

# The Effects of Microbeads on *Daphnia pulcaria*

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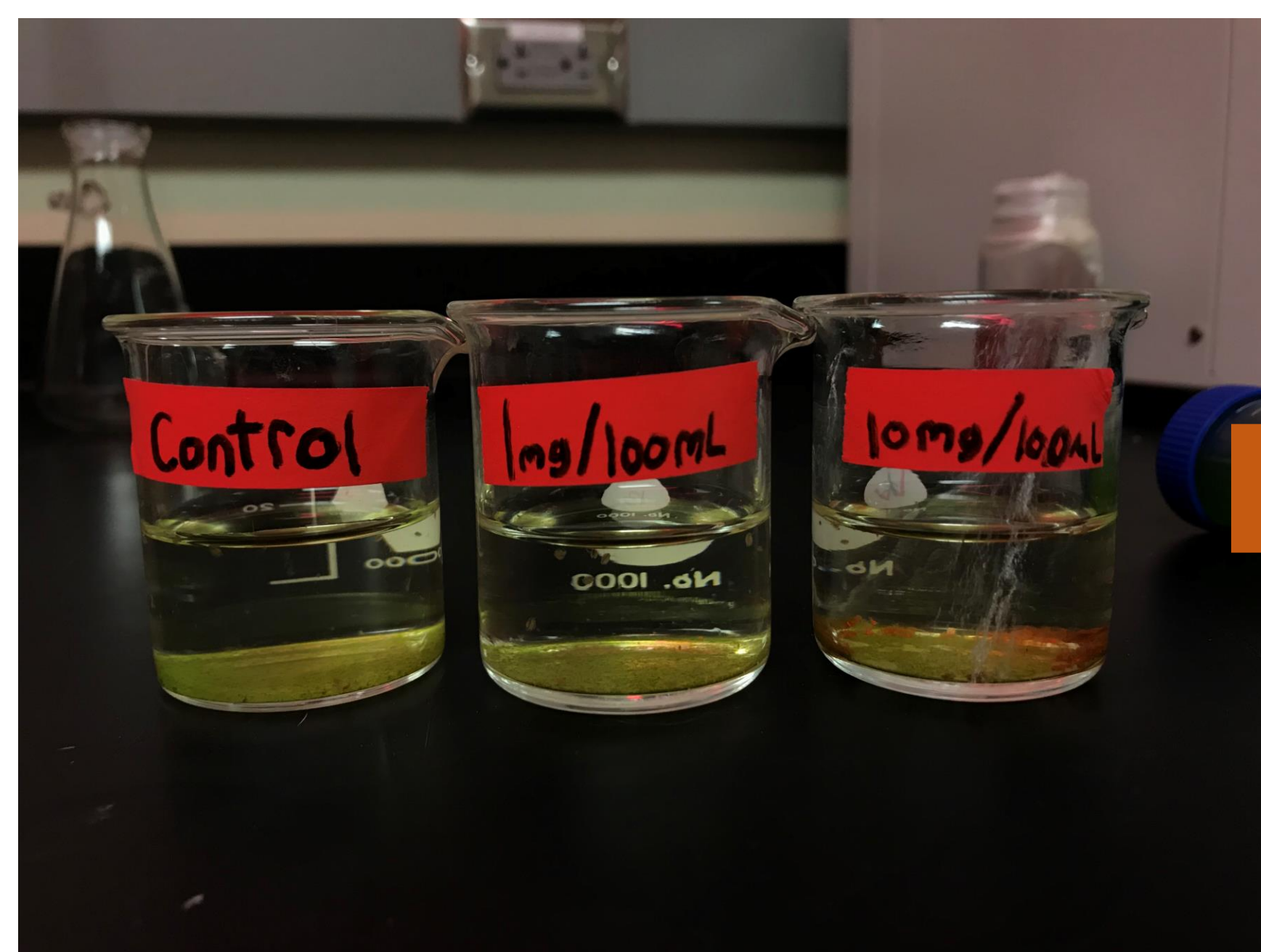
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## Introduction

Daphnia are crustaceans ranging in size from 1mm-1cm. *Daphnia pulcaria* are among the smallest species of daphnia, ranging in size from <1mm-2mm. Their small size and sensitivity to environmental change make them a suitable subject to test the effects of microbead exposure. For my experiment, I exposed daphnia to various levels of microbeads to see if there would be a noticeable difference in population after a period of time. Since daphnia take approximately 5-10 days to reproduce, the population numbers were counted after 24 hours and 10 days.

