, animals expressing mutations in the 5HT biosynthetic enzymes or in any of the previously identified receptors for this amine (5HT1AR, 5HT1BR, 5HT 2R and 5HT7R) were evaluated in their locomotion. Finally, RNAi directed to the Drosophila 5HT receptor transcripts were expressed in MB and the effect of this manipulation on motor behavior was assessed. Data obtained in the mutants and in animals exposed to the serotonergic drugs, suggest that 5HT systems are important regulators of motor programs in fly larvae. Studies carried out in animals pan-neuronally expressing the RNAi for each of the serotonergic receptors, support this idea and further suggest that CNS 5HT pathways play a role in motor control. Moreover, animals expressing an RNAi for 5HT1BR, 5HT2R and 5HT7R in MB show increased motor behavior, while no effect is observed when the RNAi for 5HT 1AR is expressed in this region. Thus, our data suggest that CNS 5HT systems are involved in motor control, and that 5HT receptors expressed in MB differentially

modulate motor programs in fly larvae.