

A Preliminary Study of the Effects of Melatonin on Cardiac Development of Quail Embryos



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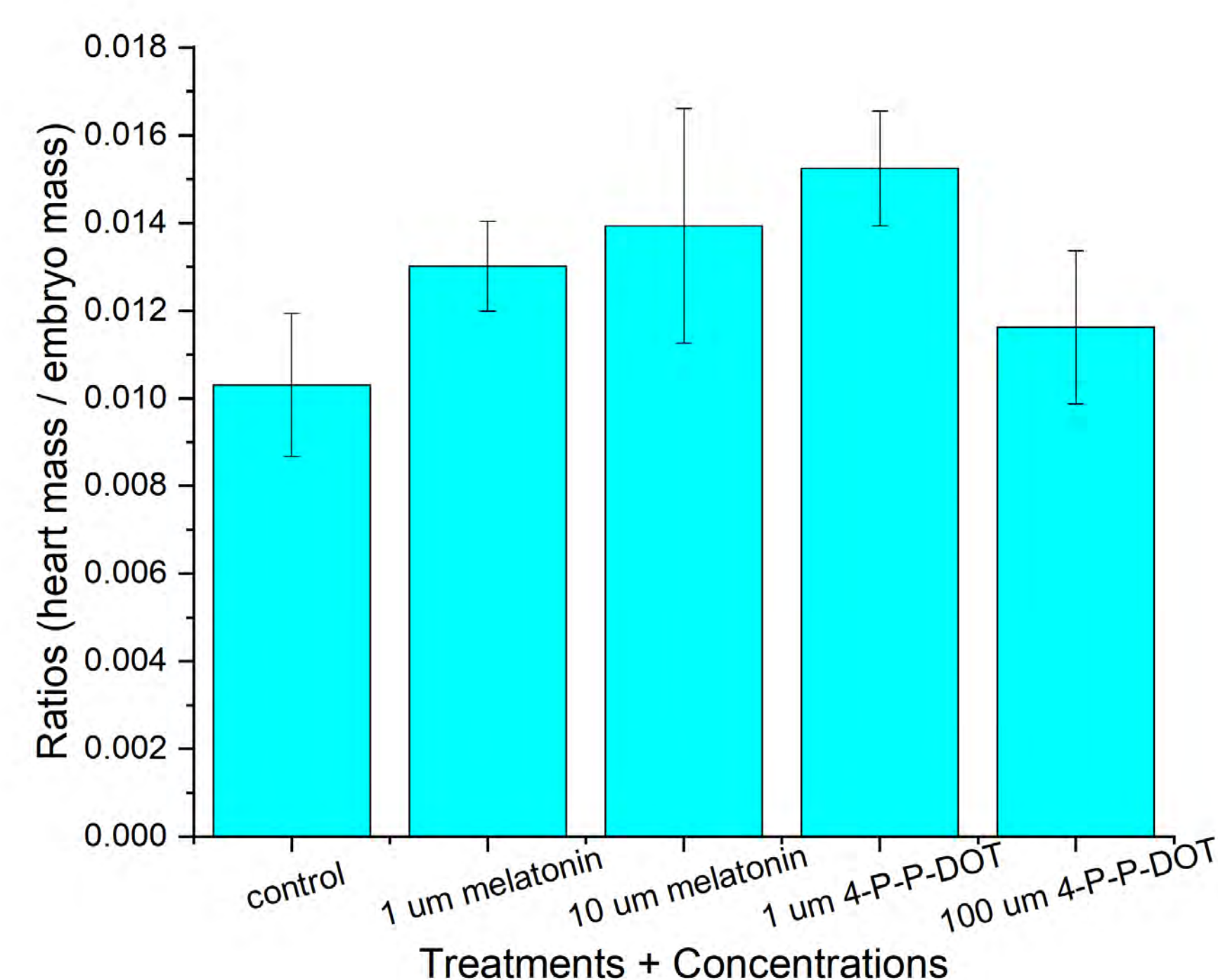
INTRODUCTION

The heart has been the subject of a vast amount of scientific research. Because of its sheer importance to the overall well-being of an organism, it is important to understand as much as possible about this vital organ. While a wide array of different animal models has been used by laboratories, the chicken embryo has become the subject of a large volume of research. The heart of a chick embryo goes through stages of development similar to that of a human heart, and a developed chicken heart is similar morphologically in structure to that of a developed human heart. Because of this, scientific studies and findings that focus on the chick heart (along with certain other avian hearts) can be equated to some degree to the human heart.

