Reviewing the Effects of Aspartame Consumption on Mice Memory

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INTRODUCTION

Aspartame is an artificial sweetener that is used as a sugar substitute in low-calorie foods and beverages. In the United States, it is available under the brand names, Nutrasweet and Equal. Aspartame was ruled safe for human consumption by the FDA as long as the daily intake is 50 milligrams per kilogram of body weight. However, people do not usually consume this much in one day. Many risks are associated with the consumption of aspartame including seizures, ADHD, Alzheimer's, cancer, and congenital disabilities. Our main focus in this poster is how aspartame impacts mice memory.

OBJECTIVES

This study focused on finding the negative effects of aspartame consumption on mice. The mice were tested via a maze to see if their memory would be significantly damaged/delayed after given repeated doses of aspartame.

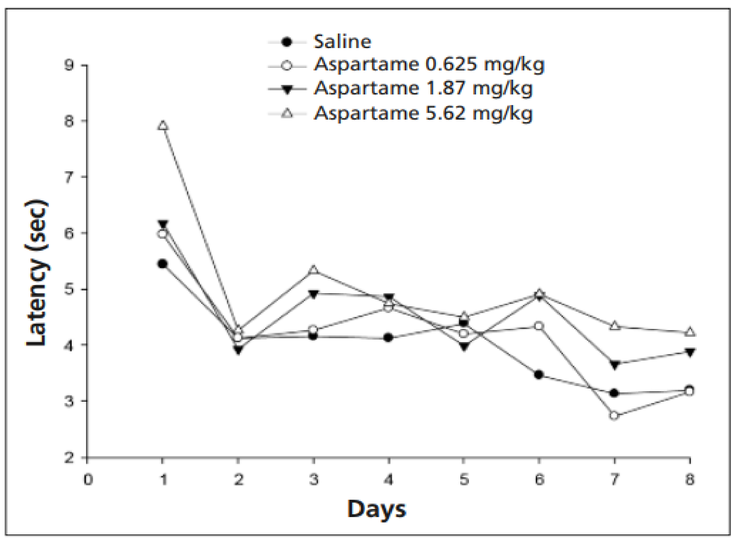

Figure 1. The mean latency to locate a submerged plate in the Morris water maze test over two weeks (Abdel-Salam et al.).

METHODS

- There were 4 groups of 6 Swiss albino mice each weighing 20-22 grams (Control, Group 1, Group 2, Group 3).
- Daily intakes:
  - Control - 0.2 mL of saline
  - Group 1 - 0.625 mg/kg of aspartame
  - Group 2 received 1.87 mg/kg of aspartame
  - Group 3 received 5.62 mg/kg of aspartame.
- The mice took Morris Water Maze test 4 times per week for 2 weeks.
- The Morris Water Maze test is of mice finding a hidden escape platform located 1 cm below the water surface.
- This Morris Water Maze tests the spatial memory of the mice.
- At the end of the test, the mice's brains were examined to measure nitric oxide level, brain glucose, brain monoamines, reduced glutathione content, and brain lipid peroxidation.

RESULTS

- The data expressed as mean standard error of the mean (± SEM).
- In the first trial, the dose of 5.625 mg/kg had significantly delayed the mean time it took to find the escape platform (latency).
- In the second and third trials, aspartame did not significantly affect the latency.
- Overall, the administration of 0.625 mg/kg did not affect the variables measured (nitric oxide, glutathione, glucose concentrations, or brain malondialdehyde).
- Higher doses of aspartame substantially impaired the spatial memory of the mice indicated by their poor water maze performance.

CONCLUSIONS

Based on these findings, it was found that aspartame consumption led to decreased performance in the water maze for mice. Aspartame has been shown to decrease glutathione in the brain, which can theoretically increase the vulnerability of the brain to oxidative insults and in turn, disrupt short-term spatial memory. Also, lipid peroxidation was measured by levels of malondialdehyde, which has been found to increase in production with the administration of aspartame; lipid peroxidation has been known to cause cell damage which can be detrimental to the brain.

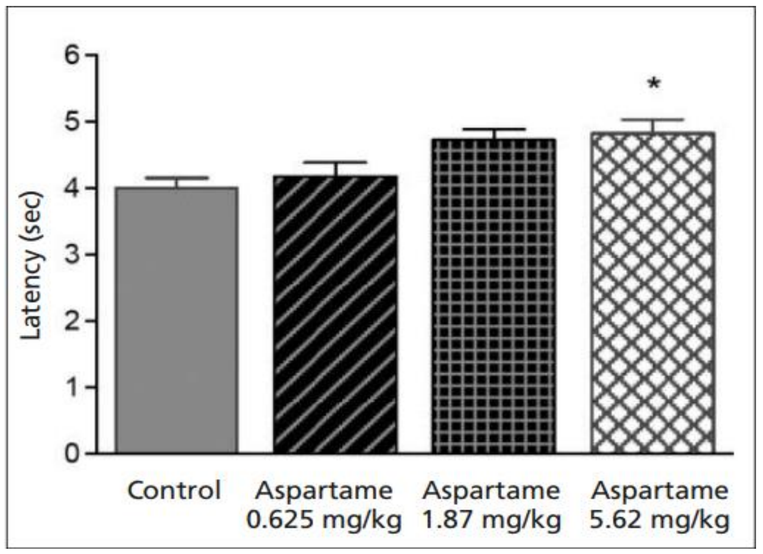

Figure 2. The mean latency and standard error of the mean to locate a submerged plate in the water maze over two weeks. Mice were injected daily with saline or aspartame at the levels shown, and tested four times each week (Abdel-Salam et al.).

FUTURE WORK

Ideas for the continuation of this study could include injecting the mice with higher doses of aspartame to test their tolerance and if there are any changes in its overall effect of the mice's memory. Further changes may include the creation of more intricate mazes to test the mice's spatial memory and see how much the aspartame has affected their brain. A manipulation of aspartame dose would also allow researchers to recognize the differences, if any, between lower and higher doses. Additionally, researchers may want to explore other areas of the body that may be affected. If of interest, it's also possible to look at aspartame effects on rats (Tilson et al.).

References

Abdel-Salam, O. M. E., et al. "Studies on the effects of aspartame on memory and oxidative stress in brain of mice." European Review Medical Pharmacological Sciences 16.15 (2012): 2092-101.

Tilson, Hugh A., J. S. Hong, and Thomas J. Sobotka. "High doses of aspartame have no effects on sensorimotor function or learning and memory in rats." Neurotoxicology and teratology 13.1 (1991): 27-35.

Acknowledgments

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