

## Effect of a GABA/5-HTP Mixture on Behavioral Changes and Biomodulation in an Invertebrate Model

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**Abstract :** Gamma-aminobutyric acid (GABA) and 5-hydroxytryptophan (5-HTP) are amino acids of digested nutrients or food ingredients and these can possibly be utilized as non-pharmacologic treatment for sleep disorder. We previously investigated the GABA/5-HTP mixture is the principal concept of sleep-promoting and activity-repressing management in nervous system of *D. melanogaster*. Two experiments in this study were designed to evaluate sleep-promoting effect of GABA/5-HTP mixture, to clarify the possible ratio of sleep-promoting action in the *Drosophila* invertebrate model system. Behavioral assays were applied to investigate distance traveled, velocity, movement, mobility, turn angle, angular velocity and meander of two amino acids and GABA/5-HTP mixture with caffeine treated flies. In addition, differentially expressed gene (DEG) analyses from next generation sequencing (NGS) were applied to investigate the signaling pathway and functional interaction network of GABA/5-HTP mixture administration. GABA/5-HTP mixture resulted in significant differences between groups related to behavior ( $p < 0.01$ ) and significantly induced locomotor activity in the awake model ( $p < 0.05$ ). As a result of the sequencing, the molecular function of various genes has relationship with motor activity and biological regulation. These results showed that GABA/5-HTP mixture administration significantly involved the inhibition of motor behavior. In this regard, we successfully demonstrated that using a GABA/5-HTP mixture modulates locomotor activity to a greater extent than single administration of each amino acid, and that this modulation occurs via the neuronal system, neurotransmitter release cycle and transmission across chemical synapses.

**Keywords :** sleep,  $\gamma$ -aminobutyric acid, 5-hydroxytryptophan, *Drosophila melanogaster*

**Conference Title :** ICFSN 2016 : International Conference on Food Security and Nutrition

**Conference Location :** Kyoto, Japan

**Conference Dates :** November 10-11, 2016