Noting the similarities between avian and human hearts, one can infer that the response of avian hearts to certain stimuli would likely be observed in human hearts as well. These stimuli can include different chemicals, such as melatonin. Melatonin is a substance that is widely used by humans, but little is known of the role of melatonin in embryonic development. By observing the response of the chicken hearts at certain stages of development to various concentrations of melatonin, inferences can be made about how similar concentrations of melatonin could impact human fetus hearts at similar stages in development. Such findings could have a significant impact in the medical and pharmacological communities, as pregnant mothers who take melatonin regularly could unknowingly be affecting the development of their child.

METHODS: Heart Mass : Embryo Mass Comparison

Quail eggs were split into 7 treatment groups of 6 eggs each for a total population of 42 eggs, although many failed to develop (treatment group size to the right of table). Each group of eggs was treated with 1 μm , 10 μm , or 100 μm melatonin, or 1 μm , 10 μm , or 100 μm melatonin antagonist, with the 7th group acting as the control group.



Control: n=6
1 μm melatonin: n=7
10 μm melatonin: n=3
1 μm 4-P-P-DOT: n=3
100 μm
4-P-P-DOT: n=3

Figure 1: Displays the average ratios of the mass of embryonic quail hearts over the mass of the quail embryos. The ratios are higher for embryos treated with melatonin, however the data is not significant.

METHODS: Confocal Microscopy of Melatonin Treated Hearts

Sample hearts from the heart mass: embryo mass experiment were taken to Boise State University's Biomolecular Research Center to use their confocal microscope. We obtained images of 5 control hearts, and 7 hearts treated with melatonin.

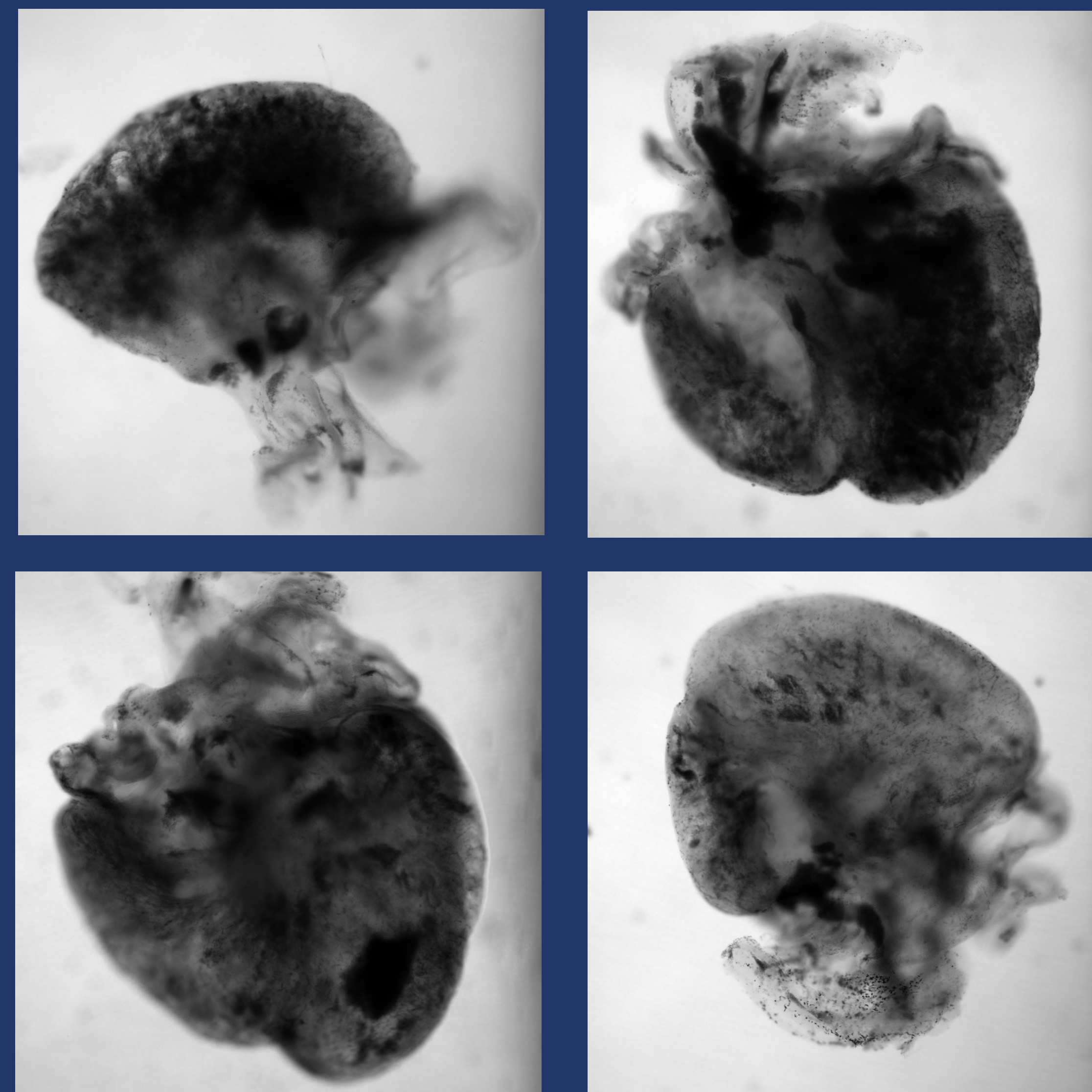


Figure 2: Displays four quail hearts as seen under the confocal microscope.

