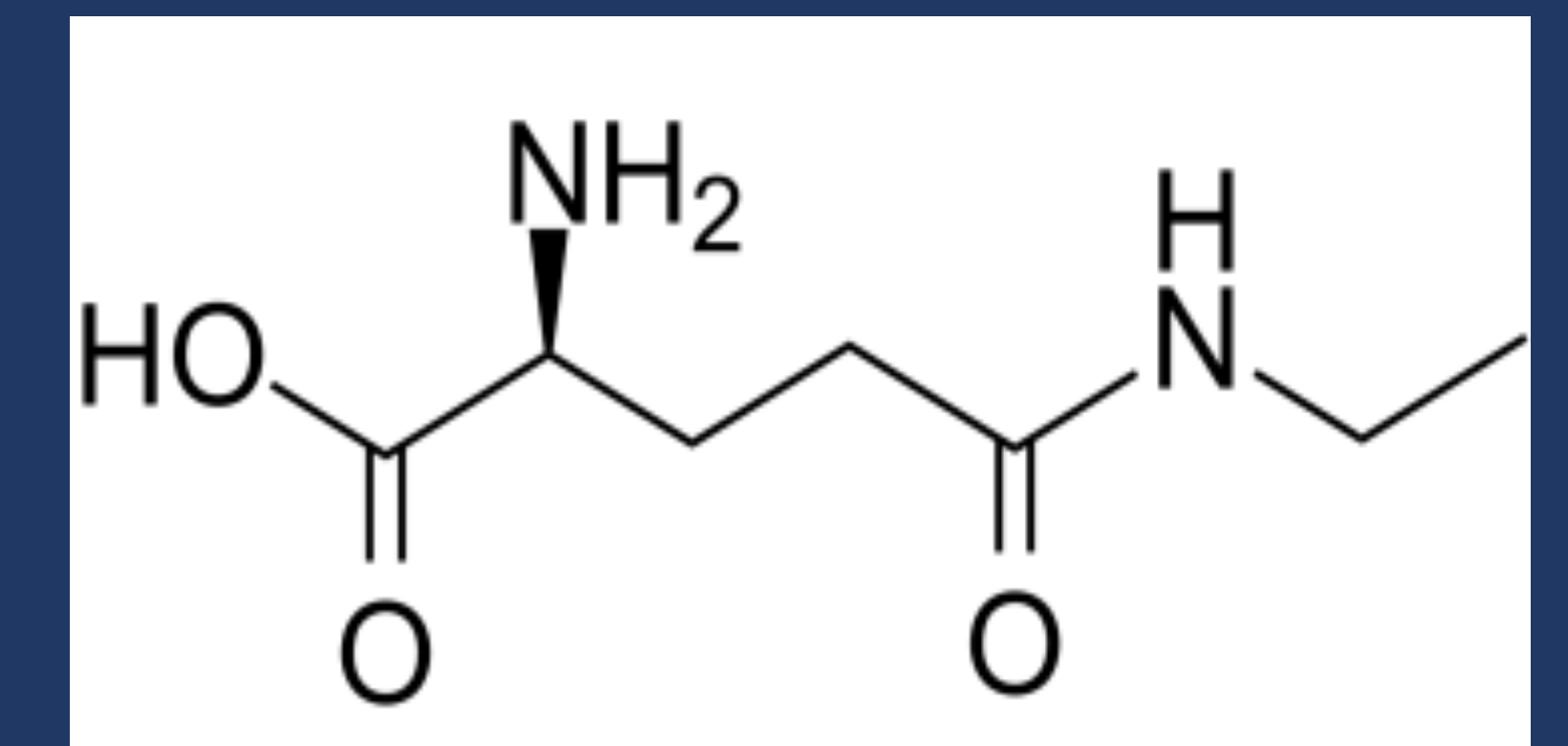


The Impact of L-theanine on Zebrafish (*Danio rerio*) Development

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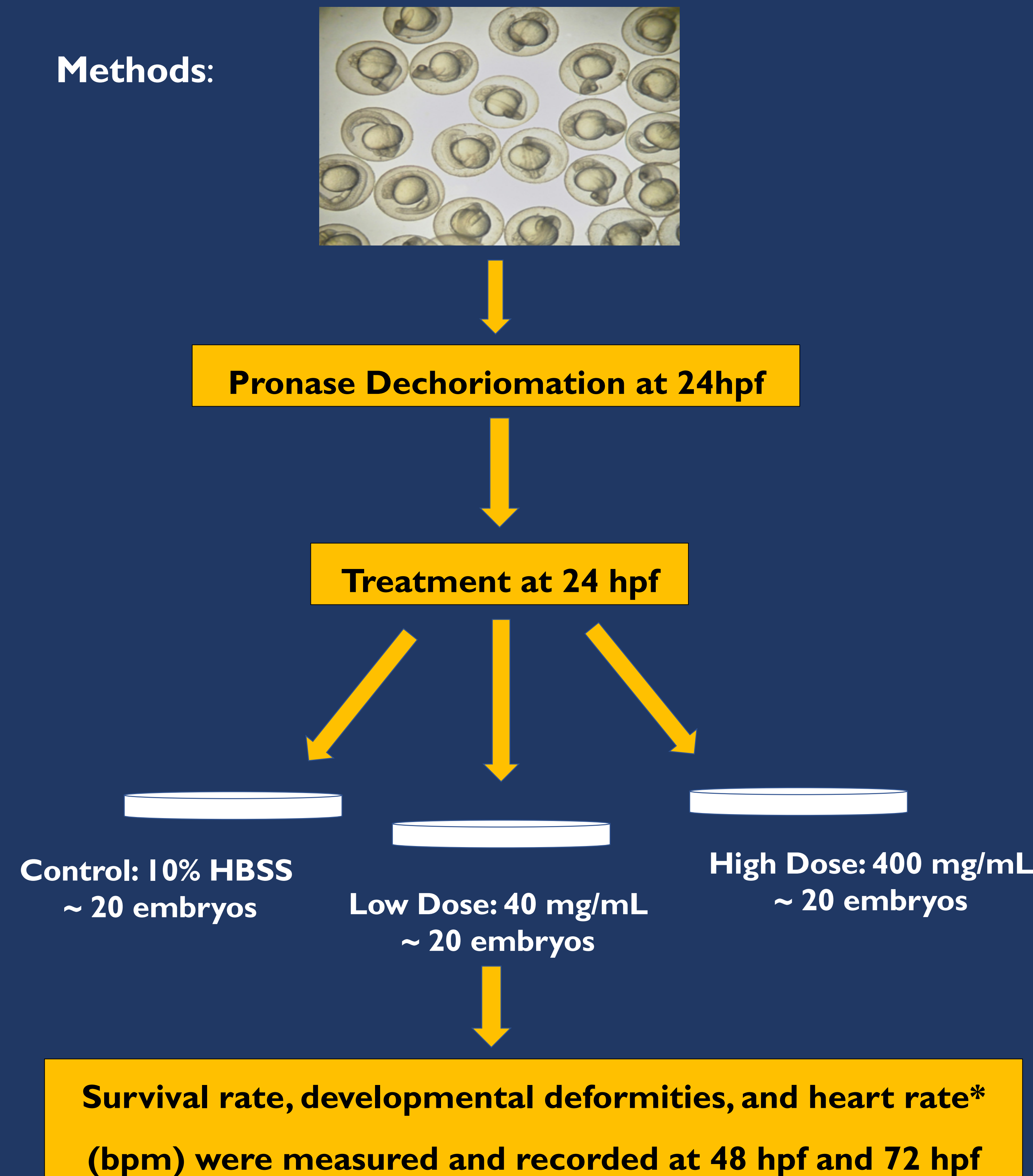
Introduction:

- Roughly three million anxiety disorder diagnoses are reported each year in the United States
- Women tend to be diagnosed with anxiety at a higher likelihood than men, with symptoms that worsen during pregnancy (Rubinchik et. al, 2005)
- Commonly treated with anxiolytics, however, these medications have a wide array of significant side effects
- There is also little research regarding the safety of anxiolytic drug use during pregnancy
- The amino acid, L-theanine, is commonly found in green tea drinks and is thought to be a cognitive enhancer as well as a relaxing agent (Sarris et. al, 2019)
- L-theanine has the potential to be a possible natural replacement for anxiolytic medications
- The toxicity and teratogenicity of L-theanine for use during pregnancy has not been researched
- Zebrafish (*Danio rerio*) embryos provide a great model for teratogenic and developmental toxicity studies