## Hypothesis

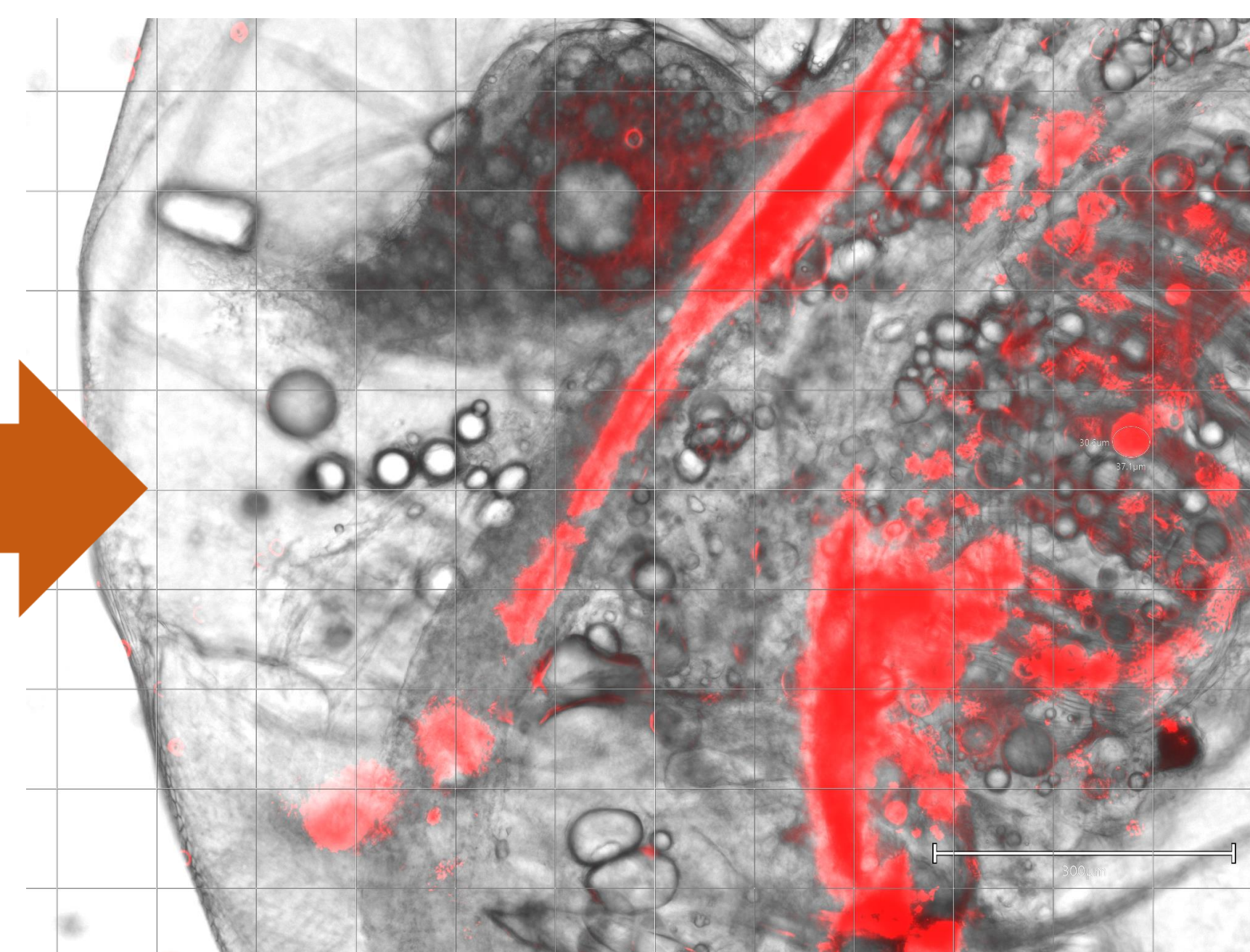
When *Daphnia pulcaria* are exposed to higher levels of microbeads over longer periods of time, their reproduction and mortality rate will increase, resulting in a smaller population after 10 days.



10 day exposure set-up



Daphnia pre-exposure to microbeads



Microbeads within daphnia digestive tract

## Methods

- Daphnia were separated into two groups. The first group were exposed to microbeads for 24 hours. The second group were exposed to microbeads for 10 days.
- Each of those groups were further divided into smaller subgroups of 20 daphnia following the same specifications.
- The first subgroup were set up as a control.
- The second subgroup were exposed to 1 mg of microbeads for every 100 mL of water.
- The final subgroup were exposed to 10 mg of microbeads for every 100 mL of water.
- The daphnia were kept in 300 mL of FLAMES water. FLAMES water was used as a consistent water to mimic daphnia's optimal living conditions. Additionally, the daphnia were fed *Scenedesmus* algae, their preferred diet.
- After each exposure period expired, the daphnia within each group were counted.
- View daphnia underneath EVOS M5000 microscope.