Confocal Microscopy Data

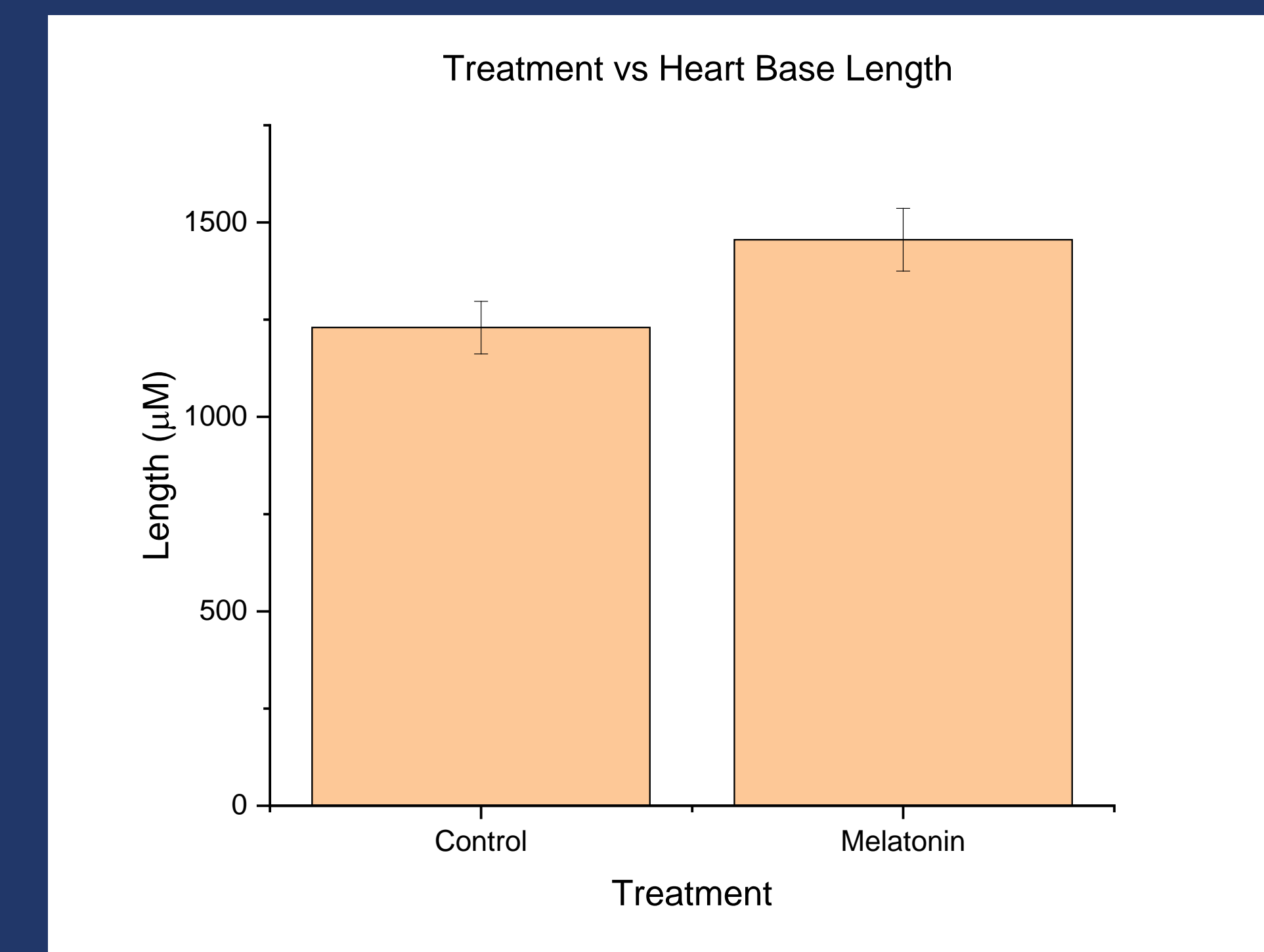


Figure 3: Displays a graph of the measurements of heart base length for control vs. melatonin treated hearts. The data shows a significant difference, the average melatonin treated heart base length is greater than the control hearts.

