The Effects of Alpha BRAIN® on *Drosophila melanogaster* Activity and Memory

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Introduction

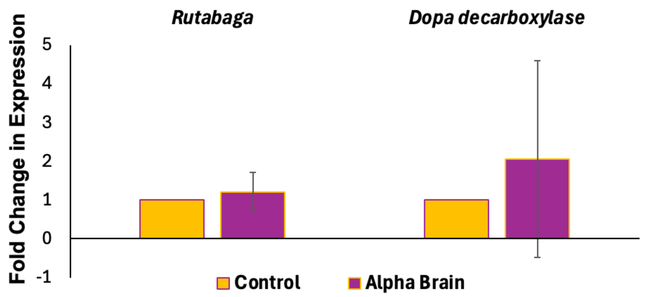
- *D. melanogaster* is a common model organism used within biological research.
- Alpha BRAIN® is an increasingly popular homeopathic supplement, promised by manufacturers to increase memory and cognition. Consumers claim they experience increased energy when taking the supplement
- The *rutabaga (rut)* gene encodes an Adenylyl Cyclase enzyme that is involved in olfactory memory and learning in *D. melanogaster*.
- The d*opa decarboxylase (ddc)* gene plays a crucial role in the synthesis of neurotransmitters, particularly dopamine, by catalyzing the decarboxylation of L-DOPA, affecting locomotion and activity.
- **Hypothesis:** *D. melanogaster* treated with Alpha BRAIN® would exhibit higher expression of the genes *rutabaga (rut)* and *dopa decarboxylase (ddc)*, along with improved performance in memory and locomotion assays.

Methods

•**Primer synthesis:** Primers for *rut* and *ddc* were designed using NCBI Primer design software.
•**Culturing:** *D. melanogaster* cultures were maintained in potato media. Experimental culture tubes received 0.210 mg of Alpha BRAIN® and control tubes received an equal volume of solvent.
•**Behavior Assays:** Rapid iterative negative geotaxis (RING) assay was used to observe *D. melanogaster* movement. Olfactory and visual learning assays were used to observe *D. melanogaster* memory.
•**RNA extraction:** RNA was extracted using the *Drosophila* Larvae RNA Extraction and DNase I Treatment Protocol and the Qiagen RNeasy Kit
•**Real-time Quantitative qPCR** was performed to measure *rut* and *ddc* expression.
•**Gene expression** was analyzed through qPCR analysis.
•**Statistical analysis** was performed using a two-tailed t-test of means, with a p-value of 0.05.

Results

Figure 1: Average fold change in expression of *rut* and *ddc* in Alpha BRAIN® treated flies compared to controls. Error bars represent the standard deviation (rut: p=0.339, ddc: p=0.357; n=6).



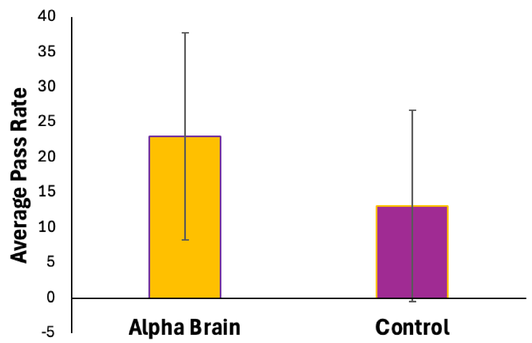
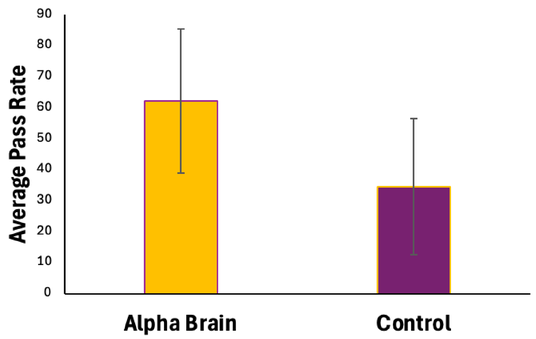


Figure 2: Average pass rates of Ring assay in Alpha BRAIN® treated flies compared to controls. Error bars represent the standard deviation (p=0.184; n=8).

Figure 3: Average pass rates of Olfactory memory learning assay in Alpha BRAIN® treated flies compared to controls. Error bars represent the standard deviation (p=0.028; n=8).



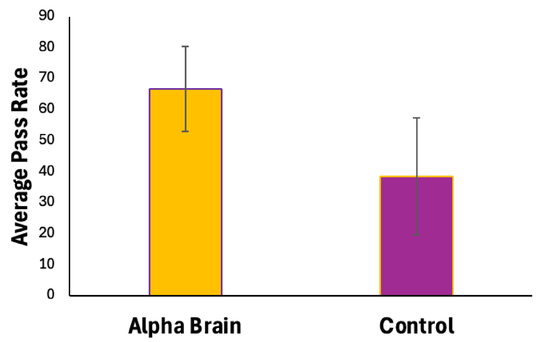


Figure 4: Average pass rates of Visual memory learning assay in Alpha BRAIN® treated flies compared to controls. Error bars represent standard deviation (p=0.005; n=6).

Conclusion

- There was a significant difference in the olfactory memory learning (p=0.028) and visual color memory learning (p=0.005) assays. No significant difference was observed for the RING assay (p=0.184).
- No significant differences were observed for the expression of *rut* (p=0.339) and *ddc* (p=0.357).
- Overall, an increase in memory and learning was observed in the flies treated with AlphaBRAIN. Consumers reporting increased activity could be experiencing a placebo effect due to increased memory and learning.
- The results disagreed with our hypothesis for gene expression and the activity assay, but significant increase in memory and learning was observed.
- Potential errors include the dosage of Alpha BRAIN®, small sample sizes, and improper technique during lab work.
- Future studies should focus on using different dosages of Alpha BRAIN® as well as use a larger number of flies and trials.

References

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