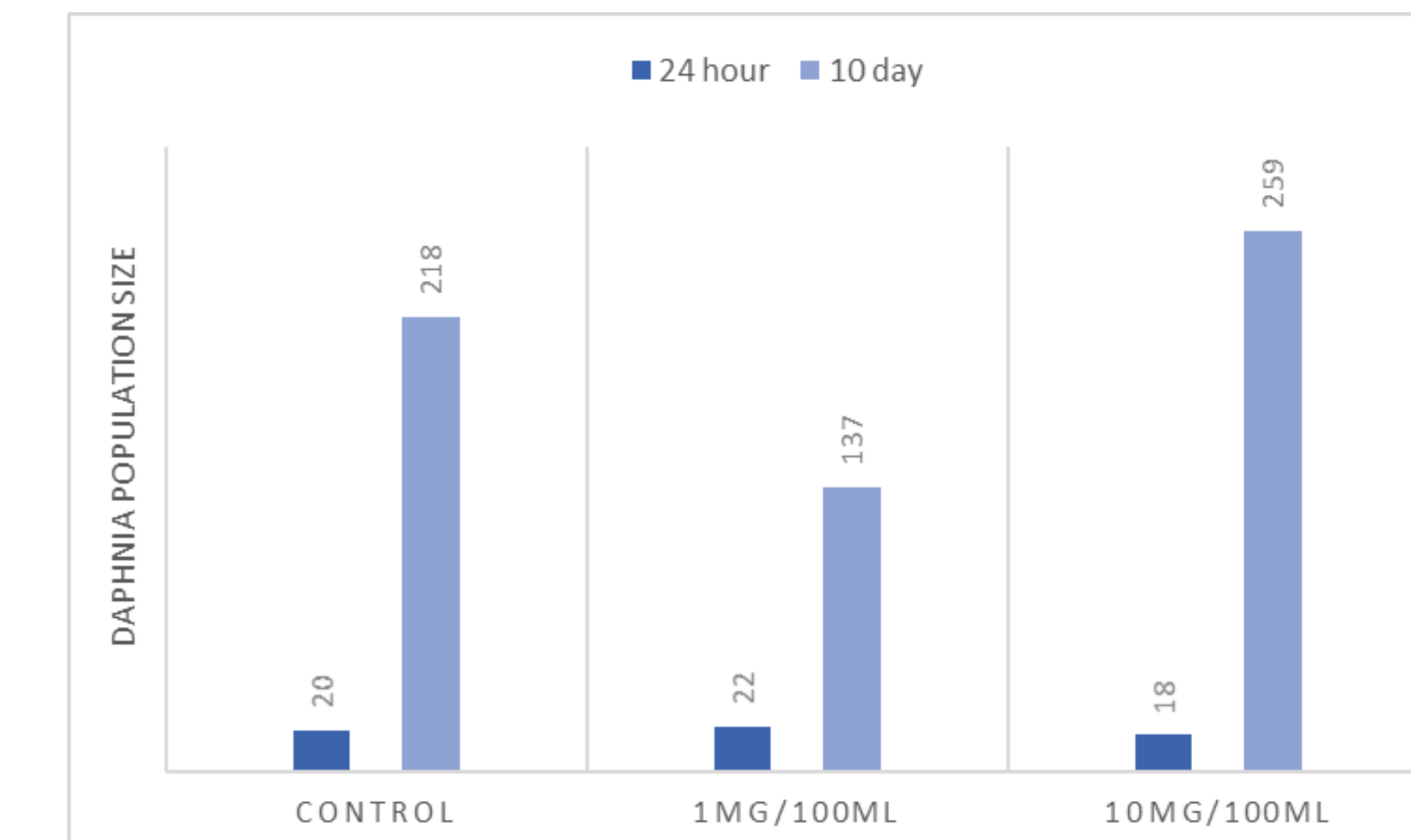


Figure 1: Population size of daphnia after their respective exposure periods.

## Results

The experiment did not go exactly as planned. The results after the 24 hour period were to be expected. There seemed to be no difference in the population sizes between the exposure groups. This is to be expected because the daphnia were not given enough time to respond to the change within their environment. However, as seen in Fig. 1, the results after ten days of microbead exposure shows the highest population of daphnia living within the highest concentration of microbeads. The lowest population of daphnia falls within the mid-range concentration of microbeads. The expected results would have had the highest population of daphnia within the control group, the second highest in the mid-range concentration, and the lowest population in the highest concentration of microbeads.

## Discussion

While the results are not what was expected, it's still reasonable to hypothesize that microbeads have an effect on daphnia's mortality rate. In past experiments there has been the negative correlation expected. Microbead size could also have an effect on the daphnia; would larger microbeads cause a higher mortality rate among daphnia? The next experiment will look to answer this question.

## References

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- Imhof, Deken, Anne. "Seeing Red: Daphnia and Hemoglobin." Hannes K., et al. "Do Microplastic Particles Affect Daphnia Magna at the Morphological, Life History and Molecular Level?" *PLOS ONE*, vol. 12, no. 11, Nov. 2017, p. e0187590, doi:10.1371/journal.pone.0187590.