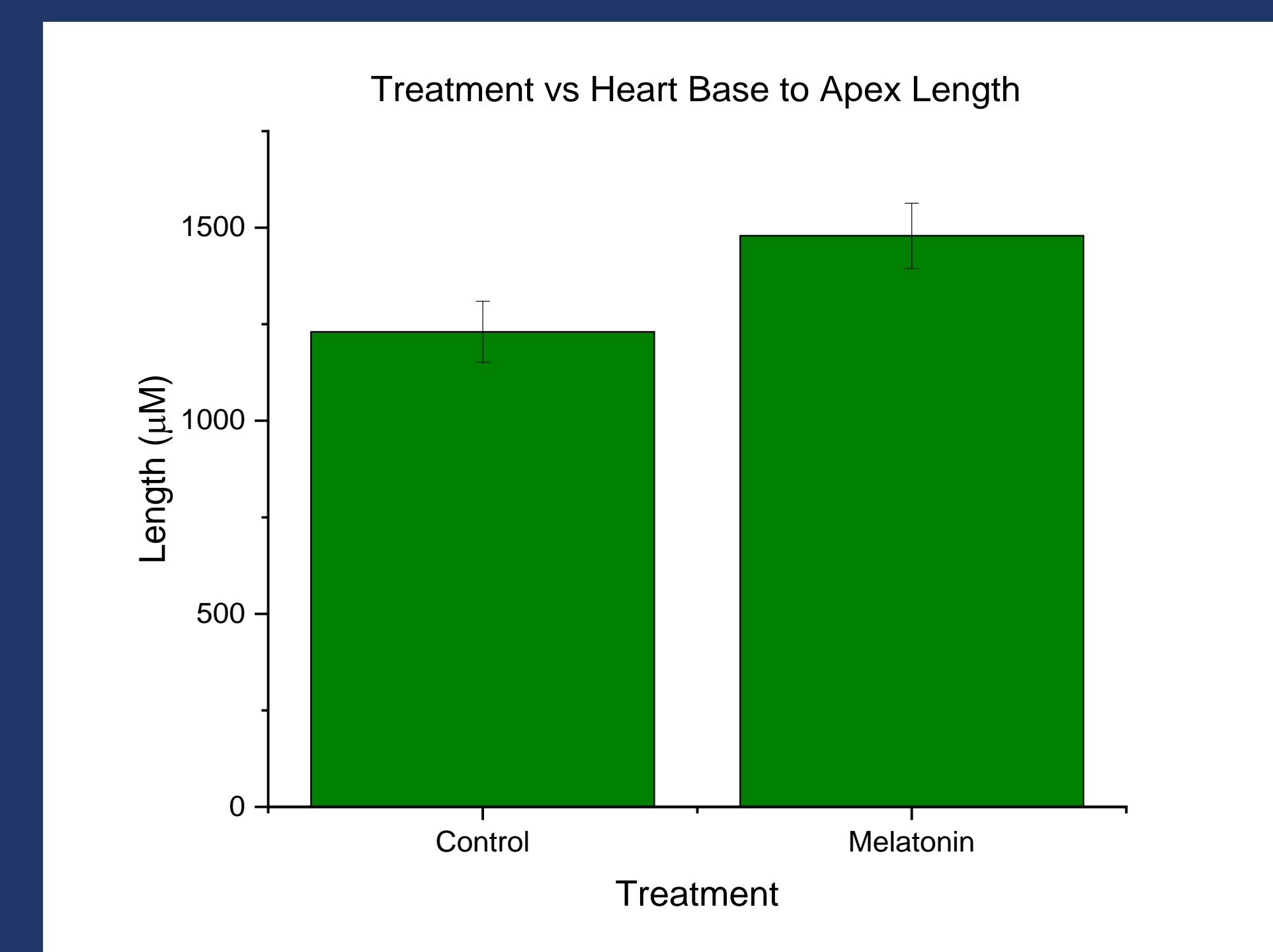


Figure 4: Displays a graph of the measurements of heart base to apex length of control vs. melatonin treated hearts. The data shows a significant difference, the average melatonin treated heart base to apex length is greater than that of the control hearts.

CONCLUSION

- Melatonin does affect the physical dimensions of the quail heart
- Seems to increase the dimensions of the heart
- Implications and sample size?

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DISCUSSION AND FURTHER INVESTIGATIONS

- Because quail embryos have low survivability, first step is to obtain more live chicken eggs
- Repeat heart mass : embryo mass experiment with increased sample size
- Determine implications of confocal microscope data