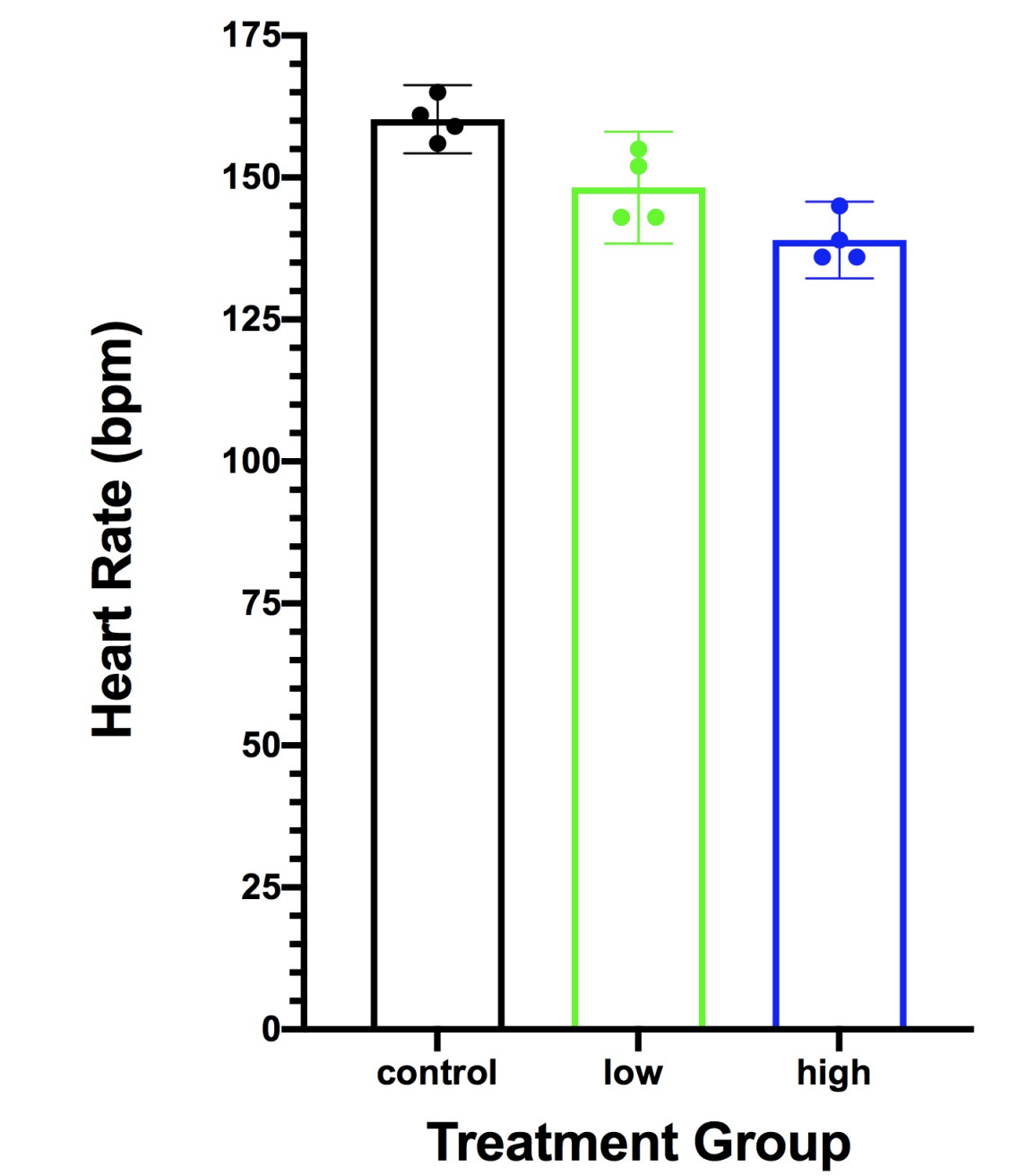
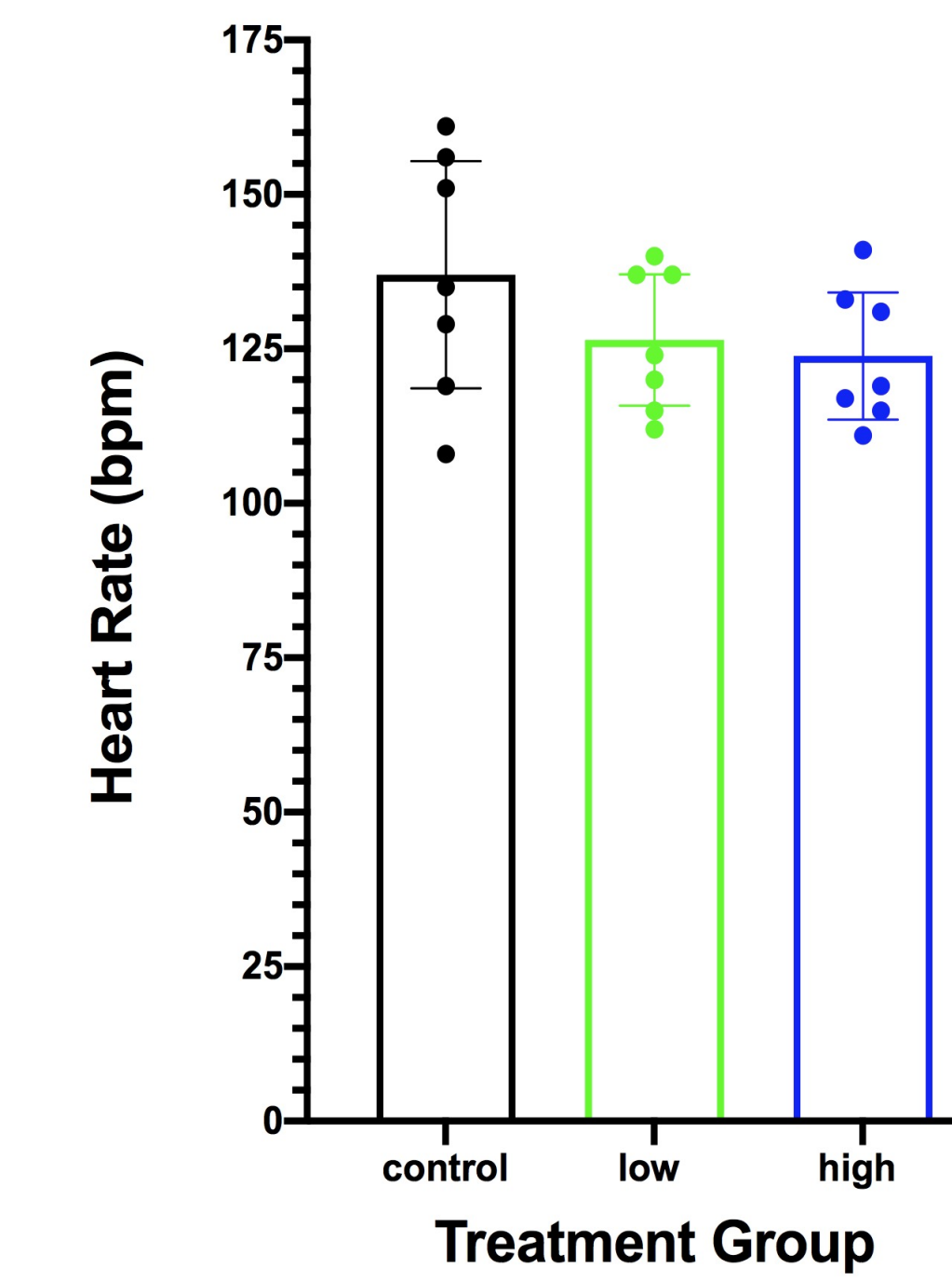
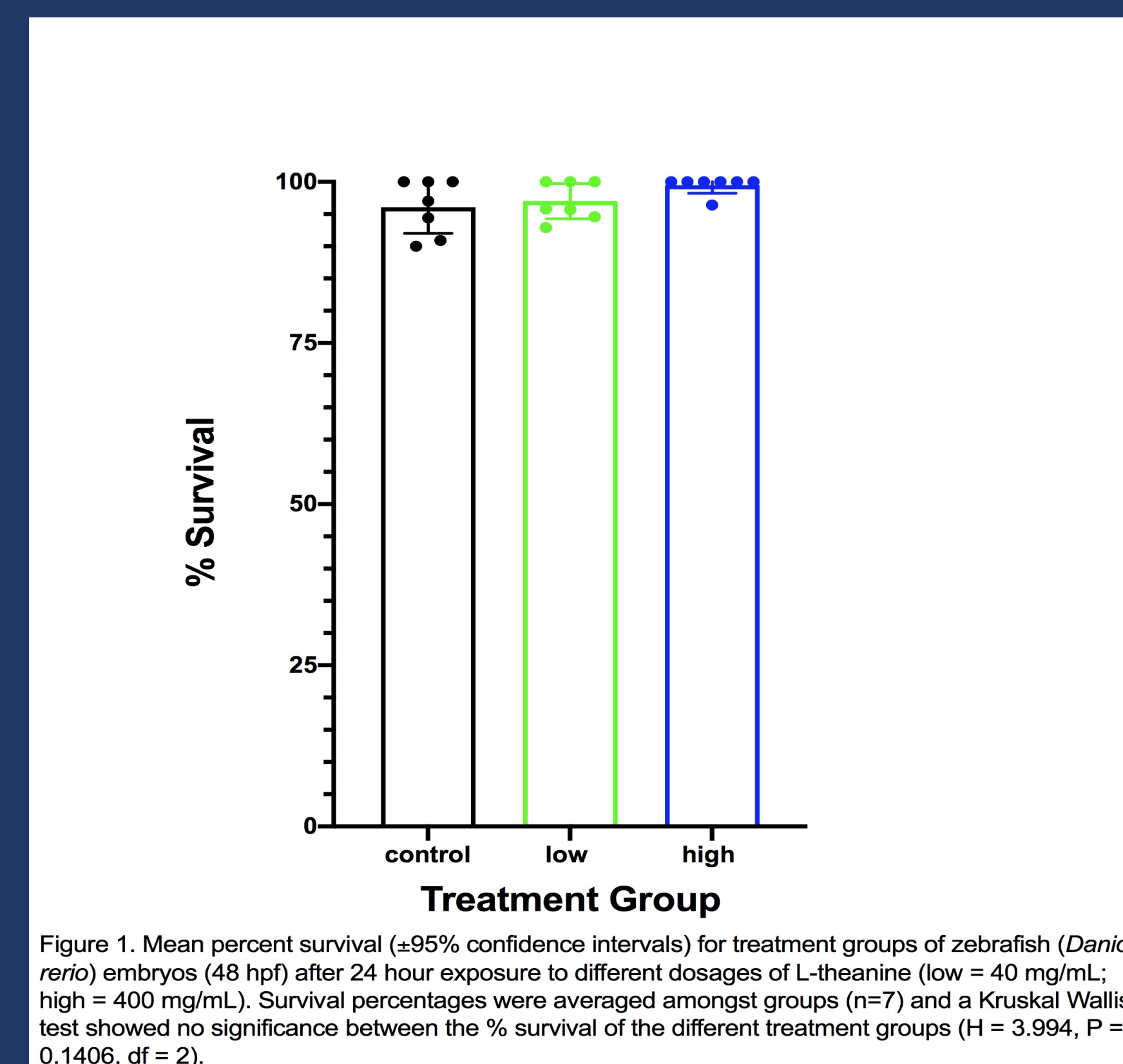
Objective:

As the concentration of L-theanine increases, there will be no significant teratogenic effects, such as drastic mortality, developmental defects, or change in heart rate

Methods:



*For HR measurements, 3 embryos were selected from each treatment dish per clutch and averaged together to make a replicate. (48 hpf results used measurements from seven clutches (n=7) and 72 hpf results used measurements from four clutches (n=4))



Results:

- **L-theanine did not significantly affect survival rate as dosages increased during both time points**
- **L-theanine did not significantly affect the amount of defects developed as dosages increased during either time point**
- **An increase in L-theanine dosage correlated with a decreasing trend in heart rate at 48 hpf and a significant decrease in heart rate at 72 hpf**

Conclusions:

- **Significant decreasing trend in heart rate may be a sign of teratogenicity with L-theanine use**
- **Previous study on adult humans also shows a decrease in heart rate after L-theanine administration (Kimura et. al, 2007)**
- **May not be a safe replacement for anxiolytics during pregnancy**
- **More research needed on the mechanism of action of L-theanine to determine safety in regards to effects on the heart**

Sources:

Kimura, K., Ozeki, M., Juneja, L., Ohira, H. (2007 January). L-Theanine Reduces Psychological and Physiological Stress Responses. *Biological Psychology*, Volume 74 (1); pp. 39-45. <https://doi.org/10.1016/j.biopsycho.2006.06.006>

Rubinchik, S. M., Kablinger, A. S., & Gardner, J. S. (2005). Medications for panic disorder and generalized anxiety disorder during pregnancy. *Primary care companion to the Journal of clinical psychiatry*, volume 7(3); pp. 100–105. doi:10.4088/pcc.v07n0304

Sarris, J., Byrne, G., Cribb, L., Oliver, G., Murphy, J., Macdonald, P., Nazareth, S., Karamacoska, D., Galea, S., Short, A. Ee, C., Birling, Y., Menon, R. Ng, C. (March 2019). L-theanine in the Adjunctive Treatment of Generalized Anxiety Disorder: A Double-Blind, Randomised, Placebo-Controlled Trial. *Journal of Psychiatric Research*, volume 110; pp. 31-37. <https://doi.org/10.1016/j.jpsychires.2018.12.014>